Draft Submittal
(Pink Paper)

Reactor Operator Written Exam

HARRIS JAN./FEB. 2006 EXAM

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HARRIS INIITIAL LICENSE EXAM MATERIAL

January 2006 RO and SRO Exams

RO WRITTEN EXAM BINDER

QUESTIONS REPORT
for Harris RO Exam

1. 003 A2.03 001/NEW/HIGHER/3/2/1/2.7/RO/

Given the following conditions:

- The plant is at 40% power.
- The crew has entered AOP-018, RCP Abnormal Conditions, due to temperature alarms on RCP "A".
- The following ERFIS indications currently exist for RCP "A":

• Upper and Lower Thrust Bearing temperatures	182 deg F
• Upper and Lower Radial Bearing temperatures	186 deg F
• Motor Stator Winding Temperature	306 deg F
• Motor Current Fluctuations Peak to Peak	25 Amps

Which ONE (1) of the following describes the impact of these indications, and the action required in accordance with AOP-018?

A. Thrust bearing temperatures exceed allowable limits. Trip the reactor and trip RCP "A".

B. Radial bearing temperatures exceed allowable limits. Trip RCP "A".

C. Motor current fluctuations exceed allowable limits. Trip the reactor and trip RCP "A".

D. Motor stator winding temperature exceeds allowable limits. Trip RCP "A".

A, B, and C are all near but not exceeding allowable limits. D is correct.
No requirement to trip the reactor below 49% power.

QUESTIONS REPORT
for Harris RO Exam

Common 1

Tier 2 Group 1
K/A Importance Rating - RO 2.7

Ability to (a) predict the impacts of the following malfunctions or operations on the RCPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Problems associated with RCP motors, including faulty motors and current, and winding and bearing temperature problems.

Reference(s) - AOP-018, attachment 1
Proposed References to be provided to applicants during examination - NONE
Learning Objective - AOP-LP-3.18, Obj 3
Question Source - New
Question History -
Question Cognitive Level - HIgher
10 CFR Part 55 Content - 41(b).10
Comments -

003 A2.03

Attachment 1
Sheet 1 of 2

Reactor Coolant Pump Trip Limits

NOTE

False indications such as step changes or spikes on both the upper and lower thrust bearings are signs that the instrumentation transient may not be valid.

Validation of the temperatures should be performed by observing positive indications of any of the following:

- Simultaneous temperature increases in upper and lower thrust bearing and upper guide bearing (may indicate loss of CCW cooling or oil viscosity problems common to the upper reservoir)
- Vibration levels increasing along with increasing bearing temperatures.
- High or low RCP oil level alarms along with increasing bearing temperatures.
- ERFIS points TRC0417A and TRC0439 have been defeated from processing during Cycle 13.

☐1. ANY of the following Motor Bearing temperatures exceeding 190°F: **[A.1]**

	ERFIS Points		
	RCP A	RCP B	RCP C
Mtr Upper Thrust Brg Temp	TRC0417A	TRC0427A	TRC0437A
Mtr Lower Thrust Brg Temp	TRC0417B	TRC0427B	TRC0437B
Mtr Upper Radial Brg Temp	TRC0418A	TRC0428A	TRC0438A
Mtr Lower Radial Brg Temp	TRC0419	TRC0429	TRC0439

☐2. ANY of the following Pump temperatures exceeding 230°F: **[A.1]**

	ERFIS Points		
	RCP A	RCP B	RCP C
Pump Radial Brg Temp	TRC0131	TRC0128	TRC0125
Seal Water Inlet Temp	TRC0132	TRC0129	TRC0126

☐3. RCP Stator Winding temperature exceeding 300°F:

	ERFIS Points		
	RCP A	RCP B	RCP C
Motor Stator Windg Temp	TRC0418B	TRC0428B	TRC0438B

Attachment 1
Sheet 2 of 2

Reactor Coolant Pump Trip Limits

NOTE

ALB-5-1-2B, RCP THERM BAR HDR LOW FLOW, indicates loss of CCW to all RCP thermal barriers.

☐**4.** Loss of RCP seal injection when ANY of the following conditions exist:

- CCW flow is lost to the associated RCP Thermal Barrier HX
- RCS temperature is greater than or equal to 400°F AND CCW HX outlet temperature is greater than 105°F
- RCS temperature is less than 400°F AND CCW HX outlet temperature is greater than 125°F

☐**5.** RCP vibration in excess of the following: **[A.1]**

- 20 mils shaft
- 15 mils shaft and increasing greater than 1 mil/hr
- 5 mils frame
- For A and C RCPs ONLY: 3 mils frame and increasing greater than 0.2 mil/hr
- For B RCP ONLY: 3.5 mils frame and increasing greater than 0.2 mils/hr

☐**6.** RCP Motor current fluctuations of 40 amps peak-to-peak:

	ERFIS Points		
	RCP A	RCP B	RCP C
Motor Current	IRC0160	IRC0161	IRC0162

☐**7.** Loss of CCW to an RCP or RCP Motor when:

- An RCP has operated for 10 minutes without CCW flow to either motor oil cooler **[A.2]**
- Isolation of CCW to an RCP is necessary to stop excessive CCW System leakage

-- END OF ATTACHMENT 1 --

2. 004 A1.07 001/NEW/HIGHER/3/2/1/004A107/RO/

Given the following conditions:

- The plant is at 100% power.
- All control systems are in their normal alignments.

Which ONE (1) of the following describes the maximum allowable amount of Letdown flow to prevent receiving alarm APP-ALB-007-3-4, LOW PRESSURE LETDOWN HIGH FLOW?

A. 105 GPM

B. 120 GPM

C. 150 GPM

D. 165 GPM

B is correct. Normally there are 2 letdown orifi in service. 45 GPM and 60 GPM for a total of 105 GPM. Placing the 3rd orifice in service will raise letdown flow by 45 GPM, for a total of 165 GPM at NOP, NOT. Alarm is set at 130 GPM
Common 2

Tier 2 Group 1
K/A Importance Rating - RO 2.7

Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CVCS controls including: Maximum specified letdown flow.

Reference(s) - CVCS SD-107, Pg 15 ALB-007-3-4
Proposed References to be provided to applicants during examination - None
Learning Objective - LP CVCS3-0, Obj 2.a
Question Source - New
Question History -
Question Cognitive Level - HIGHER
10 CFR Part 55 Content - 41(b).3
Comments -

004 A1.07

DEVICES: FS-01CS-0150W **SETPOINT**: 130 gpm

LOW PRESS LETDOWN HIGH FLOW

REFLASH: NO

OPERATOR ACTIONS:

1. **CONFIRM** alarm using FI-150.1, LP Ltdn Flow.
2. **VERIFY** Automatic Functions: None
3. **PERFORM** Corrective Actions:
   a. **REFER TO** OP-107, Chemical and Volume Control System,
      AND **PERFORM** the following:
      (1) **REMOVE OR CHANGE** in-service letdown orifices to lower letdown flow.
      (2) **IF** high letdown flow can NOT be lowered,
      THEN:
      (a) **REMOVE** letdown from service.
      (b) **IF** desired,
      THEN PLACE Excess Letdown in service.
   b. **IF** 1CS-38, Letdown PCV Isol Vlv (PK-145.1), can NOT maintain letdown pressure in automatic,
      THEN:
      (1) **PLACE** PK-145.1 in MANUAL.
      (2) **ADJUST** 1CS-38 to raise letdown pressure.
   c. **IF** letdown system leakage is suspected,
      THEN GO TO AOP-016, Excessive Primary Plant Leakage.

CAUSES:

1. Wear or failure of flow orifice
2. Letdown system leak downstream of FE-01CS-0150SW
3. 1CS-38, Letdown PCV Isol Vlv (PK-145.1) failed open
4. PK-145.1, Ltdn Pressure, failure
5. FS-01CS-0150W failure
6. Alarm circuit or instrumentation malfunction

REFERENCES:

1. AOP-016, Excessive Primary Plant Leakage
2. OP-107, Chemical and Volume Control System
3. 2165-S-1303, 1304, 1305
4. 2166-B-401 0937

3.16 Boric Acid Filter

The boric acid filter is identical to the seal water return filter, and is located directly across the aisle from the reactor coolant filter (common RAB, room A129A), northwest of column/row E/41.

3.17 Seal Water Injection Filters

The two seal water injection filters are backflushable, multi-stack units that have 5-micron filtration ratings. These stainless steel filters are designed for 2735 psig and 200°F and are rated at 80 gpm with a pressure drop of between 5 psid (clean) and 20 psid (dirty). The seal water injection filters are located adjacent to the seal water return filter (common RAB, room A129A).

3.18 Letdown Orifices

Three letdown orifices are installed in the CVCS. These orifices are designed to provide permanent pressure loss without recovery, and are fabricated of austenitic stainless steel. Their design pressure and temperature are 2485 psig and 650°F respectively. The orifices are placed into or out of service by remote operation of their respective isolation valves. The letdown flow rate is chosen according to plant operational requirements and is adjusted by selecting the proper combination of letdown orifices. Plant operation requirements include but are not limited to RCS purification, plant heatups and shutdowns and flow control at low RCS pressures. Two of the letdown orifices are 60-gpm units, which have design flows of 29,800 lb/hr and differential pressures of 1700 psid. The third orifice is a 45-gpm unit that allows flow at the rate of 22,400 lb/hr with the same differential pressure of 1700 psid. The letdown orifices are located on the 236' elevation of the containment building directly above the regenerative heat exchanger (Section 3.3).

3.19 Boric Acid Blender

The boric acid blender, constructed of austenitic stainless steel, is designed to pass the maximum letdown flow. This unit is also designed for a pressure and temperature of 150 psig and 250°F, respectively. The boric acid blender is located on the 261' elevation of the RAB, northeast of column/row E/31.

3.20 Boron Acid Batching Tank Auger

An auger is provided for loading boric acid (borax) into the boric acid batching tank. This auger is normally stationed in the proximity of the batching tank (RAB 261' Elevation at column/row D/42).

3.21 Motor Operated Valves

Power supplies for all motor operated valves are listed in Table 6.1.

3. 004 K5.02 001/NEW/LOWER/3/2/1/004K5.02/RO/
Which ONE (1) of the following describes the parameter limit that will prevent an explosive atmosphere in the VCT?

A. Nitrogen concentration is maintained less than 4%.

B. Hydrogen concentration is maintained greater than 4%.

C✔ Oxygen concentration is maintained less than 4%.

D. Hydrazine concentration is maintained greater than 4%.

C is correct. O2 is maintained <4%
Nitrogen is used to act as a buffer between O2 and H2. Hydrazine is used below 180 degrees F but no limit on minimum concentration
Common 3

Tier 2 Group 1
K/A Importance Rating - RO 3.5

Knowledge of the operational implications of the following concepts as they apply to the CVCS: Explosion hazard associated with hydrogen containing systems.

Reference(s) - OP-107, P&L 4.0 #4, Initial Condition 8.1.1 #2
Proposed References to be provided to applicants during examination - None
Learning Objective - LP CVCS3-0, Obj. AO 4.a
Question Source - New
Question History -
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).10
Comments -

004 K5.02

3.0 PREREQUISITES (continued)

7. Hydrogen gas is available per OP-152.02 as necessary to support CVCS operation.

8. Nitrogen gas is available per OP-152.01 as necessary to support CVCS operation.

9. Freeze Protection and Temperature Maintenance are aligned per OP-161 and OP-161.01.

4.0 PRECAUTIONS AND LIMITATIONS

1. The minimum required boration flow paths operable per Tech Specs 3.1.2.1 and 3.1.2.2 must be maintained.

2. The minimum CSIP operability requirements per Tech Specs 3.1.2.3 and 3.1.2.4 must be maintained.

3. The minimum required borated water sources operable per Tech Specs 3.1.2.5 and 3.1.2.6 must be maintained.

4. The oxygen concentration in the VCT must be maintained below four percent to avoid explosive mixtures of hydrogen and oxygen.

5. The temperature of the reactor coolant letdown downstream of the letdown heat exchanger, should be maintained less than 125°F.

6. The letdown flow must be maintained below its alarm setpoint of 130 gpm.

7. Do not exceed the design flow rate of 60 gpm for the cation bed demineralizer.

8. Before hydrazine addition during startup, the letdown demineralizers shall be valved out of service. When hydrazine level is within acceptable limits and with Chemistry's concurrence, the letdown demineralizers may be placed in service. (Refer to CRC-160)

9. At least 15 psig is required in the VCT to ensure sufficient cooling water to the RCP Number 2 seals.

10. One seal water injection filter is to be in service at all times.

11. T_{AVG} and control rod motion should be monitored following a VCT makeup. Corrective action should be taken to maintain shutdown margin and rod insertion limits.

12. Letdown shall not be in operation without charging.

4. 005 K6.03 001/NEW/HIGHER/3/2/1/005K6.03/RO/

Given the following conditions:

- The plant is in Mode 4.
- RHR Train "A" is in service for RCS Cooling in accordance with OP-111.
- The Instrument Air supply line to Heat Exchanger Flow Control Valve 1RH-30 becomes severed and is completely detached.

Which ONE (1) of the following describes the effect on the RHR system?

A. The operating RHR pump may reach runout conditions.

B. The operating RHR pump will operate at shutoff head.

C. RHR Heat Exchanger outlet temperature indication rises.

D. RHR Heat Exchanger outlet temperature indication lowers.

D is correct. Air to flow control valve failing - Valve fails open. Therefore, more flow through heat exchanger, but total flow is maintained by the bypass valve, which will throttle closed when HX outlet flow rises.
Common 4

Tier 2 Group 1
K/A Importance Rating - RO 2.5

Knowledge of the effect of a loss or malfunction on the following will have on the RHRS: RHR heat exchanger.

Reference(s) - SD-111 section 3.4
Proposed References to be provided to applicants during examination - none
Learning Objective - LP RHRS2-0, Obj 6.e, f
Question Source - New
Question History -
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).5
Comments -

005 K6.03

3.3.2 1RH-31, 1RH-69, Miniflow Stop Valves

These motor-operated, three-inch gate valves are located in the RHR pump miniflow line. A control switch for each valve is provided on the MCB panel 1A1 right desk section and on the ACP. The valves open on low flow (749.6 gpm) and shut on high flow (1402.6 gpm) (Section 4.6.2).

3.3.3 1RH-25, 1RH-63, RHR to CVCS Isolation Valves

These motor-operated, eight-inch gate valves are located in the lines leading from the RHR heat exchangers outlets to the suction of the charging/SI pumps. A control switch for each valve is located on the MCB panel 1A2 center desk section and on the ACP.

3.4 Air-Operated Valves

Power supplies for all air-operated valves are given in Table 6.2.

3.4.1 1RH-30, 1RH-66, RHR Heat Exchanger Flow Control Valves

These air-operated, ten-inch butterfly valves are located in the outlet lines of the RHR heat exchangers. A manual control station for each valve is provided on the MCB panel 1A1 right desk section and on the ACP. The fail position is **OPEN**. These are not isolation valves and will allow flow (200-300 gpm) in the SHUT position which can result in an unwanted RCS cooldown in some situations. This problem primarily exists when securing the reactor coolant pumps (approximately 3 mw each) when the RCS-RHR heat load must be rebalanced without affecting the cooldown rate.

To manually limit flow to 2500 GPM during mid loop or reduced inventory conditions, handwheels which limit the opening of these valves are installed on these valves. The position of these handwheels is set by Operations.

3.4.2 1RH-20, 1RH-58, RHR Heat Exchanger Bypass Flow Control Valves

These air-operated, eight-inch butterfly valves are located in the RHR heat exchangers bypass lines. A manual control station for each valve is provided on the MCB panel 1A1 right desk section and on the ACP. These valves have an automatic function which will control "total" flow as heat exchanger flow is modulated. The fail position is **SHUT**. These are not isolation valves and will allow flow (100-200 gpm) in the SHUT position.

5. 006 A1.06 001/BANK/LOWER/3/2/1/006A1.06/RO/

Given the following conditions:

- A small break LOCA has occurred. The crew is in EPP-009, Post LOCA Cooldown and Depressurization.
- One RCP is operating.
- Two CSIPs are operating.
- RCS subcooling is 72 degrees F. The crew has determined that one CSIP can be stopped.

Which ONE (1) of the following describes what will happen to the value of subcooling when the selected pump is stopped?

A. Decreases. RCS break flow remains constant while ECCS flow is decreased.

B. Decreases. RCS pressure decreases in response to reduced ECCS flow.

C. Remains the same. Flow from the running CSIP increases, reaching a balance with break flow.

D. Remains the same. RCS temperature and pressure increase in response to the reduced ECCS flow.

A-Incorrect. Break flow is dependent on the DP across the break. With less makeup volume, DP will go down
B-Correct.
C-Incorrect. Fl[Which one of the following]p for the CSIP that was turned off, that's why s[describes ~~how Subcooling~~]g off a pump
D-Incorrect. Sy[~~will respond and~~]haracteristics of a saturated system
Question 024 the system response
Tier 2 / Group 1 After the crct stops
K/A Importance F one CSIP? - Bes br..... and Sub
Cooling will decrease
Ability to predict a ...operating the ECCS controls including: Subcooling margin. ...nitors (to prevent exceeding design limits) associated

Reference(s) - EPP-009 and basis
Proposed References to be provided to applicants during examination - None
Learning Objective - LP EOP3-5, Obj 5.b
Question Source - Bank
Question History - 2002 Salem NRC exam
Question Cognitive Level - Memory
10 CFR Part 55 Content - 41(b).5
Comments -

006 A1.06

2.1 Base Case One Inch Cold Leg Break With ES-1.2 Guideline Application

This case was selected for the base case ES-1.2 guideline analysis since most of the possible operator action steps in ES-1.2 are tested. These actions include:

- o establishing a 100°F/hr cooldown rate
- o restoring PRZR level using one PORV
- o restarting an RCP
- o sequentially stopping all SI pumps (except the last charging/SI pump)
- o depressurizing the RCS with normal spray to restore PRZR level
- o aligning the last charging/SI pump to normal charging
- o adjusting normal charging flow to control PRZR level
- o depressurizing the RCS to minimize break flow

The five discrete injection flow curves used in this analysis are shown in Figure 2. Also illustrated are break flow plus cooldown shrink plots for the one inch diameter break for RCS subcoolings of 30°F and 100°F. Note that break flow increases as subcooling increases. Break flow alone (without shrink) is also shown for the 30°F subcooling case.

The transient analysis was run on a plant analyzer model called TREAT, a mini-simulator non-equilibrium computer program that runs in real time and allows the user to perform different operator actions in response to changing plant conditions. The time table of events for the base case analysis is given in Table 1 with reference to the appropriate steps in ES-1.2. Transient plots of interest are given in Figures 3 through 7.

Prior to the LOCA, the reactor was assumed to be operating at 100% power (for 3 minutes in time table and transient plots). Approximately 3 minutes after the LOCA occurred, the reactor tripped on low PRZR pressure (1850 psig). Full safety injection flow came on within 1 minute after trip. By that time, however, PRZR level indicated zero. The RCPs were tripped approximately 3 minutes after reactor trip (E-0, REACTOR TRIP OR SAFETY INJECTION, Step 21).

depressurization, break flow decreased and injection flow increased, refilling the PRZR. Note that during this ~1 minute depressurization, RCS subcooling dropped to zero (Figure 6). The upper head and upper plenum voided slightly but refilled soon after the depressurization stopped. The PORV was closed when the PRZR level reached 28%. However, level continued to increase and the RCS repressurized after the PORV was closed until a new equilibrium was reached between break flow and injection flow.

Approximately 8 minutes later (t= 40:00), RCS subcooling was restored (>20°F) and one RCP could be started (Step 12). The RCP in the PRZR loop was started since this RCP could provide normal PRZR spray.

Following RCP restart, RCS subcooling reached approximately 35°F. Additional RCS cooldown was required, however, before stopping any of the SI pumps. Cooldown continued until RCS subcooling was high enough to stop the first charging/SI pump.

The SI reduction criteria used in this analysis are given in Table 2. Values were computed using the REDUCE program described in the document SI REDUCTION SEQUENCE EVALUATION in the Generic Issues section of the Executive Volume. The criteria in Table 2 are the minimum subcooling values needed to ensure that the subcooling does not drop below 30°F after the SI flow is reduced for the entire spectrum of RCS pressures (and break areas) of interest (0-2300 psig). A smaller pressure range and variable minimum subcooling are recommended in the document SI REDUCTION SEQUENCE EVALUATION. As noted for the base case sequence 1, RCS subcooling of 69°F is required for stopping the first charging/SI pump. Note that the 20°F subcooling errors assumed previously is less than the 30°F minimum subcooling used in Table 2.

As the RCS continued to cool down, RCS subcooling continued to increase. Pressurizer level continued to increase since SI flow exceeded break flow plus shrink. Approximately 20 minutes after RCP restart, the subcooling reached 69°F and the first charging/SI pump could be stopped (Step 13, t= 60:00).

6. 006 A4.06 002/BANK/LOWER/3/2/1/006A4.06/RO/
Which one of the following conditions will exist in the associated train when the SSPS "OPERATE/TEST MODE SELECTOR" switch is in the TEST position?

A. ✔ ESF actuations will be inhibited and reactor trip signals will be available

B. ESF actuations will be available and reactor trip signals will be inhibited

C. Both ESF actuations and reactor trip signals will be inhibited

D. Both ESF actuations and reactor trip signals will be available

When the ESFAS OPERATE/TEST switch is placed in TEST, ESFAS signals are blocked, but RPS signals are not blocked.
Common 5

Tier 2 Group 1
K/A Importance Rating - RO 4.4

Ability to manually operate and/or monitor in the control room: ESF control panel.

Reference(s) - ESFAS LP 3.0
Proposed References to be provided to applicants during examination - NONE
Learning Objective - LP ESFAS3-0, Obj 6
Question Source - Bank
Question History -
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b) .7
Comments -

006 A4.06

(c) During testing, all trips and safeguards actuations from train inhibited

1) All information to status lamps, annunciators, and computer inhibited

2) All possible combinations of conditions generated

(d) Selector switches

1) Four 24-position "Logic Function" switches for testing reactor trip and safeguards functions

2) Two 12-position switches provided for testing memory and permissive functions

3) Second switch enabled when first switch reaches 24th position. Third switch enables when second reaches 24th position, etc.

e. Relay testing

(1) Master relay testing

(a) Ensures each master relay supplies signals to associated slave relays

(b) Relay tester

1) Allows operation of master relay

2) Checks master relay contact closure through slave coils

(c) Test panel

1) Allows operation of master relay

2) Applies 15-V DC to slave coils (not enough to roll slave)

(2) Operate/Test "Mode Selector" switch

(a) Used to place tester into service

(b) Enables "Master Relay Selector" switch

1) Energizes master relay

2) Push button

(c) Alarm annunciator and green lamp monitor position of switch

(d) The switch disconnects the 118-V AC supplier to the slave relays and places 15-V DC on them

Objective 6

(e) The key point for operators to remember is that TEST will inhibit actual ESF actuation but it will not inhibit reactor trip signals

ESFAS-TP-16.0 and 17.0

f. Spray actuation test

(1) Check spray logic and input relays

(2) Confirms reestablishment of input relay

g. Actual device testing

(1) Performed from safeguards test cabinets. Tests slave relays by either GO or BLOCK circuits

ESFAS-TP-11.0

(2) Performed by energizing each slave relay

(a) Actuators grouped such that devices supplied from same relay may be operated together

(b) When relay energized, components are operated

(c) Some devices cannot be operated

1) Test supplies low voltage to check continuity

2) Devices not activated are

a) Turbine trip

b) Generator trip

c) RCP trip

d) Steamline isolation

e) Feed isolation

f) Loss of component cooling to an RCP

7. 007 EK1.04 001/BANK/LOWER/3/1/1/007EK1.04/RO/
Which ONE (1) of the following describes Nuclear Instrumentation response to a reactor trip from 100% power until the Source Range instruments energize, from the time control rods begin to drop?

A. Prompt Drop of approximately 3 decades, followed by a -1/3 DPM startup rate for approximately 20 minutes.

B. ✔ Prompt Drop to approximately 5% power, followed by a -1/3 DPM startup rate for approximately 20 minutes.

C. Prompt Drop of approximately 3 decades, followed by a -1/3 DPM startup rate for approximately 3-4 hours.

D. Prompt Drop to approximately 5% power, followed by a -1/3 DPM startup rate for approximately 3-4 hours.

Prompt drop of 3 decades would almost put unit in source range within approximately 5-6 minutes. Actual prompt drop is less than 1 decade. 3-4 hours used as distractor because it is the approximate time that power will be decreasing noticeably.
Common 39

Tier 1 Group 1
K/A Importance Rating - RO 3.6

Knowledge of the operational implications of the following concepts as they apply to the reactor trip: Decrease in reactor power following reactor trip (prompt drop and subsequent decay).

Reference(s) - T&AA
Proposed References to be provided to applicants during examination - NONE
Learning Objective - Reactor Theory Obj 22
Question Source - Bank
Question History - 2005 SONGS Audit 39
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).1
Comments -

007 EK1.04

PWR | INSTRUCTOR GUIDE

VOLUME: REACTOR THEORY **TIME 8 HRS**

INSTRUCTOR GUIDE: REACTOR OPERATIONAL PHYSICS REV 2

K/A – OBJECTIVE CROSS REFERENCE

REACTOR THEORY: 192008 REACTOR OPERATIONAL PHYSICS

K/A #	K/A STATEMENT	IMPORTANCE RO	IMPORTANCE SRO	RELATED OBJECTIVE NUMBERS
K1.21	Explain the relationship between steam flow and reactor power given specific conditions.	3.6	3.8	20, 21
K1.22	Explain how boron concentration affects core life.	2.6?	3.8?	Covered in Reactor Theory, Chapter 7
K1.23	Explain the shape of a curve of reactor power versus time after a scram.	2.9	3.1	23
K1.24	Explain reactor power response to a control rod insertion.	3.5	3.6	22
K1.25	Explain the necessity for inserting control rods in a predetermined sequence during normal shutdown.	2.9	3.1	Covered in Reactor Theory, Chapter 5
K1.26	Define decay heat.	3.1	3.2	24

REACTOR SHUTDOWN AND RCS COOLDOWN

A normal plant shutdown and cooldown are performed periodically for refueling or maintenance. Power reduction is performed by decreasing the external load on the turbine generator in conjunction with a boration of the RCS. This maintains control rod position and satisfies axial flux difference requirements and rod insertion limits. As power is decreased below 15%, the rods are put in manual control and the reactor operator manipulates the rods as necessary to control RCS temperature. When the turbine generator load has been decreased to approximately 50 MW the turbine is tripped and the control rods are positioned to maintain approximately 2% reactor power.

After power has been stabilized at approximately 2%, the reactor operator records the information required for Reference Reactivity Data (RRD): power level, rod position and actual boron concentration. This data will be used for calculation of shutdown margins and for subsequent ECPs. Once the RRD data has been recorded, the reactor is shutdown by fully inserting all control banks.

Before starting the reactor cooldown, the RCS is borated to achieve the xenon-free shutdown margin required by technical specifications for RCS temperature below 200°F (typically -1000 Δk/k). Once this boration is completed and the RCS boron concentration has been verified by chemical analysis, the cooldown is performed. When cold shutdown conditions are reached, the shutdown margin is re-verified. If adequate, the shutdown banks are fully inserted and the reactor trip breakers are opened.

RESPONSE TO A REACTOR TRIP

The actions taken by reactor operators following a reactor trip are dictated by approved station procedures. These procedures ensure that the reactor is shut down, the turbine is tripped, normal and/or emergency power sources are available, and the plant response is as expected. If needed, compensatory actions are taken in accordance with the procedures.

Figure 8-24 shows the behavior of a reactor power drop following a reactor trip.

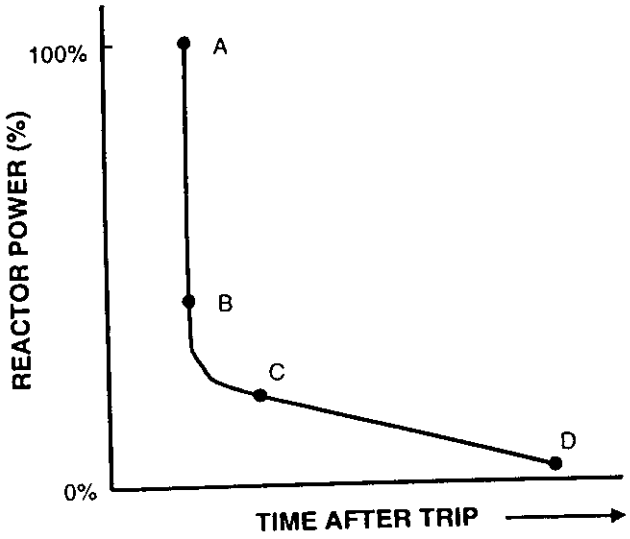


Figure 8-24 Reactor Power Drop Following a Reactor Trip

The fission rate decreases to below the power range immediately upon insertion of the control and shutdown rods. This rapid reactivity insertion is denoted by the neutron flux trace (power drop) from A to B in the figure. This is referred to as prompt drop following the reactor trip.

During the period from B to C, the neutron population is dominated by the appearance of delayed neutrons from shorter- and

intermediate-lived delayed neutron precursors. These precursors, which were formed when the reactor was at 100% power, decay within a few minutes. Once the shorter-lived precursors have effectively all decayed, neutron population is controlled by the appearance of delayed neutrons from the longest-lived precursors.

From C to D, power falls at a constant –80 second period based on the mean life of the longest lived delayed neutron precursor, bromine-87 (half-life of about 56 seconds). The –80 second period is equivalent to about a –1/3 decade per minute (DPM) startup rate (SUR). This continues until neutron population is low enough for the effect of source neutrons to be seen and a subcritical equilibrium is reached.

Core thermal power remains high for several seconds after the trip (as shown by points B to C). There is a time lag of a few seconds for the heat generated in the fuel to be conducted into the coolant, and the decay heat immediately following the prompt drop is approximately 7% of rated thermal power (RTP), assuming a trip from equilibrium full power operation. (This occurs at about point C.)

- RCS temperature is reduced by the steam dump system and stabilizes at no-load T_{ave}.
- Ten seconds after the trip, decay heat is still approximately 5% RTP, and it decreases to about 1% RTP in a little less than three hours (between points C to D).

A reactor that has been operating at steady-state 100% power trips, dropping rods worth 10 %Δk/k (10,000 pcm) into the core. This causes an immediate prompt drop in reactor power to approximately _____ %, followed by a slower decrease.

Example 8-25

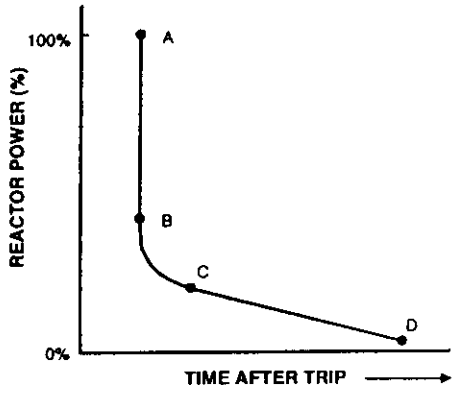
Which equation best describes the decrease in reactor power (neutron flux) from point A to point B in the figure below?

a. $T = (\overline{\beta}_{eff} - \rho)/\overline{\lambda}\rho$

b. $P = P_o e^{t/\tau}$

c. $P = P_o 10^{SUR(t)}$

d. $P = P_o \overline{\beta}_{eff}/(\overline{\beta}_{eff} - \rho)$

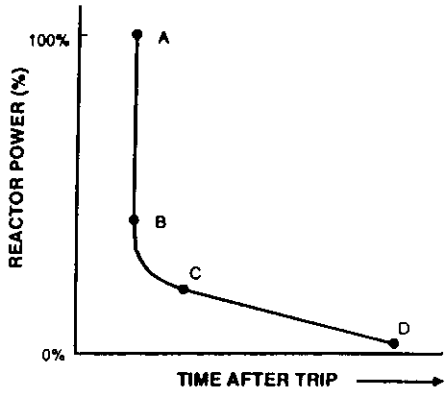


Answer: d

The decrease in neutron power due to a prompt drop is dependent on the magnitude of the negative reactivity inserted.

Example 8-26

The following figure shows the response of reactor power to a scram from 100% power. Explain the shape of the curve between points A and B, B and C, and C and D.



A-B: The rapid insertion of a large amount of negative reactivity causes the prompt neutron population to decrease rapidly. Segment A-B of the curve depicts this prompt drop.

B-C: During this period, the neutron population is dominated by the appearance of delayed neutrons from shorter- and intermediate-lived delayed neutron precursors. These precursors, which were formed when the reactor was at 100% power, decay within a few minutes.

C-D: Once the shorter-lived precursors have effectively all decayed, neutron population is controlled by the appearance of delayed neutrons from the longest-lived precursors. From this point, power falls at a constant exponential rate of −1/3 DPM until neutron population is low enough for the effect of source neutrons to be seen and a subcritical equilibrium is reached.

Example 8-27

8. 007 K4.01 002/BANK/LOWER/2/2/1/007K4.01/RO/YES

Which of the following describes how the Pressurizer Relief Tank (PRT) is normally cooled, in accordance with OP-100, "Reactor Coolant System"?

A. ✓ Recirculate the PRT through the Reactor Coolant Drain Tank heat exchanger, using Component Cooling Water to cool the heat exchanger

B. Recirculate the PRT through the Reactor Coolant Drain Tank heat exchanger, using Service Water to cool the heat exchanger

C. Drain the PRT to the Reactor Coolant Drain Tank while making up to the PRT from the Demineralized Water Storage Tank

D. Drain the PRT to the Reactor Coolant Drain Tank while making up to the PRT from the Reactor Makeup Water Storage Tank

Cooling for RCDT is by CCW. The PRT is circulated through the RCDT HX. Other methods describe a Bleed and Feed of the PRT. Service Water does not cool the RCDT HX. DWST does not supply makeup water to the PRT
Common 6

Tier 2 Group 1
K/A Importance Rating - RO 2.6

Knowledge of PRTS design feature(s) and/or interlock(s) which provide for the following: Quench tank cooling.

Reference(s) - APP-ALB-009, OP-100
Proposed References to be provided to applicants during examination - NONE
Learning Objective - PZR-3.0-3
Question Source - Bank
Question History - 2004 NRC RO 23
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).10
Comments -

007 K4.01

8.5. Recirculating the Pressurizer Relief Tank

8.5.1. Initial Conditions

1. Attachment 1 is complete. _____

2. Attachment 2 is complete. _____

8.5.2. Procedure Steps

1. **REQUEST** Radwaste Control Room lineup to cool the PRT with the RCDT Heat Exchanger per OP-120.08, Section 8.1. _____

2. **WHEN** directed by the Radwaste Control Room,
   THEN OPEN 1RC-135, PRT DRAIN. _____

3. **WHEN** informed by the Radwaste Control Room that the PRT is in recirculation,
   THEN MONITOR the following:

   - LI-0470.1 to verify proper level is being maintained. _____
   - TI-471.1 to verify cooling of the PRT. _____

4. **WHEN** PRT liquid temperature is at the desired temperature,
   THEN DIRECT the Radwaste Control Room to secure cooling the PRT with the RCDT Heat Exchanger. _____

5. **WHEN** directed by the Radwaste Control Room,
   THEN SHUT 1RC-135. _____

6. **COMPLETE** Section 8.5.3. _____

9. 008 AK2.01 001/NEW/HIGHER/2/1/1/008AK2.01/RO/

Given the following conditions:

- A reactor trip and safety injection have occurred.
- RCS pressure is 1200 psig and lowering.
- Tavg is 550 degrees F and lowering slowly.
- PRZ level is 65% and rising.
- Containment pressure is 2 psig and rising.

Which ONE (1) of the following describes the cause of this event?

A. A stuck open pressurizer PORV.

B. Large break on an RCS cold leg.

C. Small break on an RCS hot leg.

D. A stuck open pressurizer spray valve.

A is correct. A LOCA is occurring, due to RCS pressure lowering and Containment pressure rising.
D is incorrect because spray valve failure would not result in containment pressure rising
B and C are incorrect because PRZ level would be lowering or off-scale low if either of these events occurred.
Common 40

Tier 1 Group 1
K/A Importance Rating - RO 2.7

Knowledge of the interrelations between the Pressurizer Vapor Space Accident and the following: Valves.

Reference(s) - T&AA
Proposed References to be provided to applicants during examination - None
Learning Objective - BD-LP-3-3, Obj 1.f
Question Source - New
Question History -
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).5
Comments -

008 AK2.01

Progress Energy

Harris Training Section

Reactor Operator Candidates

Lesson Plan

BD-LP-3.3

Background Documents

Loss of Coolant Accident

B. Description of a LOCA

1. FSAR definitions

   a. Large LOCA is > 1 ft^2 (not expected to occur during lifetime of plant)

   b. Small LOCA is < 1 ft^2 (may occur during lifetime of plant)

2. Large Break LOCA consists of four stages

   a. Blowdown—from accident start until RCS pressure equalized with that in containment

   b. Refill—from blowdown end until accumulators fill bottom of the reactor vessel

   c. Reflood—from end of refill until core temperature rise has been terminated

   d. Long term cooling—decay heat removal using RHRS

3. Small break has only three phases—no refill

   a. Gradual blowdown (water level never reaches the bottom of the fuel)

   b. Reflood

   c. Long term cooling

4. Following events can cause RCS inventory loss

   a. Inadvertent opening of prz safety or PORV (vapor space break)

   b. Breaks in small lines penetrating RCS (small break LOCA)

   c. Primary to secondary leak (SGTR)

   d. Coolant piping breaks (large break LOCA)

5. LOCA pressure transient depends on

   a. Break flow vs. SI flow (if RCS stays subcooled, the flow balance decides RCS pressure)

   b. Core heat production vs. heat removal (if the RCS is at saturation, the heat removal sets RCS pressure)

C. LOCA Categories

1. Major categories

   a. Break ≤ 3/8" diameter

      - Normal charging maintains coolant inventory

10. Pressurizer vapor space break

    a. FSAR section 15.6.1 analyzes stuck open safety valve

        (1) DNBR drops initially but increases after trip and SI

        (2) DNBR does stay > 1.3

        (3) Bounded by small LOCA analysis, so FSAR stops after checking DNBR

    b. PORV stuck open (WCAP-9600 analysis)

        (1) Break flow removes all decay heat

        (2) RCS pressure stabilizes at 1060 psia with SI flow = break flow

        (3) No core uncovery

        (4) Prz level indicates full due to two-phase flow through the prz

        (5) Prz level not a valid indication of core inventory—use RVLIS and core thermocouples

11. Large break LOCA (design basis accident)

    a. DBA

        (1) Double-ended rupture of a cold leg pipe

        (2) Loss of power occurs simultaneously

        (3) One diesel fails to start

            (a) Most limiting single active failure

            (b) Loss one complete train of ECCS

    b. Thermal hydraulic effects

        (1) Initially subcooled, 2250 psia, 588°F

        (2) Blowdown occurs in three subphases

            (a) Subcooled depressurization to saturated conditions

                - Lasts a fraction of a second

            (b) Two-phase depressurization

                1) Lasts for several seconds

                2) Break flow decreases from increased resistance

train of ECCS). Even though the core exit thermocouple temperature increase may appear to the operator as the beginning of an inadequate core cooling situation, no extraordinary operator actions need be attempted. The operator should simply carry out his emergency procedure actions and ensure that SI flow is not terminated.

Consider the clad temperature transient in Fig. 15.6.5-36. During the period from about 800 seconds to about 1300 seconds, the core is uncovering. Cooling for the upper part of the core is being provided by steam flow past the fuel rods. Since the heat transfer ability of the steam is less than that of the two-phase mixture which was cooling the core, the heat transfer coefficient drops. Since decay heat levels have not changed significantly, clad temperatures must increase to transfer the heat to the coolant. This effect causes the first increase in peak clad temperature. The maximum temperature reached is ~1950°F. Once the accumulators inject, the core mixture level increases and cooling is then once again provided by two-phase flow and the heat transfer coefficient goes up. Clad temperatures are then reduced as the core levels increase. Even though the accumulators inject and some voids are quenched, the break flow is still greater than SI flow, and the core level once again starts to decrease. However, clad temperatures continue to decrease due to the higher core mixture levels.

As with the one- to two-inch break category, core uncovery is a result of the cold leg break location. For breaks in the hot leg or the prz vapor space, a steam vent path exists much earlier in the transient and no core uncovery is predicted.

Pressurizer Vapor Space Break

The most probably break in the pressurizer vapor space is an inadvertent opening of a pressurizer relief or safety valve. This event is classified as a fault of moderate frequency which is analyzed in the FSAR (inadvertent opening of a pressurizer safety valve). The analysis is concerned with ensuring the thermal limits are not exceeded. In order to give conservative results for this accidental depressurization, assumptions are made to minimize the DNBR.

The sequence of events for this transient show that the DNBR decreases initially, but increases rapidly following a reactor trip on low pressurizer pressure or OTΔT. The DNBR remains above the limit value throughout the transient. From an analysis standpoint, the transient for a safety valve stuck open is essentially ended when the DNBR increases rapidly following the reactor trip. However, from the standpoint of plant indications and long-term cooling, this transient is not over; a loss-of-coolant accident is still occurring. As a small break LOCA, this event is bounded by the small break analysis discussed in the previous sections of this text and in other sections of the FSAR. Because of this bounding

analysis, the FSAR discussion of a vapor space break ends when the DNBR increases.

For the case where one PORV is stuck open (WCAP-9600) the RCS depressurizes to 1000 psia by 2500 seconds, at which time it begins to repressurize until it becomes stable at approximately 1060 psia, remaining there for the remainder of the transient. It should be noted that the RCS pressure for this small LOCA has stabilized at a pressure less than the steam generator safety valve setpoint indicating that by this time the break is adequate to remove the decay heat. Initially, the pressurizer mixture level falls as the pressure is decreasing in the pressurizer (because of the increasing vaporization rate), allowing steam to be formed which flows out the break. The sudden pressure drop is reflected throughout the RCS; as void formation begins, the hot legs and upper core reach saturation. This increase in void fraction in the RCS causes the pressurizer pressure to level off, and the pressurizer begins to fill as a two-phase mixture begins to flow into the pressurizer through the surge line. At about 500 seconds, the mixture level reaches the top of the pressurizer and a two-phase mixture begins to flow through the break. For the remainder of the transient, the break flow is alternately vapor and liquid. The pressurizer mixture quality remains very low during the entire transient.

While the two phase mixture begins to flow into the pressurizer via the surge line, the reactor coolant liquid inventory is being depleted and replaced by vapor. The upper head is drained at about 1200 seconds and the core mixture level reaches the top of the hot legs. At the end of the transient, SI flow matches the break flow and all of the pressures, temperatures, and mixture levels have reached equilibrium. There is no net loss or gain of mass in the system and the break is removing decay heat. The core remains covered during the transient with virtually no voiding. Since the plant has reached a stable condition, the core will continue to remain fully covered.

Pressurizer vapor space breaks of sizes encompassed by PORVs or by combinations of PORVs are not limiting breaks in terms of peak clad temperatures. No core uncovery and very slight core voiding are expected in these transients. Perhaps more important are the indications of the plant's response to these events. Very soon after the PORV is stuck open, the pressurizer is essentially full and primary pressure is less than the steam generator pressure. The operator must analyze all available indications to determine the nature and extent of the transient. This is one example of pressurizer level not being a valid indication of core inventory. Other indications, such as RVLIS and core exit thermocouples, must be used.

10. 008 K1.05 001/NEW/LOWER/2/2/1/008K1.05/RO/
Which ONE (1) of the following states the NORMAL and ALTERNATE sources of makeup water to the CCW Surge Tank?

	NORMAL	ALTERNATE
A.	Demineralized Water System	Primary Makeup Water System
B.	Condensate Storage Tank	Demineralized Water System
C.	Potable Water System	Condensate Storage Tank
D.	Primary Makeup Water System	Potable Water System

A is correct. The CST and Potable Water systems do not provide CCW Surge Tank makeup water.
Common 7

Tier 2 Group 1
K/A Importance Rating - RO 3.0

Knowledge of the physical connections and/or cause-effect relationships between the CCWS and the following systems: Sources of makeup water.

Reference(s) - SD-145 Page 6
Proposed References to be provided to applicants during examination - None
Learning Objective - LP CCWS3-0, Obj 3
Question Source - New
Question History -
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).8
Comments -

008 K1.05

2.0 SYSTEM FUNCTION (continued)

During normal power operation one component cooling pump and one component cooling heat exchanger will accommodate the heat removal loads. One of the two standby pumps and the other heat exchanger will provide 100 percent backup during normal operation. Two pumps and two heat exchangers will normally be utilized to remove the residual and sensible heat during unit cooldown. The design cooldown rate, based on reducing the temperature of the reactor coolant from 350°F to 140°F in 20 hours, is achieved using two CCWS pumps and two CCWS heat exchangers. Failure of a heat exchanger would increase the time required for shutdown but would not affect the safe operation of the plant. Failure of a pump would not affect the time required for shutdown since the third standby pump may not be wired to the same electrical bus as the failed CCW pump. Safety injection heat removal requirements will be met with one pump and one heat exchanger in operation. Two loops, operating with two pumps and two heat exchangers, will normally be utilized to remove heat during post LOCA recirculation. If one loop is not available, the other loop, with one pump and one heat exchanger, will be utilized to remove the residual and sensible heat during unit cool down.

Makeup water for the CCWS will be taken from the Demineralized Water System or the Primary Makeup System (emergency makeup only) and delivered to the surge tank. The surge tank accommodates surges resulting from component coolant water thermal expansion and contraction and accommodates water that may leak into the system from components that are being cooled. The surge tank also contains a supply of water to provide component cooling water supply until a leaking cooling line can be isolated. The surge tank water level is adjusted manually from the Control Room by delivering makeup water from the Demineralized Water System to the tank.

Water chemistry control of the CCWS is accomplished by additions of Molybdate-Nitrite-Tolytriazole (MNT) solution to the chemical addition tank or to the surge tank. Mixing the MNT with the loop water will be accomplished by recirculation through either tank. The CCWS is designed on the basis that the following CCW chemistry is maintained:

a.	Corrosion Inhibitor	≥300 ppm Molybdate
		>300 ppm Nitrite
		>10 ppm Tolytriazole
b.	Ph at 25°C	8.5 to 9.5
c.	Chloride ppm (max)	0.15
d.	Fluoride ppm (max)	0.15
e.	Makeup Water	Same quality as listed for the Reactor Coolant System

11. 009 EA2.22 001/NEW/HIGHER/2/1/1/009EA2.22/RO/

Given the following conditions:

- A small break LOCA is in progress.
- All equipment responded as designed.
- RCS pressure is 1450 psig and stable.
- Containment pressure is 2.5 psig and rising slowly.

Which ONE (1) of the following describes the trend on MCR Charging flow indication FI-122.A1 and the computer trend during this event?

A. Charging flow indication stable prior to reactor trip, and rising to a stable higher value after reactor trip.

B. Charging flow indication rising prior to reactor trip, and off-scale high upon safety injection actuation.

C. Charging flow indication rising prior to reactor trip, and lowers to zero upon safety injection actuation.

D. Charging flow indication stable prior to reactor trip, and lowers to zero upon safety injection actuation.

C is correct. Charging flow rises as PRZ level goes below program. When SI actuates, SI through FV-122 is isolated to direct all CSIP flow through the BIT
Common 41

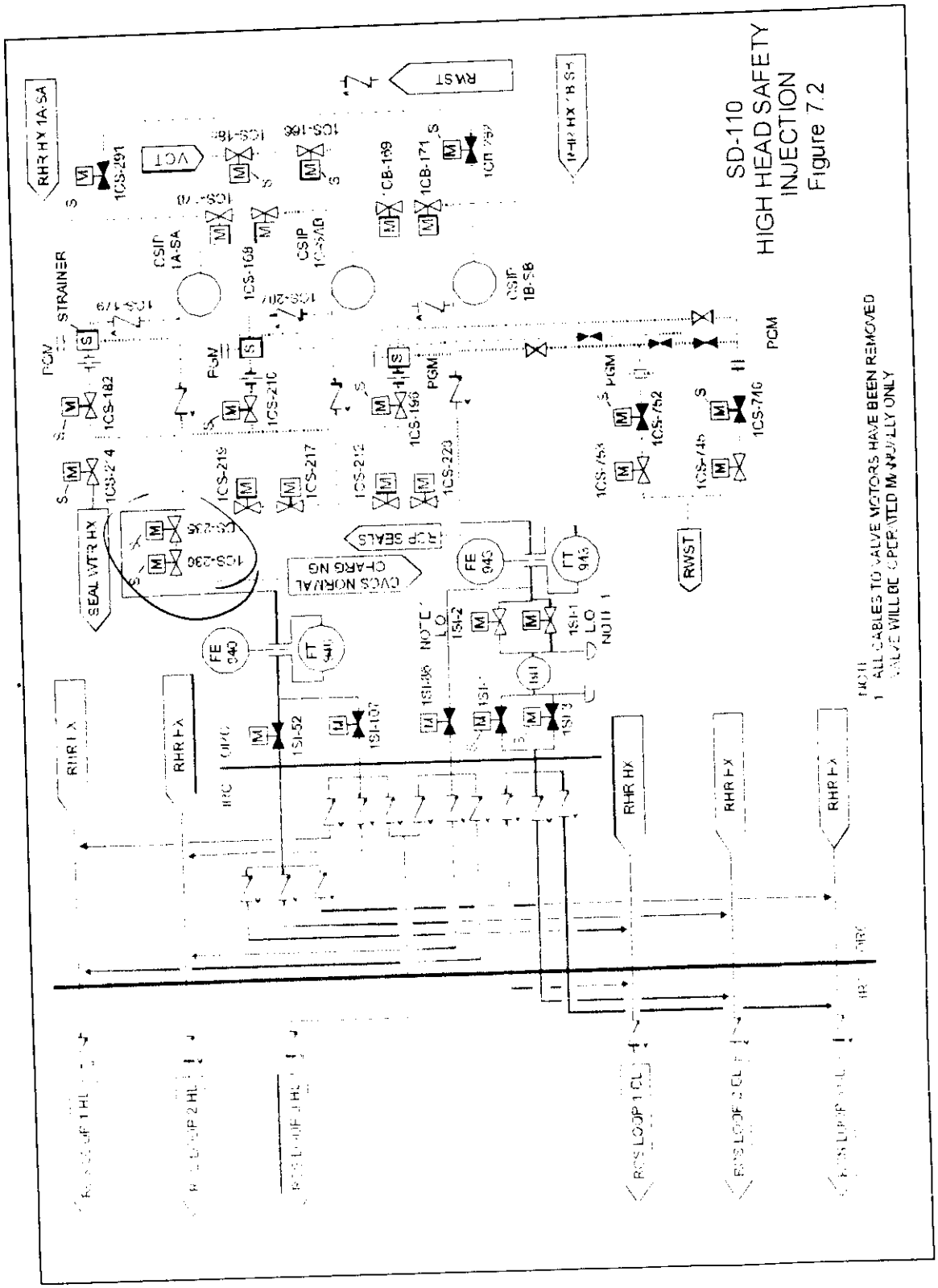
Tier 1 Group 1
K/A Importance Rating - RO 3.0

Ability to determine or interpret the following as they apply to a small break LOCA: Charging flow trend recorder.

Reference(s) - SD-110, Figure 7.2
Proposed References to be provided to applicants during examination - None
Learning Objective - LP CVCS3-0, Obj 8.b
Question Source - New
Question History -
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).5
Comments -

009 EA2.22

Head Safety Injection
Figure 7.2



12. 010 K2.04 001/NEW/LOWER/2/2/1/010K2.04/RO/

Which ONE (1) of the following combinations of pressurizer heater groups may be powered from Emergency Diesel Generators following a Loss of Off-Site Power?

A. Groups A and B

B. Groups A and C

C. Groups B and D

D. Groups C and D

A is correct. Backup heater groups A and B are safety related. C is the control group and D is the non-safety related backup group
Common 8

Tier 2 Group 1
K/A Importance Rating - RO 3.0

Knowledge of bus power supplies to the following: Pressurizer Heaters.

Reference(s) - SD-100.03
Proposed References to be provided to applicants during examination - NONE
Learning Objective - LP PZRPC3-0 Obj 7.a
Question Source - New
Question History -
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).3
Comments -

010 K2.04

3.6 Pressurizer Heaters

The PRZ heaters are divided into four groups, two of which (groups A and B) are capable of being powered from the emergency diesel generators, per the requirements of NUREG-0737, Item II.E.3.1:

Group	Function	Rating (KW)	Power Supply
C	Control	377	1D2 compartment 5B
A	Backup	431	1A1 compartment 1D
B	Backup	431	1B1 compartment 4B
D	Backup	162	1D1 compartment 4D

The PRZ heater bundle consists of 78 individual heater elements. Each element is seal welded to a heater well assembly that extends into the PRZ via openings in the bottom head. The heater element sheath tubing is fabricated from stainless steel and is designed for conditions of 2485 psig at 680°F. The heating elements are fabricated from Nichrome.

3.7 Pressurizer Manway

The PRZ manway is used for access to the PRZ internals, and to maintain a hot leg opening during midloop operations. ESR 9700133 provides design details for a screen to cover the manway without excessively restricting the open area. The manway utilizes a stud/nut bolting design which allows for an automatic tensioning/detensioning device to remove the manway studs.

3.8 RCS High Point Vent Valves

The RCS high point vent valves are 1-inch Y-body dual pilot-operated solenoid valves, manufactured by Target-Rock Corporation, Model Number 79Q-017-1. Control switches and position indication are provided on Auxiliary Equipment Panel-1. Six valves are provided in the system; two in parallel from the reactor vessel upper head, two in parallel from the PRZ vessel upper head, and one in each discharge path to the containment atmosphere. This arrangement, with independent power supplies to the parallel valves, provides single failure protection for the venting function and for assuring isolation of each path. A disconnect is provided for the piping from the reactor vessel head to accommodate removal of the vessel head.

Valve	Location	Power Supply
1RC-900SA	Reactor Vessel Head	PP-1A311-SA circuit 4
1RC-901SB	Reactor Vessel Head	PP-1B311-SB circuit 3
1RC-902SA	PRZ Vessel Head	PP-1A311-SA circuit 4
1RC-903SB	PRZ Vessel Head	PP-1B311-SB circuit 3
1RC-904SA	Containment Atmosphere	PP-1A312-SA circuit 11
1RC-905SB	Containment Atmosphere	PP-1B312-SB circuit 11

13. 010 K3.01 001/NEW/HIGHER/2/2/1/010K3.01/RO/
Given the following conditions:

- The plant is at 100% power.
- All control systems are in their normal alignments, with the exception of the Pressurizer Pressure Master Controller, which is in MANUAL.
- The Pressurizer Pressure Master Controller output fails HIGH.

Which ONE (1) of the following describes the effect on RCS pressure and the reason for that effect?

A. RCS pressure rises due to pressurizer control group heater energization.

B. RCS pressure rises due to pressurizer backup group heater energization.

C. RCS pressure lowers due to pressurizer heater deenergization and PRZ spray valve operation only.

D. RCS pressure lowers due to pressurizer heater deenergization and PRZ spray valve and PORV operation.

D is correct. As output is raised, it is calling for pressure to be reduced. Pressure will be reduced by heaters turning off, and subsequently, spray valve operation. Two PORVs are controlled from Pressure transmitters, which will be lowering. However, PORV 444B is controlled from the master controller, and it will open with no action

If setpoint (not output) was raised, then heaters would turn on
Common 9

Tier 2 Group 1
K/A Importance Rating - RO 3.8

Knowledge of the effect that a loss or malfunction of the PZR PCS will have on the following: RCS.

Reference(s) - SD-100.03
Proposed References to be provided to applicants during examination - NONE
Learning Objective - LPPZRPC3-0, Obj. 3.j
Question Source - Modified
Question History - PZRPC-R5-001
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).7
Comments -

010 K3.01

4.1.2 PT-444 and Master Pressure Controller

Pressure transmitter PT-444 provides the control signal for control of the PRZ heaters, spray valves, and PORV 1RC-114 via the PRZ Master Pressure Controller. PT-444 also provides a signal for indicator PI-444 on MCB panel 1A2, and PR-444 trend recorder which is located on the control room recorder panel.

To provide a signal to the various control circuits, system pressure must first be compared with desired (reference) pressure. The output of this comparison is supplied to a PI controller (Proportional + Integral) where the signal is conditioned to produce a compensated output. The "P" portion of the controller produces an output that is directly proportional to the input multiplied by some amplification factor (gain). The input is the difference between actual PRZ pressure and reference pressure (P_{act}-P_{ref}). The larger the input to this portion of the controller, the larger the output will be. Added to this portion of the output is the integral component of "P_{act}-P_{ref}" that accounts for the length of time a difference between actual and reference pressure exists. Accordingly, the longer a deviation is present, the larger the output from the integral portion of the circuit. This means that there may well be an output from the integral section of the controller when P_{act} returns to P_{ref}. This provides a more stable response for the PRZPCS. Included in the PRZPCS circuitry is an optional derivative or rate-of-change function. To meet the requirements of NUREG-0737, Item II.K.3.9, the derivative component is removed to preclude early actuation of PORV PCV-444B due to a rapid pressure transient below the nominal PORV opening setpoint.

The total output signal, referred to as the error signal, is developed in the PRZ Master Pressure Controller. With the pressure controller PK-444A1 (A2 at ACP) in AUTO, the PRZ heaters, spray valves, and PORV PCV-444B will operate to maintain system pressure at the reference value set on the potentiometer located on PK-444A1. With PK-444A1 in MANUAL, the normal output of the controller is interrupted and replaced with one that is controlled by two manual pushbuttons on PK-444A1. The manual control portion of the circuitry continuously tracks the output of the controller when it is in AUTO, permitting □bumpless□ transfer to MANUAL. While in MANUAL, pressing the increase pushbutton will affect the system by simulating a pressure that is above reference pressure, therefore, it is sensed as a demand by the operator to decrease plant pressure. Conversely, pressing the decrease pushbutton is sensed as a demand by the operator to increase plant pressure.

14. 012 K5.01 001/BANK/LOWER/3/2/1/012K5.01/RO/

Which one of the following reactor trip signals provides protection against DNB (Departure from Nucleate Boiling).

A. High pressurizer level

B. Overpower Delta T

C. ✔ RCP underfrequency

D. Steam generator low-low water level

High PZR level is a backup for High RCS pressure. OP Delta T is for overpower events, fuel degradation. SG LO-LO level is also a backup for RCS pressure transients
Common 10

Tier 2 Group 1
K/A Importance Rating - RO 3.3

Knowledge of the operational implications of the following concepts as the apply to the RPS: DNB.

Reference(s) - TS LSSS
Proposed References to be provided to applicants during examination - NONE
Learning Objective - LP TS2-0, Obj 5
Question Source - Bank
Question History -
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).3
Comments -

012 K5.01

Reactor Coolant Flow (Continued)

(a power level of approximately 49% of RATED THERMAL POWER) an automatic Reactor trip will occur if the flow in any single loop drops below 90.5% of nominal full loop flow. Conversely, on decreasing power between P-8 and the P-7 an automatic Reactor trip will occur on low reactor coolant flow in more than one loop and below P-7 the trip function is automatically blocked.

Steam Generator Water Level

The Steam Generator Water Level Low-Low trip protects the reactor from loss of heat sink in the event of a sustained steam/feedwater flow mismatch resulting from loss of normal feedwater. The specified Setpoint provides allowances for starting delays of the Auxiliary Feedwater System.

Steam/Feedwater Flow Mismatch and Low Steam Generator Water Level

The Steam/Feedwater Flow Mismatch in coincidence with a Steam Generator Low Water Level trip is not used in the transient and accident analyses but is included in Table 2.2-1 to ensure the functional capability of the specified trip settings and thereby enhance the overall reliability of the Reactor Trip System. This trip is redundant to the Steam Generator Water Level Low-Low trip. The Steam/Feedwater Flow Mismatch portion of this trip is activated when the steam flow exceeds the feedwater flow by the setpoint value. The Steam Generator Low Water level portion of the trip is activated when the setpoint value is reached, as indicated by the narrow range instrument. These trip values include sufficient allowance in excess of normal operating values to preclude spurious trips but will initiate a Reactor trip before the steam generators are dry. Therefore, the required capacity and starting time requirements of the auxiliary feedwater pumps are reduced and the resulting thermal transient on the Reactor Coolant System and steam generators is minimized.

Undervoltage and Underfrequency - Reactor Coolant Pump Buses

The Undervoltage and Underfrequency Reactor Coolant Pump Bus trips provide core protection against DNB as a result of complete loss of forced coolant flow. The specified Setpoints assure a Reactor trip signal is generated before the Low Flow Trip Setpoint is reached. Time delays are incorporated in the Underfrequency and Undervoltage trips to prevent spurious Reactor trips from momentary electrical power transients. For undervoltage, the delay is set so that the time required for a signal to reach the Reactor trip breakers following the simultaneous trip of two or more reactor coolant pump bus circuit breakers shall not exceed 1.2 seconds. For underfrequency, the delay is set so that the time required for a signal to reach the Reactor trip breakers after the Underfrequency Trip Setpoint is reached shall not exceed 0.3 second.

On decreasing power the Undervoltage and Underfrequency Reactor Coolant Pump Bus trips are automatically blocked by the loss of P-7 (a power level of approximately 10% of RATED THERMAL POWER) or a turbine impulse chamber pressure

15. 013 A2.05 002/BANK/HIGHER/3/2/1/013A2.05/RO/

Given the following conditions:

- The plant is currently at full power.
- The following sequence of events occurred:

  0200 The normal feeder breaker to 6.9kV bus 1A-SA (Bkr 105) tripped open. The 1A-SA EDG started and the sequencer correctly loaded all loads.
  0215 The 1A-SA EDG tripped
  0220 The 1A-SA DC bus was lost

- No operator actions have been taken.
- The 1A-SA EDG has been repaired and the operating crew is preparing to restart the EDG and reenergize 6.9kV bus 1A-SA.

What is the current status of the load breakers on 6.9kV bus 1A-SA AND what action is required prior to re-energizing the bus?

A. Shut; Open all load breakers on 6.9kV bus 1A-SA. This can be done from the MCB.

B. Shut; Open all load breakers on 6.9kV bus 1A-SA. This must be done from the switchgear room.

C. Shut; no additional action is necessary.

D. Open; no additional action is necessary.

Load breakers do not trip open on loss of control power, and they cannot be operated remotely without control power. The loads must be manually stripped prior to placing the DG back on the bus

QUESTIONS REPORT
for Harris RO Exam

Common 11

Tier 2 Group 1
K/A Importance Rating - RO 3.7

Ability to (a) predict the impacts of the following malfunctions or operations on the ESFAS; and (b) based Ability on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations; Loss of dc control power.

Reference(s) - AOP-025 Basis Document p. 2
AOP-025 step 45.a - first Caution at step 45
Proposed References to be provided to applicants during examination - None
Learning Objective - LPAOP3-25 Obj 5
Question Source - Bank
Question History - AOP-3.25-R3 004
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).7
Comments -

013 A2.05

Prolonged loss of an emergency bus will place a heavy drain on affected station batteries due to loss of associated chargers. The discharge rate will not be a linear function. Initially, the rate will be slow but will increase the longer the battery is carrying the load. The battery voltages should be monitored to assess battery conditions and verify Tech Spec limits are being met. Individual cell voltage is a critical parameter for assessing battery conditions. Staff personnel should be notified to evaluate the situation and recommend actions to prolong battery life. (SER 3-99)

Symptoms for Loss of an Emergency AC Bus:

- Zero voltage indication on BUS 1A-SA (EI-6956A1, EMER BUS 1A-SA VOLT)
- Zero voltage indication on BUS 1B-SB (EI-6956B1, EMER BUS B-SB VOLT)
- ALB-24-1-2, 6.9KV EMER BUS A-SA TROUBLE alarm
- ALB-25-1-2, 6.9KV EMER BUS B-SB TROUBLE alarm
- Alarms on busses fed from BUS 1A-SA or 1B-SB
- Trouble alarms from the Start Up Xfmrs, Aux Xfmrs, BUS 1D, or BUS 1E

Loss of Emergency DC Bus

The emergency DC System consists of two buses designated DP-1A-SA and DP-1B-SB. Each bus is connected to its own battery supply and two redundant battery chargers. Each charger is capable of supplying all DC loads while the battery serves as an immediate back-up source of power to vital DC loads.

If batteries were discharged below a usable condition and are being recharged, proper air flow through the battery and SWGR rooms is necessary to avoid a possible build up of hydrogen gas. Charger output current is monitored because the charger will be carrying the bus while charging the batteries. (Batteries are hard wired to the bus.)

Loss of DP-1B-SB results in losing the control panel for the TDAFW pump. If started, the TDAFW pump will trip on overspeed without any alarm or indication of trip and throttle valve.

If DP-1A-SA is lost, the letdown orifice valves will fail shut. If DP-1B-SB is lost, 1CS-11 will fail shut. In this condition, if the letdown orifice valves are not shut in a timely manner, the letdown relief will lift resulting in a loss of coolant in excess of Tech Spec Limits.

Section 3.0, Operator Actions

This section serves as the entry point into the procedure. The main purpose of this section is to quickly diagnose the general nature of the problem. If neither emergency AC bus is energized, the EOPs take precedence and the operator is directed to trip the reactor or RCPs, depending on Mode, and go to EOP. If one emergency AC bus remains energized, the operator is directed to the appropriate section of this procedure for actions to mitigate the loss of the applicable bus.

Section 3.1, Loss of 1A-SA Emergency AC Bus (6.9KV)

This section provides the actions necessary to recover from the loss of emergency AC bus 1A-SA. Initial actions check to determine if the EDG is running and energizing the bus as designed. If not, actions are taken to mitigate the loss of the bus. Redundant vital equipment is placed in service where required. Recovery actions are implemented after the cause of the problem has been corrected. The emergency bus is re-energized by the EDG or Off-site and support systems required for continued operation of the unit are placed in service. Then, when off-site power has been restored, returning all equipment to its normal power supply.

Section 3.2, Loss of 1B-SB Emergency AC Bus (6.9KV)

This section provides the actions necessary to recover from the loss of emergency AC bus 1B-SB. Initial actions check to determine if the EDG is running and energizing the bus as designed. If not, actions are taken to mitigate the loss of the bus. Redundant vital equipment is placed in service where required. Recovery actions are implemented after the cause of the problem has been corrected. The emergency bus is re-energized by the EDG or Off-site and support systems required for continued operation of the unit are placed in service. Then, when off-site power has been restored, returning all equipment to its normal power supply.

Section 3.3, Loss of DP-1A-SA Emergency DC Bus (125V)

This section provides the actions necessary to recover from the loss of emergency DC bus DP-1A-SA. Recovery actions are implemented after checking that equipment went to the required position, there is proper voltage on the instrument bus, and the equipment is checked for fault conditions. The basic sequence for recovery is to open all load breakers, check faults isolated from affected bus. Then when conditions causing the loss of the bus are corrected, closing load breakers to the bus while monitoring equipment for overloads, then verifying any equipment affected by the loss of power is returned to normal and operability is verified.

16. 015 G2.1.14 003/NEW/HIGHER/2/1/1/015G2.1.14/RO/

Given the following conditions:

- The following alarm is received in the control room:
  - APP-ALB-010-1-1B, RCP A UPPER OIL RSVR LOW LEVEL
- The crew reduces power from 65% to 47% in the last 30 minutes in accordance with AOP-038, Rapid Downpower, to remove RCP A from service.

In accordance with AOP-038, which of the following plant personnel must be notified?

A. Health Physics

B. Chemistry

C. Plant Manager

D. Operations Manager

Chemistry must be notified due to a load change greater then 15% in one hour. The other personnel may be notified in accordance with OMM-001, but will not be notified as directed by the AOP
Common 42

Tier 1 Group 1
K/A Importance Rating - RO 2.5

Conduct of Operations: Knowledge of system status criteria which require the notification of plant personnel.

Reference(s) - AOP-038, OMM-001
Proposed References to be provided to applicants during examination - None
Learning Objective - LPAOP38-0, Obj 3
Question Source - New
Question History -
Question Cognitive Level - HIGHER
10 CFR Part 55 Content - 41(b).10
Comments -

015 G2.1.14

INSTRUCTIONS	RESPONSE NOT OBTAINED

3.0 OPERATOR ACTIONS

8. **NOTIFY** Chemistry of the following:

☐ **a.** Reactor power change will exceed 15% in a one hour period.

☐ **b.** The following surveillances specified in the applicable sections require performing:

- RST-204, Reactor Coolant System Chemistry and Radiochemistry Surveillance
- RST-211, Gaseous Effluent Radiochemistry Surveillance

☐ **9.** **CHECK** Rod Control in AUTO.

9. **PERFORM** ANY of the following:

☐ **a.** **PLACE** Rod Control selector switch in AUTO.

☐ **b.** **CONTROL** Rods in manual as necessary to maintain T_{avg} within 2°F of T_{ref}.

NOTE

When PRZ backup heaters are energized in manual, PK-444A1, PRZ Master Pressure Controller (a PI controller) will integrate up to a greater than normal output, opening PRZ Spray Valves to return and maintain RCS pressure at setpoint. The result is as follows:

- PORV PCV-444B will open at a lower than expected pressure
- ALB-009-3-2, PRESSURIZER HIGH PRESS DEVIATION CONTROL, will activate at a lower than expected pressure
- Increased probability for exceeding Tech Spec DNB limit for RCS pressure

☐ **10.** **ENERGIZE** ALL available PRZ Backup heaters.

17. 015 K5.02 001/BANK/HIGHER/3/2/2/015K5.02/RO/

Which one of the following contains BOTH conditions that will result in indicated reactor power being LOWER than actual reactor power?

A. Source Range pulse height discrimination set too LOW
Intermediate Range Compensating voltage set too LOW

B✔ Source Range pulse height discrimination set too HIGH
Intermediate Range Compensating voltage set too HIGH

C. Source Range pulse height discrimination set too LOW
Intermediate Range Compensating voltage set too HIGH

D. Source Range pulse height discrimination set too HIGH
Intermediate Range Compensating voltage set too LOW

A. Incorrect. If pulse height discrimination is set too low, then more gamma pulses will be counted, resulting in an indicated reading higher than actual. If IR compensating voltage is set too low, the detector will have a higher output, resulting in a higher power indication

B. Correct.

C. Incorrect. See explanation for 'A' above

D. Incorrect. See explanation for 'A' above

Common 36

Tier 2 Group 2
K/A Importance Rating - RO 2.7

Knowledge of the operational implication of the following concepts as they apply to the NIS: Discrimination/compensation operation.

Reference(s) - SD-105
Proposed References to be provided to applicants during examination - NONE
Learning Objective - LP NIS3-0, Obj 4
Question Source - Bank
Question History - BVPS-1 2002 NRC
Question Cognitive Level - HIGHER
10 CFR Part 55 Content - 41(b).1
Comments -

015 K5.02

3.1.1 **Source Range Detector** (continued)

Proportional counters are used in the source range because of their relative high sensitivity when compared to the ionization chambers. The sensitivity is increased by increasing the voltage applied to the chamber, which in turn causes secondary ionization of the detector gases. Therefore, the detector output will increase if the voltage applied to the chamber increases or if the neutron or gamma flux increases. An intense neutron or gamma flux (or a detector voltage set too high) would produce a continual current discharge from the chamber and damage the detector. Therefore, the source range detectors are de-energized during reactor startup when the power level exceeds 10^{-10} amps (P-6) in the intermediate range.

In the Source Range the fast neutron enters the polyethylene surrounding the detector within the steel canister and collides with numerous hydrogen atoms (Figure 7.18). When the fast neutron strikes a hydrogen nucleus, the nucleus absorbs some of the neutron's energy and recoils. The neutron continues to travel through the polyethylene at a lower energy level. When the neutron enters the gas filled chamber, the energy level has been reduced by such a magnitude that it is classified as a slow neutron. The slow neutron will pass through the BF_3 gas, causing no ionization, until the neutron is absorbed by a boron-10 ($_5B^{10}$) atom. The $_5B^{10}$ atom will then become an excited boron-11 ($[_5B^{11}]$) nucleus.

This excited nucleus emits an alpha particle ($_2He^4$) and becomes a lithium-7 ($_3Li^7$) atom. The reaction is as follows:

$$_5B^{10} + {}_0n^1 \rightarrow [{}_5B^{11}] \rightarrow {}_2He^4 + {}_3Li^{-} + 5e^{-}$$

The positively charged alpha and lithium particles, and the negatively charged electrons are attracted to the outer detector wall and inner electrode, respectively. As the charged particles travel through the BF_3 gas, they cause secondary ionizations, producing an electrical current pulse. This measurable current is transformed by the source range circuitry into counts per second and are inputs to the plant process computer.

The BF_3 gas chamber also detects gamma rays because they also cause ionization of the BF_3 gas. This presents a false indication of power. The electrical current pulse caused by the gamma rays is smaller than that of the neutron reaction and can be electrically discriminated out.

3.1.2 Intermediate Range Detector

Compensated ionization chambers (NE-35 and NE-36) serve as neutron sensors for the intermediate range (IR) channels and are located above and in the same instrument wells and detector assemblies as the source range detectors. These detectors have a nominal thermal neutron sensitivity of 4×10^{-14} amperes per neutron per square centimeter per second. Gamma sensitivity is less than 3×10^{-11} amperes per roentgen per hour (amp/R/hr) when operated uncompensated and is reduced to approximately 3×10^{-13} amp/R/hr in compensated operation. The detectors are positioned with their centers at an elevation corresponding to one-half of the core height.

The compensated ion chamber consists of two concentric volumes, each of which is filled with nitrogen gas (N_2) (Figure 7.19). The outer volume is lined on its inside surfaces with a boron coating; the inner volume is not. The center electrode is also a cylinder (instead of a wire as in the source range) with serrations on the outside surface to give it more area.

In the intermediate range detector, the signal is taken from the partition between the inner and outer enclosed volumes. This partition, or can, is held at zero volts compared to the outer can and central electrode. A high positive potential is applied to the outer can (800 volts), and the electrode is biased with a relatively low adjustable negative potential (0 to -100 volts). The adjustable voltage on the electrode is called the compensating voltage.

Gamma radiation entering the detector will ionize the gas in both the inner and outer volumes. The polarity of the outer can compared to the partition can is opposite that of the electrode. Gamma current induced in the two volumes will attempt to flow in opposite directions in the signal lead. The tube is designed so that within the range of the compensating voltage adjustment, these two currents can be made to exactly cancel one another. When this is done, no gamma activity will be observed in the signal.

Neutron flux will interact with the boron coating in the outer volume. The ions produced here will cause a current in the signal lead that is not balanced by the inner volume since the inner volume contains no boron. Therefore, when the compensating voltage is correctly adjusted, the only signal current will be due to neutron radiation, and gamma noise will be effectively cancelled.

18. 016 K4.01 001/NEW/LOWER/4/2/2/016K4.01/RO/
Which ONE (1) of the following describes the Steam Generator level indication that is available on the Auxiliary Control Panel?

A. One channel of SG narrow range per SG

B. Two channels of SG narrow range per SG

C. One channel of SG wide range per SG

D. Two channels of SG wide range per SG

C is correct. No narrow range level available on ACP. 1 wide range level serves as secondary inventory indication, and trend determines AFW flow availability
Common 29

Tier 2 Group 2
K/A Importance Rating - RO 2.8

Knowledge of NNIS design feature(s) and/or interlock(s) which provide for the following: Reading of NNIS channel values outside control room.

Reference(s) - TS 3.3.3.5.a
Proposed References to be provided to applicants during examination - None
Learning Objective -
Question Source - New
Question History -
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).7
Comments -

TABLE 3.3-9

REMOTE SHUTDOWN SYSTEM

INSTRUMENT	READOUT LOCATION	TOTAL NO. OF CHANNELS	MINIMUM CHANNELS OPERABLE
1. Reactor Coolant System Hot-Leg Temperature	ACP*	2	2
2. Reactor Coolant System Cold-Leg Temperature	ACP*	2	2
3. Pressurizer Pressure	ACP*	2	1-SSA Channel**
4. Pressurizer Level	ACP*	2	1-SSA Channel**
5. Steam Generator Pressure (Note 1)	ACP*	1/Steam Generator	1/Steam Generator
6. Steam Generator Water Level--Wide Range (Note 1)	ACP*	1/Steam Generator	1/Steam Generator
7. Residual Heat Removal Flow	ACP*	2	1 (Note 2)
8. Auxiliary Feedwater Flow (Note 1)	ACP*	1/Steam Generator	N.A. (Note 3)
9. Condensate Storage Tank Level	ACP*	2	1-SSA Channel**
10. Reactor Coolant System Pressure-Wide Range	ACP*	2	1-SSA Channel**
11. Wide-Range Flux Monitor (SR Indicator)	ACP*	1	1-SSA Channel**
12. Charging Header Flow	ACP*	1	1-SSA Channel**
13. a. Auxiliary Feedwater Turbine Steam Inlet--Pump Discharge ΔP	ACP*	1	1-SSA Channel**
or			
b. Auxiliary Feedwater Turbine Speed	ACP*	1	1-SSA Channel**
14. Boric Acid Tank Level	ACP*	1	1-SSA Channel**

*ACP = Auxiliary Control Panel
**SSA = Safe Shutdown Analysis

Note 1 - Steam Generators A&B Only
Note 2 - RHR Train B Only
Note 3 - Steam Generator Water Level is used

19. 017 K3.01 002/BANK/HIGHER/4/2/2/017K3.01/RO/YES

Given the following conditions:

- Following a plant trip, EPP-004, "Reactor Trip Response," is being performed.
- The crew is verifying Natural Circulation conditions as a result of a loss of power to all RCPs.
- Five (5) core exit thermocouples are failed.

How do the failed core exit thermocouples affect indications used to verify Natural Circulation?

A. • The Core Exit Temperature indications will be HIGHER than actual
• RCS Subcooling will indicate MORE subcooling than actual

B. • The Core Exit Temperature indications will be HIGHER than actual
• RCS Subcooling will indicate LESS subcooling than actual

C. • Core Exit Temperature indications will indicate LOWER than actual
• RCS Subcooling will indicate MORE subcooling than actual

D. • Core Exit Temperature indications will indicate the SAME as actual
• RCS Subcooling will indicate the SAME subcooling as actual

Failed CETs will show as low indications (50 deg F). Therefore, the 5 highest will not include the 5 failed CETs. Subcooling is determined by using the average of the 5 highest CETs
Common 30

Tier 2 Group 2
K/A Importance Rating - RO 3.5

Knowledge of the effect that a loss or malfunction of the ITM system will have on the following: Natural circulation indications.

Reference(s) - SD-106
Proposed References to be provided to applicants during examination - NONE
Learning Objective - ICCM-3.0-R6
Question Source - Bank
Question History - 2004 NRC RO 70
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).7
Comments -

ICCM-TP-19.0

2. When the ICCM-86 microprocessor initializes itself, the introductory screen is displayed. This screen will also be displayed when the plasma display RESET button is depressed (located on the rear of the display unit). The message number counts from 0 to 255 at 2-second intervals prior to resetting to zero

3. If the plasma display loses its communication's link to the microprocessor cabinet, the message number will either be frozen at its last good value or it will be absent

ICCM-TP-15.0

4. Thermocouple screens

   a. When the T/C button is pressed, the QUADRANT SUMMARY page is displayed. This display will show maximum, average, and minimum valid reading for each quadrant in that train

ICCM-TP-16.0

   b. Pressing the PAGE button will advance the display to the THERMOCOUPLE MAP page

ICCM-TP-17.0

   c. Pressing the PAGE button again will advance the display to the QUADRANT I/II page

ICCM-TP-18.0

   d. Pressing the PAGE button again will advance the display to the QUADRANT III/IV page

   e. Pressing the PAGE button again will loop the display program back to the QUADRANT SUMMARY page

   f. When a thermocouple fails or is taken out of service, a reading of 50°F will be displayed

i. R/W switch

- Used in monitor mode
- Affects reading and writing ability to NVRAM (Nonvolatile RAM)
- R—read only; W—write enable

j. MONITOR switch

- Places system in monitor mode so that maintenance terminal can be used
- Switch must be held down until OFF LINE lamp is illuminated

k. Terminal connector

(1) Typical 24-pin RS-232 type connector for the maintenance terminal

4. There are no operations procedures that require us to obtain data from the microprocessor cabinets; however, knowledge of how to use the thumb wheels to obtain data may prove useful during unusual circumstances

5. Manipulation of the thumb wheels has no effect on the system other than what is shown on the local display

6. By use of the thumbwheels and legend inside the panel door, the operator may obtain both thermocouple and vessel level data.

RO Obj. 6

H. Plant subcooling monitor

1. Although the ICCM cabinets do not calculate subcooling for the plant's subcooling monitor, they do provide inputs from the core exit thermocouples

ICCM-TP-20.0

2. A routine within the ERFIS computer is actually the plant's subcooling monitor

3. The pressure inputs to the subcooling monitor are from Channels 455, 456, 457, 402, and 403

4. If there are more good quality codes in the 455, 456, and 457 range than there are in the 402 and 403 range, then an average of the narrow range channels is used for PRC 9445

5. If 402 and 403 have the majority of good quality codes, then the average of these two points is used for PRC 9445

6. A saturation temperature is calculated based on PRC 9445

7. This saturation temperature is then compared with the average of the 5 hottest thermocouples (of all 51 operable T/Cs). This average of the 5 hottest T/Cs is Point TRC9300

8. A value of subcooling will be calculated using the following equation

$T_{subcool} = T_{SAT}$ - TRC9300

9. Negative numbers for point TRC9400 (subcooling) indicate a superheated condition

I. RVLIS ventilation

1. The 1A-SA train of RVLIS is located in a relatively small enclosure which is adjacent to the north side of containment

2. Since there is no forced ventilation into or out of this area from normal RAB ventilation, a small fan was installed to circulate air from the adjacent mechanical penetration area

3. The S-68 (1X-SA) fan takes a suction from the 236' el RAB north mechanical penetration area and discharges into the enclosure. Air then returns through the doorless passage from the enclosure

4. The fan is controlled from a 3-position key locked switch (STOP/AUTO/START). The key is removable in the AUTO position only

5. In AUTO, the fan will start if the enclosure temperature rises to 115°F. The fan will automatically return to a standby configuration when temperature has been reduced

6. An ERFIS point will go into alarm if the temperature rises to 125°F

7. The fan is powered from MCC 1A31-SA

8. This fan receives no automatic starts from the sequencer; however, the fan is inhibited from starting or running on any sequencer program until the manual loading permissive is met (CY3 relay). This condition is true in both the START and AUTO positions

J. Procedures

1. There is no system operating procedure for the ICCM System

2. The system description which discusses the ICCM trains is SD-106, Incore Instrumentation

20. 022 A3.01 004/BANK/HIGHER/2/2/1/022A3.01/RO/YES

Given the following conditions:

- A small break LOCA has occurred.
- Containment pressure is 3.8 psig and increasing.
- Containment temperature is 137°F and increasing.

The expected Containment Cooling Fan alignment will be one (1) fan in each Containment Fan Cooler Unit running in ...

A. high speed with the post-accident dampers shut.

B. high speed with the post-accident dampers open.

C. low speed with the post-accident dampers shut.

D✓ low speed with the post-accident dampers open.

A. Plausible since this alignment is an alignment that would be used following a loss of offsite power, but the SI alignment has the fans in low speed.
B. Plausible since this alignment is an alignment that would be used following a loss of offsite power with the dampers aligned for the SI alignment, but the SI alignment has the fans in low speed.
C.Plausible since the fans are aligned per the SI alignment, but the dampers are aligned per the loss of offsite power alignment.
D. Correct

Common 13

Tier 2 Group 1
K/A Importance Rating - RO 4.1

Ability to monitor automatic operation of the CCS, including: Initiation of safeguards mode of operation.

Reference(s) - SD-169
Proposed References to be provided to applicants during examination - NONE
Learning Objective - LPCCS3-0, R2
Question Source - Bank
Question History - 2004 NRC
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).8
Comments -

4.1 Containment Fan Coolers (AH-1A,B;AH-2A,B;AH-3A,B;AH-4A,B) (cont.)

4.1.2 Normal Operation - Containment Average Temperature Above 118°F

During this mode of operation, both Train A and Train B are in operation. Therefore, both service water trains must be in operation. The two fan cooler units located at Elevation 286', (AH-3 and AH-4) will operate with both fans of each unit running at full speed. Each of the two vertical concrete airshafts is served by one of these two fan coolers. The other two fan cooler units located at Elevation 236' - (AH-1 and AH-2) will be manually energized to operate with one fan per unit operating at full speed. If the containment average temperature continues to rise, all fans will be manually energized to operate at full speed and the nozzle dampers will remain closed. The following sequence of operation is important to prevent over-pressurization of the system. Assuming AH-2 and AH-3 are operating normally, start one fan in AH-1, stop one fan in AH-2, and then start both fans in AH-4. When the containment average temperature drops to 118°F or below, the system can be returned to normal by stopping one fan in AH-1, stopping both fans in AH-4, and then by starting both fans in AH-2. If AH-1 and AH-4 were operating normally, the above sequence would be similar, with AH-1 corresponding to AH-2 and AH-4 corresponding to AH-3. The dampers will automatically assume the proper position.

4.1.3 Emergency Operations

During plant emergencies, the Containment Fan Coolers will start automatically and dampers will assume the proper position. The system has two automatic start signals for two types of emergency operation, a Loss of Off-Site Power (LOSP) and a Loss of Coolant Accident (LOCA).

On a LOSP, the fan cooler units receive an automatic start signal through ESS Load Block 2. One fan per unit will start on high speed and discharge to the concrete airshaft. The setting of the lead fan selector switch for each unit will determine which fan, in each unit, will start. If one diesel generator or one service water train fails, the system will be operating at 50 percent capacity.

In the event of a LOCA, the fan coolers receive an automatic start signal through ESS Load Block 2. One fan per unit will start on low speed. Time delay relays maintain the start signal and allow the fans to coast down during the shift from high to low speeds. The failure to start on Safety Injection alarm is also temporarily blocked. See Table 6.4 for the time delay relays. With a low speed start and a LOCA, the post accident discharge nozzle dampers open. The post-accident discharge duct is provided with high velocity nozzles to diffuse air to a minimum distance of 40 feet. These nozzles are directed to selected areas of heat release, to achieve thorough mixing of containment atmosphere.

21. 022 K1.01 001/NEW/LOWER/2/2/1/022K1.01/RO/

Which ONE (1) of the following describes the cooling water provided to the following Containment Cooling System components?

	Containment Fan Coil Units	Containment Fan Coolers
A.	Normal Service Water	Normal Service Water
B.	Normal Service Water	Emergency Service Water
C.	Emergency Service Water	Normal Service Water
D.	Emergency Service Water	Emergency Service Water

B is correct. The Containment Fan Coil Units are supplied by normal service water and are not designed for post-accident operation. The Containment Fan Coolers are required for post-accident operation and must be supplied by safety grade service water.
Common 12

Tier 2 Group 1
K/A Importance Rating - RO 3.5

Knowledge of the physical connections and/or cause-effect relationships between the CCS and the following systems: SWS/cooling system.

Reference(s) - SD-169
Proposed References to be provided to applicants during examination - None
Learning Objective - LPCCS3-0, A2
Question Source - New
Question History -
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).8
Comments -

022 K1.01

5.0 INTERFACE SYSTEMS

5.1 Systems Required for Support

1. Power is supplied by the 480V MCC's, 480 V Aux Bus, and 120 VAC systems (SD-156).

2. Control power is supplied by the 125 VDC system (SD-156).

3. The Emergency Service Water System supplies cooling water to the containment fan cooler cooling coils. The Normal Service Water System supplies cooling water to the containment fan coil unit cooling coils (SD-139).

4. The Instrument Air System supplies control air to the pneumatic damper operators (SD-151).

5.2 System-to-System Cross Ties

There are no system-to-system cross ties in the Containment Cooling System.

6.0 TABLES

6.1 Containment Cooling System Power Supplies

6.2 Containment Cooling System Controls

6.3 Containment Cooling System Alarms

6.4 Time Delay Relays

22. 024 AK1.02 001/MODIFIED/LOWER/2/1/2/024AK1.02/RO/

Given the following conditions:

- Emergency Boration is required.
- Boric Acid Pump "B" is operating

Which ONE (1) of the following alignments is the preferred method resulting in the FASTEST power reduction in the RCS in accordance with AOP-002, "Emergency Boration"?

A. Open both 1CS-283, Boric Acid To Boric Acid Blender FCV-113A and 1CS-155, Make Up To VCT FCV-114A

B. Open both 1CS-283, Boric Acid To Boric Acid Blender FCV-113A and 1CS-156, Make Up To VCT FCV-113B

C. Open either 1CS-291, Suction From RWST LCV-115B or 1CS-292, Suction From RWST LCV-115D

D. Open 1CS-278, Emergency Boric Acid Addition

First action for emergency boration is to open 1CS-278. This is the most direct method of shutting down the reactor. each of the other methods is an alternative to the first method
Common 57

Tier 1 Group 2
K/A Importance Rating - RO 3.6

Knowledge of the operational implications of the following concepts as they apply to Emergency Boration: Relationship between boron addition and reactor power.

Reference(s) - AOP-002
Proposed References to be provided to applicants during examination - None
Learning Objective - AOP-3.2-2
Question Source - Modified
Question History - AOP-3.2-2 001
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).8
Comments -

ORIGINAL
024 AK1.02

QUESTION: 78

Given the following conditions:

- Emergency Boration is required.
- 1CS-278, Emergency Boric Acid Addition, is failed CLOSED.

Which of the following alignments will provide adequate boric acid flow?

	1CS-283 Boric Acid to Boric Acid Blender FCV-113A	1CS-156 Makeup to CSIP Suction FCV-113B	1CS-155 Makeup to VCT FCV-114A	1CS-291 CSIP Suction from RWST LCV-115B	1CS-292 CSIP Suction from RWST LCV-115D	1CS-165 VCT Outlet LCV-115C	1CS-166 VCT Outlet LCV-115E
a.	CLOSED	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	OPEN
b.	OPEN	CLOSED	OPEN	CLOSED	CLOSED	OPEN	CLOSED
c.	CLOSED	OPEN	CLOSED	CLOSED	CLOSED	OPEN	OPEN
d.	OPEN	CLOSED	CLOSED	OPEN	CLOSED	OPEN	CLOSED

ANSWER:

d.	OPEN	CLOSED	CLOSED	OPEN	CLOSED	OPEN	CLOSED

INSTRUCTIONS	RESPONSE NOT OBTAINED

3.0 OPERATOR ACTIONS

NOTE

This procedure contains no immediate actions.

☐ 1. **START** a Boric Acid pump.	☐ 1. **GO TO** Step 6.
2. **ESTABLISH** boration flowpath using 1CS-278 as follows:	
☐ a. **OPEN** 1CS-278, Emergency Boric Acid Addition.	☐ a. **GO TO** Step 3.
☐ b. **VERIFY** at least 30 gpm boric acid flow to CSIP suction on FI-110.	☐ b. **GO TO** Step 3.
☐ c. **GO TO** Step 4.	
3. **ESTABLISH** boration flowpath using FCV-113A/B as follows:	
a. **OPEN** the following valves:	☐ a. **GO TO** Step 6.
☐ • 1CS-283, Boric Acid To Boric Acid Blender FCV-113A	
☐ • 1CS-156, Make Up To CSIP Suction FCV-113B	
☐ b. **VERIFY** at least 30 gpm boric acid flow to CSIP suction on recorder panel or ERFIS point FCS0113A.	☐ b. **GO TO** Step 6.
☐ 4. **VERIFY** and **MAINTAIN** at least 30 gpm charging flow to RCS (FI-122A.1) until required boration is completed.	
☐ 5. **OBSERVE** Note prior to Step 8 AND **GO TO** Step 8.	

INSTRUCTIONS	RESPONSE NOT OBTAINED

3.0 OPERATOR ACTIONS

6. **ESTABLISH** boration flow from RWST as follows:

   a. OPEN the following valves:

   ☐ • 1CS-291, Suction From RWST LCV-115B

   ☐ • 1CS-292, Suction From RWST LCV-115D

   b. SHUT the following valves:

   ☐ • 1CS-165, VCT Outlet LCV-115C

   ☐ • 1CS-166, VCT Outlet LCV-115E

   ☐ **c. VERIFY** and **MAINTAIN** at least 90 gpm charging flow to RCS (FI-122A.1) until required boration is completed.

   c. PERFORM the following:

   ☐ **(1) IF** a Boric Acid Pump is available, **THEN GO TO** Step 7.

   ☐ **(2) WHEN** a Boric Acid Pump is available, **THEN GO TO** Step 7.

CAUTION

Low VCT level is a precursor to gas binding the CSIPs **[C.2]**

✱☐ **d. CHECK** VCT level greater than or equal to 5% and can be maintained on scale.

d. Locally TORQUE SHUT the following valves: **[C.2]**

☐ • 1CS-165, VCT Outlet LCV-115C

☐ • 1CS-166, VCT Outlet LCV-115E

☐ **e. OBSERVE** Note prior to Step 8 AND **GO TO** Step 8.

3.0 OPERATOR ACTIONS

NOTE

The alternate boric acid flowpath will supply sufficient boric acid for emergency boration but is slower to respond than other flowpaths.

☐ **7.** **ALIGN** alternate boric acid flowpath as follows:

a. **VERIFY** the following valves **OPEN**:

☐ • 1CS-165, VCT Outlet LCV-115C

☐ • 1CS-166, VCT Outlet LCV-115E

b. **VERIFY** the following valves **SHUT**:

☐ • 1CS-291, Suction From RWST LCV-115B

☐ • 1CS-292, Suction From RWST LCV-115D

☐ **c.** **VERIFY** a Boric Acid Pump RUNNING.

d. **OPEN** the following valves:

☐ • 1CS-283, Boric Acid To Boric Acid Blender FCV-113A

☐ • 1CS-155, Make Up To VCT FCV-114A

☐ **e.** **VERIFY** at least 30 gpm boric acid flow to CSIP suction on recorder panel or ERFIS point FCS0113A.

(Continued on Next Page)

23. 025 G2.1.30 002/NEW/HIGHER/3/1/1/025G2.1.30/RO/

Given the following conditions:

- The plant was operating with the Reactor Coolant System in a reduced inventory condition, with the "B" RHR train in service.
- RCS level was 85 inches below the reactor vessel flange.
- "B' RHR Pump exhibited signs of cavitation, and RHR Cooling was lost.
- The crew entered AOP-020, Loss of RCS Inventory or Residual Heat Removal while Shutdown.
- The cause of the Loss of Inventory has been corrected.

Which ONE (1) of the following actions is required to restore RHR flow using Train "B"?

A. Raise CCW flow to Train "B" RHR heat exchanger to ensure adequate heat removal and maintain RCS temperature below 200 degrees F.

B. ✔ Restore RCS inventory and vent the "B" RHR Pump at 190' RAB and 236' RAB in accordance with AOP-020, Attachment 1, RHR Venting.

C. Refill the RCS to greater than 55 inches below the reactor vessel flange, start "B" RHR Pump, and maintain RHR flow less than 3500 GPM.

D. Restore RCS inventory and start "B" RHR Pump at greater than 3500 GPM to sweep voids from the RHR system.

For the reduced inventory conditions provided, the requirement is to stop the running RHR pump and vent the pump prior to restart. This is due to the possibility that air binding of the pump may have occurred.
Common 43

Tier 1 Group 1
K/A Importance Rating - RO 3.9

Conduct of Operations: Ability to locate and operate components, including local controls.

Reference(s) - AOP-020
Proposed References to be provided to applicants during examination - None
Learning Objective - LPAOP3-20, Obj 4
Question Source - New
Question History -
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).10
Comments -

025 G2.1.30

INSTRUCTIONS	RESPONSE NOT OBTAINED
3.5 Core Heat Removal Recovery	
1. CHECK that at least one RHR train meets ALL of the following:	**1. PERFORM** the following:
☐ • No leak	☐ **a. INITIATE** actions to make a train available while continuing with this section.
☐ • Power and CCW available	
☐ • Train and any associated components required for shutdown cooling are functional	✱☐ **b. WHEN** an RHR train becomes available, **THEN RETURN** to step 1 of this procedure section.
	☐ **c. GO TO** step 10.
☐ **2. CHECK** RCS level HIGHER THAN 67 inches below RV flange.	☐ **2. FILL** RCS to higher than 67 inches below RV flange.
☐ **3. CHECK** that RCS level has remained 67 inches below RV flange OR higher throughout the event.	**3. IF** ANY RHR pump was running during the time level was lower than 67 inches below the RV flange, **THEN**:
	☐ **a. REFER TO** Attachment 1, RHR Venting.
	☐ **b. VENT** each RHR pump that was running during low RV level conditions.
	☐ **c. WAIT** until RHR pump to be started is vented before proceeding.

Attachment 1
Sheet 1 of 1
RHR Venting

1. **CONSULT** with Health Physics to determine extent of radiation hazards or other factors that may affect the safe performance of venting RHR.
2. **VERIFY** the following for the train to be vented:
   - Vent rigs are installed at each point listed below
   - Each vent rig is secured at a drain.
3. **VENT** the applicable RHR train from the vent points listed below, until water is flowing from the vent, or until air ceases to be expelled from the vent.

RHR Train A

1RH-123, RHR Pump Seal Cooler Vent	(190' RAB, A Pump Rm)
1RH-126 and 1RH-127, RHR HX Vents	(236' RAB, A HX Rm)
1RH-124 and 1RH-125, RHR HX Bypass Vents	(236' RAB, A HX Rm)

RHR Train B

1RH-122, RHR Pump Seal Cooler Vent	(190' RAB, B Pump Rm)
1RH-132 and 1RH-133, RHR HX Vents	(236' RAB, B HX Rm)
1RH-130 and 1RH-131, RHR HX Bypass Vents	(236' RAB, B HX Rm)

--END OF ATTACHMENT 1--

24 026 AA1.02 001/NEW/HIGHER/4/1/1/026AA1.02/RO/

Given the following conditions:

- The plant is at 80% power.
- A Loss of Component Cooling Water has occurred.
- The crew is performing actions of AOP-014.
- The USCO has directed isolation of the non-essential CCW header to isolate the leak.

Which ONE (1) of the following describes the effect on the plant?

A. Letdown and Charging must be stopped. RCPs may only run for up to 10 minutes due to loss of thermal barrier cooling flow.

B. Letdown and Charging must be stopped. RCPs may only run for up to 10 minutes due to loss of motor oil cooling.

C. Letdown and Charging are unaffected. RCPs may only be run for up to 10 minutes due to loss of thermal barrier cooling flow.

D. Letdown and Charging are unaffected. RCPs may only be run for up to 10 minutes due to loss of motor oil cooling.

B is correct per AOP. Loss of thermal barrier cooling is a concern if seal injection is also lost. Letdown is supplied from the non-essential header. It must be isolated, then charging isolated, if no cooling is available. RCP run time is 10 minutes due to loss of motor cooling
Common 44

Tier 1 Group 1
K/A Importance Rating - RO 3.2

Ability to operate and / or monitor the following as they apply to the Loss of Component Cooling Water: Loads on the CCW system in the control room

Reference(s) - AOP-014
Proposed References to be provided to applicants during examination - None
Learning Objective - LPAOP3-14, Obj 6
Question Source - New
Question History -
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).7
Comments -

026 AA1.02

INSTRUCTIONS	RESPONSE NOT OBTAINED

3.2 Leakage From CCW System

CAUTION

Operation of RCPs for greater than 10 minutes without CCW cooling to the motor oil coolers may result in RCP bearing damage.

✸☐ **11. CHECK** CCW expected to be lost for greater than 10 minutes.	☐ **11. GO TO** Step 12.
☐ **a. CHECK** the Reactor is TRIPPED.	☐ **a. TRIP** the Reactor **AND GO TO** EOP PATH-1. (Continue with this procedure as time permits.)
☐ **b. STOP** ALL running RCPs. **[A.1, 2]**	

CAUTION

Reactor Makeup Water Tank contains potentially tritiated water. Making up to the CCW System from the Reactor Makeup Water Tank could result in CCW System contamination. Operation of the system while it is contaminated requires an evaluation per 10CFR50.59. **[C.2, 3]**

✸☐ **12. CHECK** CCW Surge Tank level STABLE OR RISING.	**12. IF** Reactor Makeup Water is needed to maintain Surge Tank level greater than 4%, **THEN PERFORM** the following (while continuing with this procedure):
	☐ **a. VERIFY** one RMW pump RUNNING.

(Continued on Next Page)

INSTRUCTIONS	RESPONSE NOT OBTAINED

3.2 Leakage From CCW System

☐**7.** **VERIFY** Both CCW Trains are isolated from the non-essential header:

a. Train A:

☐ • **VERIFY SHUT** 1CC-99, CCW Heat Exchanger A To Nonessential Sup

☐ • **VERIFY SHUT** 1CC-128, CCW Nonessential Return To Header A

b. Train B:

☐ • **VERIFY SHUT** 1CC-113, CCW Heat Exchanger B To Nonessential Sup

☐ • **VERIFY SHUT** 1CC-127, CCW Nonessential Return To Header B

☐**8.** **CHECK** RCS temperature greater than 200°F.

☐**8.** **GO TO** Step 10.

☐**9.** **CHECK** the Non-Essential header affected or previously isolated (insufficient flow, known to be the leak source, or other indication).

☐**9.** **GO TO** Step 10.

a. **VERIFY SHUT** the following valves:

☐ • 1CS-7, 45 gpm Letdown Orifice A

☐ • 1CS-8, 60 gpm Letdown Orifice B

☐ • 1CS-9, 60 gpm Letdown Orifice C

☐ • 1CS-460, Excess Letdown

(Continued on Next Page)

INSTRUCTIONS	RESPONSE NOT OBTAINED

3.2 Leakage From CCW System

9. (continued)

- ☐ • 1CS-461, Excess Letdown
- ☐ • 1CS-28, RHR Letdown (HC-142.1)
- ☐ • 1SP-948 SB, RCS Loop B & C Hot Leg Cnmt Isol
- ☐ • 1SP-949 SA, RCS Loop B & C Hot Leg Cnmt Isol
- ☐ • 1SP-40 SB, Pressurizer Liquid Sample Isol
- ☐ • 1SP-41 SA, Pressurizer Liquid Sample Cnmt Isol
- ☐ • 1SP-59 SB, Pressurizer Stm Space Sample Isol
- ☐ • 1SP-60 SA, Pressurizer Stm Space Sample Isol

b. **ISOLATE** Charging flow as follows:

☐ **(1)** **PLACE** controller FK-122.1, Charging Flow, in MANUAL AND SHUT.

☐ **(2)** **SHUT** 1CS-235 SB, Charging Line Isolation.

☐ **(3)** **SHUT** 1CS-238 SA, Charging Line Isolation.

(Continued on Next Page)

INSTRUCTIONS	RESPONSE NOT OBTAINED

3.2 Leakage From CCW System

9. (continued)

NOTE

The intent of the following step is to stop the running CSIP if the potential exists for over pressurizing the RCS.

	c. **CHECK** that ONE of the following EXISTS:	☐ **c.** **STOP** the running CSIP.
☐	• Bubble in the PZR	
☐	• RPV Head removed or detensioned	
☐	• RCS vented per Tech Specs	
☐	**10.** **CHECK** CCW lost to ANY operating RHR Train:	☐ **10.** **GO TO** Step 11.
☐	**a.** **VERIFY** affected RHR pump STOPPED.	
☐	**b.** **REFER TO** AOP-020, Loss of RCS Inventory or Residual Heat Removal While Shutdown. (Continue with this procedure, as time permits.)	

25. 026 K1.01 001/BANK/LOWER/2/2/1/026K1.01/RO/

With an SI signal present and both Containment Spray pumps in service, the Spray pump suctions are _____ aligned to the Containment Sump upon receipt of a _____ condition.

A. manually; lo-lo RWST level

B. manually; high Containment Sump level

C. ✔ automatically; lo-lo RWST level

D. automatically; high Containment Sump level

Automatic swapover occurs at Lo-Lo RWST level. Containment sump level is going to be high, but it does not provide the actual signal for swapover. This signal automatically actuates.
Common 14

Tier 2 Group 1
K/A Importance Rating - RO 4.2

Knowledge of the physical connections and/or cause-effect relationships between the CSS and the following systems: ECCS.

Reference(s) - SD-112
Proposed References to be provided to applicants during examination - None
Learning Objective - LPCSS3-0, R2d
Question Source - Bank
Question History -
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).7
Comments -

026 K1.01

4.0 OPERATIONS

CAUTION

Setpoints given in this SD are for reference only. Actual values should be obtained from a controlled setpoint document.

The CSS has two principle modes of operation. These are:

1. The initial injection mode, during which time the CSS sprays borated water which is taken from the RWST (sodium hydroxide is introduced through the eductors).

2. The recirculation mode which is initiated when a low-low level (23.4%) is reached in the RWST. Pump suction is automatically transferred from the RWST to the recirculation sump.

4.1 System Actuation

The CSS receives two signals from the Engineered Safety Features Actuation System (SD-103) which are essential for system actuation (SD-112). These are the Phase "A" Containment Isolation Signal ("T" Signal) and the Containment Spray Actuation Signal (CSAS).

Before CSS operation may begin, a certain system lineup must be present. The "T" signal assures the presence of this lineup by automatically actuating (if necessary) the following components:

NOTE: An abnormal CSS lineup should only occur during system testing.

1. Containment Spray Pumps - If being tested during the receipt of the "T" signal, these pumps will stop.

2. Containment Spray Recirculation Valves (1CT-47 and 1CT-95) - If the CSS is being tested, these valves will be open to provide a flow path back to the RWST. Upon receipt of a "T" signal they will close.

3. Containment Spray Eductor Test Valves (1CT-24 and 1CT-25) - A "T" signal will close these valves if they are open for eductor testing.

The CSAS is the actuating signal of the containment spray system. This signal can be initiated by either of two means:

4. Manually - There are four momentary control switches for the manual initiation of the CSAS. Initiation of the CSAS will occur when two associated control switches (left two or right two) are operated simultaneously. See Figure 7.6 for the MCB location of these switches. See SD-103.

26. 027 A4.04 001/NEW/HIGHER/3/2/2/027A4.04/RO/

Given the following conditions:

- The plant is at 50% power.
- ARR Fan S-1A is in operation in Containment.
- The following alarm is received:
    - APP-ALB-28-1-4, CNMT BLDG ARR CHAR FILTER TROUBLE
- ARR Fan S-1A control switch indication is OFF

Which ONE (1) of the following describes the cause of the condition above?

A. High charcoal filter DP.

B. ARR Fan S-1A electrical overload

C. High charcoal filter temperature

D. Loss of power to ARR Fan S-1A

IAW APP-ALB-28, indication of filter trouble is cused by high temperature. Window 1-5 would alarm if fan overload occurred. High DP would alarm window 1-2
Common 31

Tier 2 Group 2
K/A Importance Rating - RO 2.8

Ability to manually operate and/or monitor in the control room: Filter temperature.

Reference(s) - APP-ALB-28-1-4
Proposed References to be provided to applicants during examination - None
Learning Objective - LPCVS3-0, R3a
Question Source - New
Question History -
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).7
Comments -

027 A4.04

1-4

DEVICES: TAS-01AR-7644AV(BV) **SETPOINT**: 180°F
280°F

CNMT BLDG ARR CHAR FILTER TROUBLE

REFLASH: YES

OPERATOR ACTIONS:

1. **CONFIRM** alarm using:
   a. ARR Fans S-1(A) and S-1(B) control switch indication
   b. Fire alarms

2. **VERIFY** Automatic Functions:
   a. Filter fans S-1(A) and S-1(B) trip on pre-high temperature alarm

3. **PERFORM** Corrective Actions:
   a. **VERIFY** the standby fan unit starts 12 seconds after the in-service fan unit trips.
   b. **IF** a fire alarm is present,
      THEN REFER to FPP-002, Fire Emergency.

CAUSES:

1. Faulty temperature sensor
2. Fire in Containment or the charcoal filter
3. Alarm malfunction
4. High temperature in the charcoal filter
5. Thermal detection circuit failure (charcoal loop failure)

REFERENCES:

1. 6-B-401 2677
2. 6-B-401 2678
3. FPP-002, Fire Emergency

DEVICES: FIS-01AR-7647A(B) **SETPOINT**: 8000 CFM

CNMT BLDG ARR FANS S1 LOW FLOW - O/L

REFLASH: NO

OPERATOR ACTIONS:

1. **CONFIRM** alarm using:
   a. Fans S-1(A) and S-1(B) control switch indication
   b. Annunciator window ALB-028-1-2, Cnmt Bldg ARR High ΔP

2. **VERIFY** Automatic Functions:
   a. The operating fan trips and the standby fan starts 12 seconds later.

3. **PERFORM** Corrective Actions:
   a. **IF** window ALB-028-1-2 is also LIT,
      THEN CHECK for a clogged filter
      AND REFER TO APP-ALB-028-1-2.
   b. **IF** the white fan trouble light is LIT,
      THEN DISPATCH an operator to check/reset the thermal overload relays on MCC 1D11-2B (S-1A) or MCC 1E11-1E (S-1B).

CAUSES:

1. Fan breaker is OPEN
2. Clogged filter unit
3. Fan failure
4. Overload Trip
5. Instrument or alarm circuit malfunction
6. Loss of control power

REFERENCES:

1. 6-B-401 2661, 2662

DEVICES: PDS-7642A(B)
PDS-7643A(B)
PDS-7640A(B)

SETPOINT: 1.15 INWC
2.0 INWC
4.52 INWC

CNMT BLDG ARR HIGH ΔP

REFLASH: YES

OPERATOR ACTIONS:

1. **CONFIRM** alarm using:
   a. No Control Room indication is available. Local indication is verified in the Corrective Actions section.

2. **VERIFY** Automatic Functions: None

3. **PERFORM** Corrective Actions:
   a. **DISPATCH** an operator to determine the location of the clogged filter using the following local indications:
      (1) PDI-7642A(B), S-1-1A(B) Supply Fan Medium Efficiency Filter ΔP
      (2) PDI-7643A(B), S-1-1A(B) Supply Fan HEPA Filter ΔP
      (3) PDI-7640A(B), Supply Fan Overall Filter Train ΔP

CAUSES:

1. High ΔP across the medium efficiency filter
2. High ΔP across the HEPA filter
3. High ΔP across the filter train
4. Instrument or alarm circuit malfunction

REFERENCES:

1. 6-B-401 2677
2. 6-B-401 2678

27. 027 AK2.03 002/MODIFIED/HIGHER/3/1/1/027AK2.03/RO/YES

Given the following conditions:

- The unit is in Mode 3 at normal operating pressure
- Pressurizer Pressure Control is in AUTO.
- Pressurizer Pressure Channel PT-445 fails high.

- PRZ Pressure Channel indications are:
  - PI-444 2025 psig
  - PI-445 2500 psig
  - PI-455 1975 psig
  - PI-456 2025 psig
  - PI-457 1975 psig

Assuming NO operator actions, which of the following describes the expected conditions of the PRZ Pressure PORVs and Spray Valves?

A.
- PRZ PORV PCV-444B closed
- PRZ PORVs PCV-445B and PCV-445A open
- PRZ Spray Valves PCV-444C and PCV-444D open

B.
- PRZ PORV PCV-444B open
- PRZ PORVs PCV-445B and PCV-445A closed
- PRZ Spray Valves PCV-444C and PCV-444D open

C✓
- PRZ PORV PCV-444B closed
- PRZ PORV PCV-445B and PCV-445A closed
- PRZ Spray Valves PCV-444C and PCV-444D closed

D.
- PRZ PORV PCV-444B open
- PRZ PORVs PCV-445B and PCV-445A closed
- PRZ Spray Valves PCV-444C and PCV-444D closed

For pressure less than P-11, (2 of 3 < 2000 psig), all PORVs will receive a close signal. PT-444 inputs to master controller, keeping spray valves closed.

QUESTIONS REPORT
for Harris RO Exam

Common 45

Tier 1 Group 1
K/A Importance Rating - RO 2.6

Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: Controllers and positioners.

Reference(s) - SD-100.03, Pg 12, 16, 38-39
Proposed References to be provided to applicants during examination - None
Learning Objective - PZRPC-3.0-3
Question Source - Modified
Question History - 2004 NRC RO 32
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).7
Comments -

ORIGINAL
027AK2.03

QUESTION: 32

Given the following conditions:

- The unit is in Mode 3 at normal operating pressure
- Pressurizer Pressure Control is in AUTO.
- Pressurizer Pressure Channel PT-445 fails high.

- PRZ Pressure Channel indications are:
  - PI-444 2050 psig
  - PI-445 2500 psig
  - PI-455 2050 psig
  - PI-456 1950 psig
  - PI-457 2050 psig

Assuming **NO** operator actions, which of the following describes the expected conditions of the PRZ Pressure PORVs and Spray Valves?

a.
- PRZ PORV 1RC-114 closed
- PRZ PORVs 1RC-116 and 1RC-118 open
- PRZ Spray Valves PCV-444C and PCV-444D open

b.
- PRZ PORV 1RC-114 open
- PRZ PORVs 1RC-116 and 1RC-118 closed
- PRZ Spray Valves PCV-444C and PCV-444D open

c.
- PRZ PORV 1RC-114 closed
- PRZ PORV 1RC-116 and 1RC-118 open
- PRZ Spray Valves PCV-444C and PCV-444D closed

d.
- PRZ PORV 1RC-114 open
- PRZ PORVs 1RC-116 and 1RC-118 closed
- PRZ Spray Valves PCV-444C and PCV-444D closed

ANSWER:

c.
- PRZ PORV 1RC-114 closed
- PRZ PORV 1RC-116 and 1RC-118 open
- PRZ Spray Valves PCV-444C and PCV-444D closed

027 AK2.03

4.1.5 Power-Operated Relief Valve Control

Control switches for the three PORVs are provided at the MCB panel 1A2 and at the ACP. They have three positions (SHUT, AUTO, OPEN). When the PORVs are selected to operate in AUTO by the operator, they are controlled by bistables that energize solenoid valves and admit nitrogen (instrument air is the backup) to the PORV actuator to fully open the valve. The bistable for PORV 1RC-114 receives a signal via the PRZ Master Pressure Controller. This PORV will open when the error signal output of the PRZ Master Pressure Controller corresponds to +100 psi, or 2335 psig. Since the PRZ Master Pressure Controller is a P + I

controller, the actual pressure at which the PORV will open is dependent on the duration of the error signal. The bistables for the other two
PORVs receive a signal directly from pressure transmitter 1PT-445, at 2335 psig. When pressure reduces to 2315 psig, the bistable resets and the PORVs shut.

The PORVs are blocked from automatically opening whenever the P-11 permissive bistable is tripped. The P-11 permissive only allows automatic PORV operation whenever two out of three pressure channels (PT-455, PT-456, PT-457) are greater than 2000 psig. When PT-455, PT-456 and PT-457 (2 of 3) detect pressure less than 2000 psig, the P-11 bistable will trip and block the automatic open signal to all PORVs.

Manual operation of the PORV control switches from either the MCB or the ACP overrides the automatic control circuits and bypasses the P-11 block signal.

PORV PCV-444B receives a separate automatic control signal from PT-444 at the ACP.

Figure 7.8
Sheet 1 of 1

Pressurizer Pressure Protection Circuits

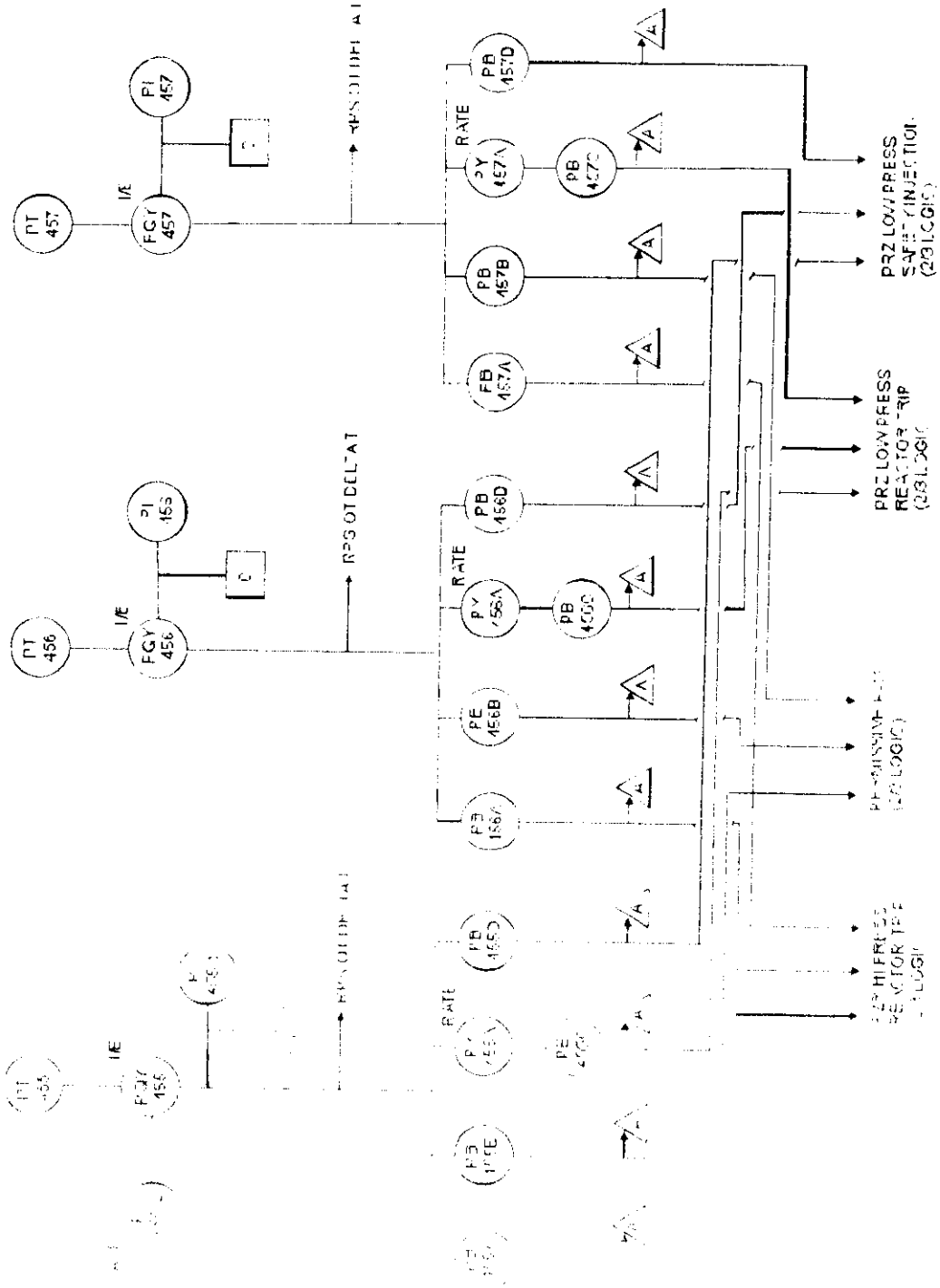
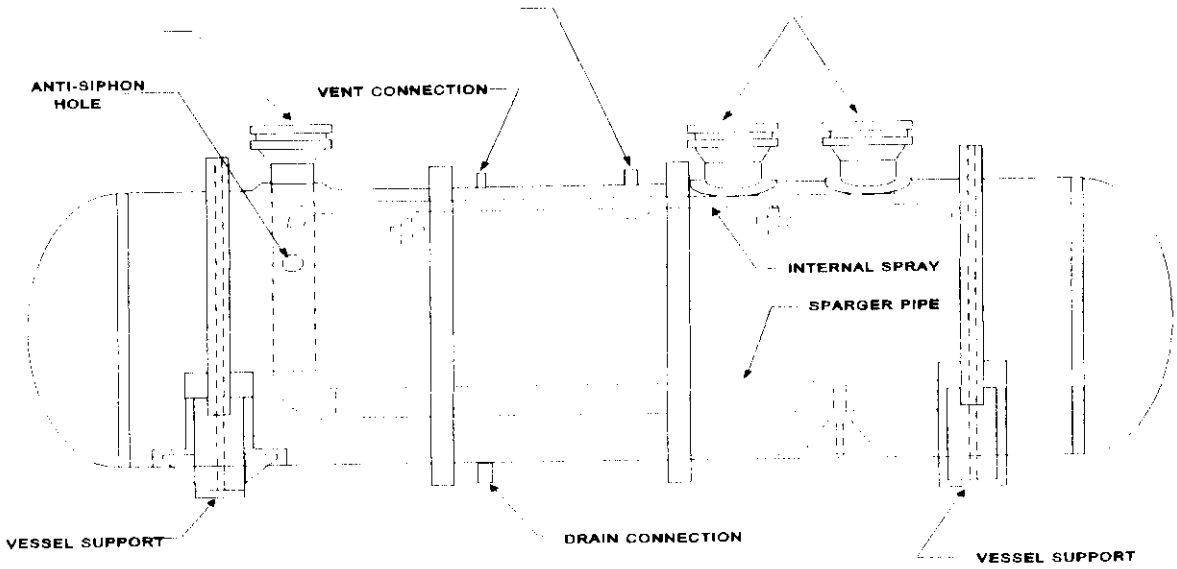


Figure 7.6
Sheet 1 of 1

Pressurizer Relief Tank



28. 028 AA2.13 001/NEW/HIGHER/4/1/2/028AA2.13/RO/

Given the following conditions:

- The plant is at 100% power.
- Pressurizer Level indication LT-459, 460, and 461 failed a channel check in accordance with OST-1021, Daily Surveillance Requirements.
- The USCO directs verification of actual pressurizer level using Cold-Calibrated channel LI-462.

Assuming actual pressurizer level is on program, which ONE (1) of the following describes the indication on LI-462 if it is indicating as designed?

A. 40%

B. 44%

C. 54%

D. 60%

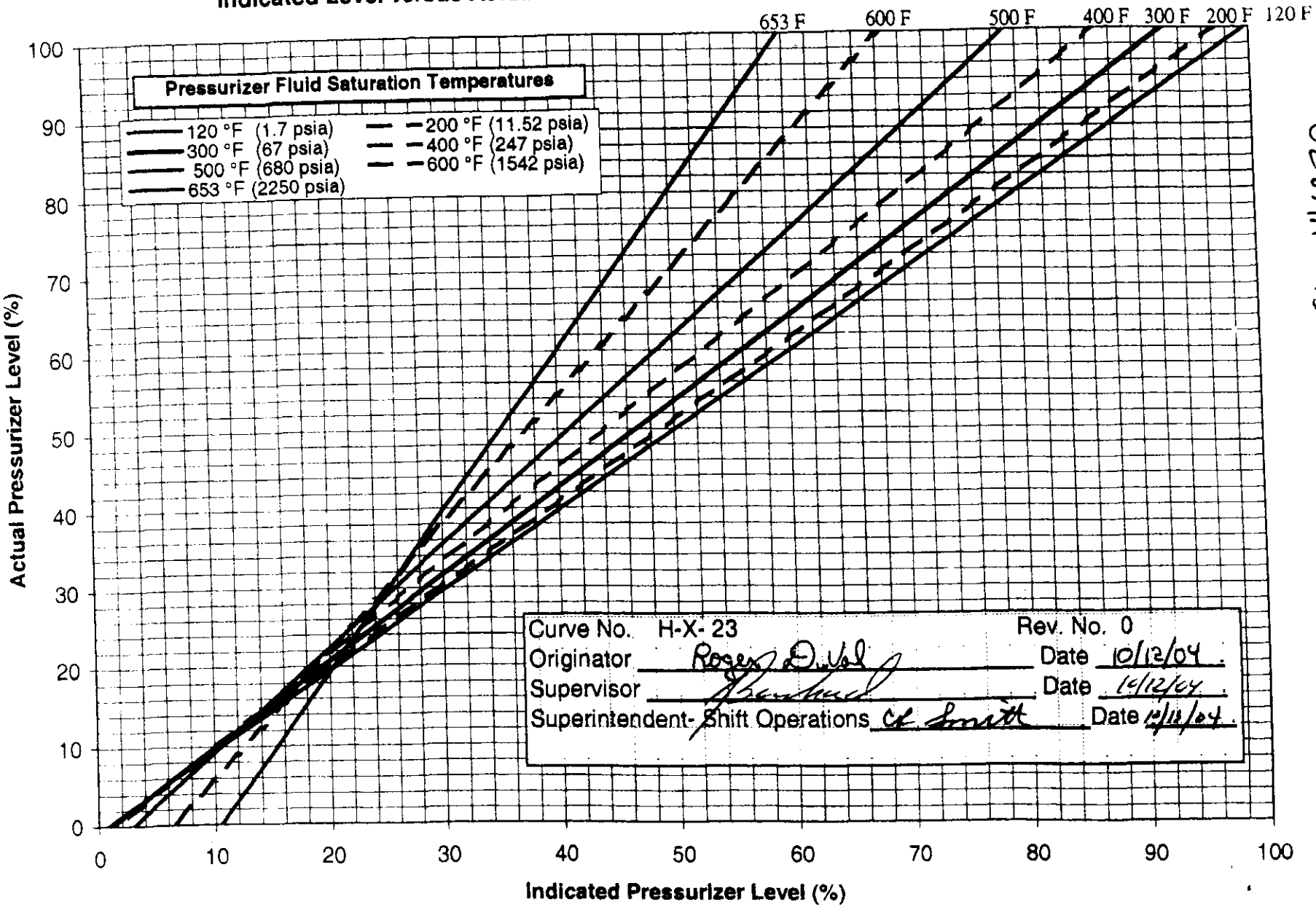
A is correct. See graph.
B and C are other cross points on the same graph.
D is the normal hot calibrated level for 100% power.
Common 58

Tier 1 Group 2
K/A Importance Rating - RO 2.9

Ability to determine and interpret the following as they apply to the Pressurizer Level Control Malfunctions: The actual PZR level, given uncompensated level with an appropriate graph.

Reference(s) - Curve H-X-23
Proposed References to be provided to applicants during examination - Curve H-X-23
Learning Objective - LPPZRLC R4
Question Source - New
Question History -
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).7
Comments -

Pressurizer Level Cold Calibrated Channel (LI-462)
Indicated Level versus Actual Water Level at Various Saturation Temperatures



Curve No. H-X- 23 Rev. No. 0

Originator Roger D. Vol Date 10/12/04

Supervisor [signature] Date 10/12/04

Superintendent- Shift Operations C. E. Smith Date 10/12/04

0284A2.13

29. 029 EA1.12 001/NEW/LOWER/2/1/1/029EA1.12/RO/

Given the following conditions:

- An ATWS has occurred.
- Actions of FRP-S.1 are in progress.
- Reactor Trip Breakers indicate CLOSED.
- The RO is inserting control rods.

Which ONE (1) of the following describes ALL of the methods that may be attempted to locally cause control rods to insert?

A. Open Reactor Trip Breakers only.

B. Open Reactor Trip Breakers or one Rod Drive MG Set output breaker.

C. Open Reactor Trip Breakers or both Rod Drive MG Set supply breakers.

D. Open Reactor Trip Breakers, or both Rod Drive MG Set output breakers, or both Rod Drive MG Set supply breakers

In accordance with FRP-S.1, locally operating these controls in the order listed is required. The MG set motor breakers are operated last because they will not immediately deenergize MG sets to drop rods. There is a coastdown time for the MG set
Common 46

Tier 1 Group 1
K/A Importance Rating - RO 4.1

Ability to operate and monitor the following as they apply to a ATWS: M/G set power supply and reactor trip breakers.

Reference(s) - FRP-S.1
Proposed References to be provided to applicants during examination - None
Learning Objective - LPEOP3-15, 3a
Question Source - New
Question History -
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).10
Comments -

029 EA1.12

Instructions	Response Not Obtained
9. Check Trip Status:	
a. Check reactor - TRIPPED	a. Locally trip reactor using any of the following (listed in order of preference): 1) Locally trip reactor trip breakers. 2) Locally trip both rod drive MG set generator output breakers. 3) Locally trip both rod drive MG set motor breakers.
b. Check turbine - TRIPPED 1) Check for any of the following: o All turbine throttle valves - SHUT o All turbine governor valves - SHUT o All MSIVs AND bypass valves - SHUT	1) Locally trip turbine.
10. Check Reactor Subcritical:	
a. Check for both of the following: o Power range channels - LESS THAN 5% o Intermediate range startup rate channels - NEGATIVE	a. Observe NOTE prior to Step 11 AND GO TO Step 11.
b. Observe CAUTION prior to Step 25 AND GO TO Step 25.	

30. 032 AK3.01 001/BANK/HIGHER/4/1/2/032AK3.01/RO/

Given the following conditions:

- A reactor startup is in progress.
- Both Intermediate Range channels indicate approximately 5 E -11 amps.
- Source Range Channel N-31 fails DOWNSCALE.

Which one of the following describes the required operator response and the reason for the response?

A. Continue the reactor startup; with only one source range channel operable; 48 hours is allowed to restore two channels to service.

B. Suspend the reactor startup; source range channels are not required to trip the reactor; however, the source range monitoring functions must be available.

C. Continue the reactor startup; the Intermediate Range Neutron Flux Trip and the Power Range Neutron Flux-Low Trip provide the necessary core protection.

D✓ Suspend the reactor startup; with only one source range channel operable, the minimum required Source Range High Flux Trip protection is not met.

A Incorrect. Cannot continue to Mode 1 or go above P-6.
B Incorrect. Source Range is required for Rx Trip.
C Incorrect. May not continue, and PR High Flux Low Setpoint is not enabled.

Common 59

Tier 1 Group 2
K/A Importance Rating - RO 3.2

Knowledge of the reasons for the following responses as they apply to the Loss of Source Range Nuclear Instrumentation: Startup termination on source-range loss.

Reference(s) - TS
Proposed References to be provided to applicants during examination - None
Learning Objective - LPNIS3-0, obj 12
Question Source - Bank
Question History - 46445, BVPS-1 2002 NRC
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).10
Comments -

TABLE 3.3-1

REACTOR TRIP SYSTEM INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NO. OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
1. Manual Reactor Trip	2	1	2	1, 2	1
	2	1	2	3*, 4*, 5*	9
2. Power Range, Neutron Flux					
a. High Setpoint	4	2	3	1, 2	2
b. Low Setpoint	4	2	3	1###, 2	2
3. Power Range, Neutron Flux High Positive Rate	4	2	3	1, 2	2
4. Power Range, Neutron Flux, High Negative Rate	4	2	3	1, 2	2
5. Intermediate Range, Neutron Flux	2	1	2	1###, 2	3
6. Source Range, Neutron Flux					
a. Startup	2	1	2	2##	4
b. Shutdown	2	1	2	3, 4, 5	5
7. Overtemperature ΔT	3	2	2	1, 2	6
8. Overpower ΔT	3	2	2	1, 2	6
9. Pressurizer Pressure--Low (Above P-7)	3	2	2	1	6(1)
10. Pressurizer Pressure--High	3	2	2	1, 2	6
11. Pressurizer Water Level--High (Above P-7)	3	2	2	1	6

032AK3.01

TABLE 3.3-1 (Continued)

ACTION STATEMENTS (Continued)

ACTION 3 - With the number of channels OPERABLE one less than the Minimum Channels OPERABLE requirement and with the THERMAL POWER level:

a. Below the P-6 (Intermediate Range Neutron Flux Interlock) Setpoint, restore the inoperable channel to OPERABLE status prior to increasing THERMAL POWER above the P-6 Setpoint, and

b. Above the P-6 (Intermediate Range Neutron Flux Interlock) Setpoint but below 10% of RATED THERMAL POWER, restore the inoperable channel to OPERABLE status prior to increasing THERMAL POWER above 10% of RATED THERMAL POWER.

ACTION 4 - With the number of OPERABLE channels one less than the Minimum Channels OPERABLE requirement, suspend all operations involving positive reactivity changes.

ACTION 5 - a. With the number of OPERABLE channels one less than the Minimum Channels OPERABLE requirement, restore the inoperable channel to OPERABLE status within 48 hours or open the Reactor Trip System breakers, and verify compliance with the shutdown margin requirements of Specification 3.1.1.2 within 1 hour and at least once per 12 hours thereafter.

b. With no channels OPERABLE, open the Reactor Trip System breakers within 1 hour and suspend all operations involving positive reactivity changes. Verify compliance with the SHUTDOWN MARGIN requirements of Specification 3.1.1.2 within 1 hour and at least once per 12 hours thereafter.

ACTION 6 - With the number of OPERABLE channels one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may proceed provided the following conditions are satisfied:

a. The inoperable channel is placed in the tripped condition within 6 hours, and

b. The Minimum Channels OPERABLE requirement is met; however, the inoperable channel may be bypassed for up to 4 hours for surveillance testing of other channels per Specification 4.3.1.1.

ACTION 7 - With less than the Minimum Number of Channels OPERABLE, within 1 hour determine by observation of the associated permissive annunciator window(s) that the interlock is in its required state for the existing plant condition, or apply Specification 3.0.3.

31. 034 K6.02 001/NEW/HIGHER/4/2/2/034K6.02/RO/

Given the following conditions:

- The plant is in Mode 1.
- All plant equipment is operating normally.
- Irradiated Fuel movement is being performed in the Spent Fuel Pool in preparation for Refueling.
- Fuel Handling Building area radiation monitor RM-1*FR-3564ASA, fails HIGH and is declared inoperable.

Which ONE (1) of the following describes the effect on the plant and the status of fuel movement in the Spent Fuel Pool?

A. Fuel Handling Building Emergency Exhaust unit E-12 starts. Fuel movement may continue with no additional actions required.

B. Fuel Handling Building Emergency Exhaust unit E-12 starts. Fuel movement may continue ONLY as long as BOTH Control Room Outside Air Intake radiation monitors remain operable

C. Fuel Handling Building Emergency Exhaust unit E-12 must be declared inoperable. Fuel movement must be suspended until Fuel Handling Building Emergency Exhaust unit E-13 is placed in service in the recirculation mode.

D. Fuel Handling Building Emergency Exhaust unit E-12 must be declared inoperable. Fuel movement must be suspended until both trains of Fuel Handling Building Emergency Exhaust are operating in the recirculation mode or restored to operable.

E-12 will auto start on high radiation from 3564ASA. With other equipment operating normally, the opposite train EDG is available to supply the other FHB ventilation train. Therefore, no further actions are required. Control Room ventilation must be operable, but not the reason for the question asked here.

QUESTIONS REPORT
for Harris RO Exam

Common 32

Tier 2 Group 2
K/A Importance Rating - RO 2.6

Knowledge of the effect of a loss or malfunction on the following will have on the Fuel Handling System : Radiation monitoring systems.

Reference(s) - TS 3.9.12, 3.3.3.1
Proposed References to be provided to applicants during examination - TS 3.3.3.1, 3.9.12
Learning Objective - LPRMS3-0, Obj 9a
Question Source - New
Question History -
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).13
Comments -

034 K6.02

REFUELING OPERATIONS

3/4.9.12 FUEL HANDLING BUILDING EMERGENCY EXHAUST SYSTEM

LIMITING CONDITION FOR OPERATION

3.9.12 Two independent Fuel Handling Building Emergency Exhaust System Trains shall be OPERABLE.*

APPLICABILITY: Whenever irradiated fuel is in a storage pool.

ACTION:

a. With one Fuel Handling Building Emergency Exhaust System Train inoperable, fuel movement within the storage pool or crane operation with loads over the storage pool may proceed provided the OPERABLE Fuel Handling Building Emergency Exhaust System Train is capable of being powered from an OPERABLE emergency power source and is in operation and discharging through at least one train of HEPA filters and charcoal adsorber.

b. With no Fuel Handling Building Emergency Exhaust System Trains OPERABLE, suspend all operations involving movement of fuel within the storage pool or crane operation with loads over the storage pool until at least one Fuel Handling Building Emergency Exhaust System Train is restored to OPERABLE status.

c. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.12 The above required Fuel Handling Building Emergency Exhaust System trains shall be demonstrated OPERABLE:

a. At least once per 31 days on a STAGGERED TEST BASIS by initiating, from the control room, flow through the HEPA filters and charcoal adsorbers and verifying that the system operates for at least 10 continuous hours with the heaters operating;

b. At least once per 18 months or (1) after any structural maintenance on the HEPA filter or charcoal adsorber housings, or (2) following significant painting, fire, or chemical release in any ventilation zone communicating with the system by:

1. Verifying that the cleanup system satisfies the in-place penetration and bypass leakage testing acceptance criteria of less than 0.05% and uses the test procedure guidance in Regulatory Positions C.5.a, C.5.c, and C.5.d of Regulatory Guide 1.52, Revision 2, March 1978, and the unit flow rate is 6600 cfm ± 10% during system operation when tested in accordance with ANSI N510-1980.

* The Fuel Handling Building Emergency Exhaust System boundary may be opened intermittently under administrative controls.

TABLE 3.3-6

RADIATION MONITORING INSTRUMENTATION FOR PLANT OPERATIONS

INSTRUMENT	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ALARM/TRIP SETPOINT	ACTION
1. Containment Radioactivity--					
a. Containment Ventilation Isolation Signal Area Monitors	2	3	1, 2, 3, 4, 6	#	27
b. Airborne Gaseous Radioactivity					
1) RCS Leakage Detection	1	1	1, 2, 3, 4	$\leq 1.0 \times 10^{-3}$ μCi/ml	26, 27
2) Pre-entry Purge	1	1	##	$\leq 2.0 \times 10^{-3}$ μCi/ml	30
c. Airborne Particulate Radioactivity					
1) RCS Leakage Detection	1	1	1, 2, 3, 4	$\leq 4.0 \times 10^{-8}$ μCi/ml	26, 27
2) Pre-entry Purge	1	1	##	$\leq 1.5 \times 10^{-8}$ μCi/ml	30
2. Spent Fuel Pool Area-- Fuel Handling Building Emergency Exhaust Actuation					
a. Fuel Handling Building Operating Floor--South Network	1/train***	1/train 2 trains	**	$\leq$ 100 mR/hr	28
b. Fuel Handling Building Operating Floor--North Network	1/train***	1/train 2 trains	*	$\leq$ 100 mR/hr	28
3. Control Room Outside Air Intakes--					
a. Normal Outside Air Intake Isolation	1	2	1,2,3,4,5,6 and during movement of irradiated fuel assemblies and movement of loads over spent fuel pools.	$\leq 4.9 \times 10^{-6}$ μCi/ml	29

TABLE 3.3-6 (Continued)

TABLE NOTATIONS

* With irradiated fuel in the Northend Spent Fuel Pool or transfer of irradiated fuel from or to a spent fuel shipping cask.

** With irradiated fuel in the Southend Spent Fuel Pool or New Fuel Pool.

*** Each channel consists of 3 detectors with 1 of 3 logic. A channel is OPERABLE when 1 or more of the detectors are OPERABLE.

\# For MODES 1, 2, 3 and 4, the setpoint shall be less than or equal to three times detector background at RATED THERMAL POWER. During fuel movement the setpoint shall be less than or equal to 150 mR/hr.

Required OPERABLE whenever pre-entry purge system is to be used.

ACTION STATEMENTS

ACTION 26 - Must satisfy the ACTION requirement for Specification 3.4.6.1.

ACTION 27 - With less than the Minimum Channels OPERABLE requirement, operation may continue provided the containment purge makeup and exhaust isolation valves are maintained closed.

ACTION 28 - With less than the Minimum Channels OPERABLE requirement, declare the associated train of Fuel Handling Building Emergency Exhaust inoperable and perform the requirements of Specification 3.9.12.

ACTION 29 - With the number of OPERABLE channels one less than the Minimum Channels OPERABLE requirement, within 1 hour initiate isolation of the respective air intake. With no outside air intakes available, maintain operation of the Control Room Emergency Filtration System in the Recirculation Mode of Operation.

ACTION 30 - With less than the Minimum Channels OPERABLE requirement, pre-entry purge operations shall be suspended and the containment pre-entry purge makeup and exhaust valves shall be maintained closed.

32. 035 A1.02 001/BANK/HIGHER/3/2/2/035A1.02/RO/

Given the following conditions:

- A Unit startup is in progress with the MSIVs closed.
- The operating crew is preparing to warm up the main steam lines.

Which one of the following actions will cause "A" SG pressure to INCREASE in this plant configuration?

A. Decrease "A" SG PORV controller setpoint in AUTO.

B. Decrease "A" SG PORV controller output in MANUAL.

C. Decrease Steam Dump pressure controller output in STM PRESS mode.

D. Decrease Steam Dump pressure controller setpoint in STM PRESS mode.

A Incorrect. Lowering the setpoint will cause pressure to lower.
C Incorrect. Steam line warmup, condenser not yet in service.
D Incorrect. Steam line warmup, condenser not in service yet.

Common 33

Tier 2 Group 2
K/A Importance Rating - RO 3.5

Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the S/GS controls including: S/G pressure.

Reference(s) - OP-126
Proposed References to be provided to applicants during examination - NONE
Learning Objective - LP MSSS3-0 R1A
Question Source - Bank
Question History - 46414, BVPS-1 2002
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).4
Comments -

035 A1.02

8.0 INFREQUENT OPERATIONS

8.1. Steam Generator Pressure Control/RCS Temperature Control with PORVs

8.1.1. Initial Conditions

1. One or more of the following conditions exist:

   a. A plant heat-up or cooldown is in progress. _____

   b. The Main Steam Isolation valves are shut. _____

   c. The Steam Dump System is inoperable or incapable of maintaining SG pressure. _____

8.1.2. Procedural Steps

NOTE: If Manual Control of the PORV is desired to control SG pressure/RCS temperature, proceed to Step 8.1.2.2.

1. **PERFORM** the following to control SG pressure/RCS temperature with PORV in AUTO:

   a. **ADJUST** the setpoint of the S/G PORV Controllers PK-308A1, PK-308B1, and PK-308C1 to 85% (1106) psig by using the SETPOINT increase or decrease push buttons. _____

   b. **DEPRESS** the AUTO pushbutton on the S/G PORV Controllers PK-308A1, PK-308B1, and PK-308C1. _____

NOTE: By increasing the PORV Controllers setpoint, the SG pressure/RCS temperature will increase.

   c. **ADJUST** the setpoints of the S/G PORV Controllers PK-308A1, PK-308B1, and PK-308C1, by using the SETPOINT increase or decrease pushbuttons, as necessary to control SG pressure/RCS temperature. _____

8.1.2 Procedural Steps (continued)

2. To **CONTROL SG PRESSURE/RCS TEMPERATURE** with PORVs in MANUAL:

   a. **DEPRESS** the MAN pushbutton on the S/G PORV Controllers PK-3081A1, PK-308B1, PK-308C1. _____

   b. **ADJUST** PORV position as necessary by using the OUTPUT increase or decrease push buttons on S/G PORV Controllers PK-308A1, PK-308B1, and PK-308C1 to control SG pressure/RCS temperature. _____

33. 037 AA2.01 001/NEW/HIGHER/3/1/2/037AA2.01/RO/

Given the following conditions:

- REM-01TV-3534, Condenser Vacuum Pump Effluent radiation monitor, indication is rising.
- Chemistry has been directed to perform CRC-804, Primary to Secondary Leak Rate Monitoring, to quantify the leak rate

Which ONE (1) of the following indications will serve to verify the value of actual primary to secondary leak rate?

A. Condenser Vacuum Pump Effluent Monitor indication and a conversion factor supplied by Chemistry

B. Local surveys of Steam Generator Blowdown Lines

C. Alarm status of Main Steam Line Radiation Monitors RM-01MS-3591 SB, 3592 SB, or 3593 SB

D. Trend on Turbine Building Vent Stack Effluent, RM-1TV-3536-1

Vacuum pump effluent radiation and a conversion factor will help determine actual leak rate. The other methods may identify the actual SG, or verify that there is a leak, but will not quantify it.
Common 60

Tier 1 Group 2
K/A Importance Rating - RO 3.0

Ability to determine and interpret the following as they apply to the Steam Generator Tube Leak: Unusual readings of the monitors; steps needed to verify readings.

Reference(s) - AOP-016
Proposed References to be provided to applicants during examination - None
Learning Objective - LPAOP3-16, Obj 5
Question Source - New
Question History -
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).7
Comments -

037AA2.01

Attachment 1
Sheet 1 of 6

Primary-To-Secondary Leak

INSTRUCTIONS	RESPONSE NOT OBTAINED

1. **NOTIFY** Chemistry to implement CRC-804, Primary-To-Secondary Leak Rate Monitoring, to accomplish the following: **[A.2]**

- ☐ • quantify leak rate
- ☐ • quantify leak rate trend
- ☐ • determine leaking SG

NOTE

Condenser Vacuum Pump radiation monitor indication is sensitive to high temperature and may read higher than actual when the monitor cooler is not in service. The cooling water alignment is located in OP-139, Service Water System.

☐2. **ESTIMATE** Primary-To-Secondary leak rate every 15 minutes based on ONE of the following (no preferred method): **[C.5, 7]**

	Method
(1)	• Condenser Vacuum Pump Rad Monitor, REM-01TV-3534 (Grid 2) • Curve H-X-15a, H-X-15b or H-X-15c (depending on the status of motivating air)
(2)	OSI PI plot (Chemistry tab) for Curve H-X-15a, H-X-15b or H-X-15c
(3)	Condenser Vacuum Pump Rad Monitor, REM-01TV-3534 (Grid 2) and conversion factor (Attachment 20), after Chemistry sampling has commenced

34. 039 K3.03 002/BANK/HIGHER/3/2/1/039K3.03/RO/

Given:

- A Main Steam line break has occurred.
- Steam Generator pressures are:
  - SG A - 900 psig
  - SG B - 750 psig
  - SG C - 910 psig

Under these conditions...

A. the open signal for the AFW flow control valve to SG-C will increase.

B. ✔ AFW will isolate to SG-B following the Main Steam Line Isolation signal.

C. the Turbine Driven AFW pump steam supply from SG-C will be blocked from opening.

D. AFW will isolate to all SGs.

Because SG B is at a pressure 150 psig below the other SGs, when MSLI actuates, AFW will also isolate to the SG with the low pressure. AFW isolation does not occur unless there is a 100 psi DP between 2 SGs when MSLI occurs. The SG with the lower pressure will receive the isolation signal
Common 15

Tier 2 Group 1
K/A Importance Rating - RO 3.2

Knowledge of the effect that a loss or malfunction of the MRSS will have on the following: AFW pumps.

Reference(s) - SD-137
Proposed References to be provided to applicants during examination - None
Learning Objective - LPAFS3-0, Obj 2e and 3
Question Source - Bank
Question History - AFS-R3 003
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).7
Comments -

039K3.03

4.2 Emergency Operations

The AFS can be used for start-up and shutdown as described in Section 4.1. However, its primary purpose is to provide a reliable and sufficient supply of water to the Steam Generators during plant emergencies when main feedwater is not available.

FSAR Chapter 15 takes credit for the availability of the AFW System in the mitigation of the following accidents:

- Loss of Non-Emergency AC Power to the Station Auxiliaries (15.2.6)
- Loss of Normal Feedwater Flow (15.2.7)
- Feedwater System Pipe Break (15.2.8)
- Steam Generator Tube Rupture (15.6.3)
- Small Break LOCA (15.6.5)

An AFW flow rate of 390 GPM is assumed in each of these events, with the exception of steam generator tube rupture. For this event, different AFW flow rates are assumed when analyzing for off-site dose than for margin to overfill. Auxiliary Feedwater flow is also included in the analysis of the Steam System Piping Failure (15.1.5). However, since AFW helps to increase cooldown, thus increasing the consequences of this event, a conservatively high AFW flow rate of 3000 GPM is assumed in the analysis.

Two additional events, Station Blackout (SBO) and Anticipated Transient Without Scram (ATWS), also rely heavily on the Auxiliary Feedwater System. These transients are not design basis accidents because multiple failures must occur to initiate the events. However, both scenarios contributes to the AFS design requirements. Station Blackout establishes the need for an auxiliary feedwater pump powered by a diverse source. In conforming to the guidelines of NUMARC 87-00, it has been determined that the TDP must provide 117,013 gallons of water from the CST for decay heat removal over the four-hour SBO duration. The ATWS event introduces a redundant actuation logic for all three AFW pumps on low-low steam generator level when the reactor power exceeds 40% of rated power. The ATWS analysis, performed generically in WCAP-8330, assumes an AFW flow rate of 1400 GPM for 3-loop plants.

An AFW isolation signal will shut the AFW motor-operated isolation valves and AFW FCVs for each SG. This signal protects against feeding AFW to a faulted SG (steam line break, main or auxiliary feedwater line break, and so forth.). Two inputs are required to generate an AFW isolation signal:

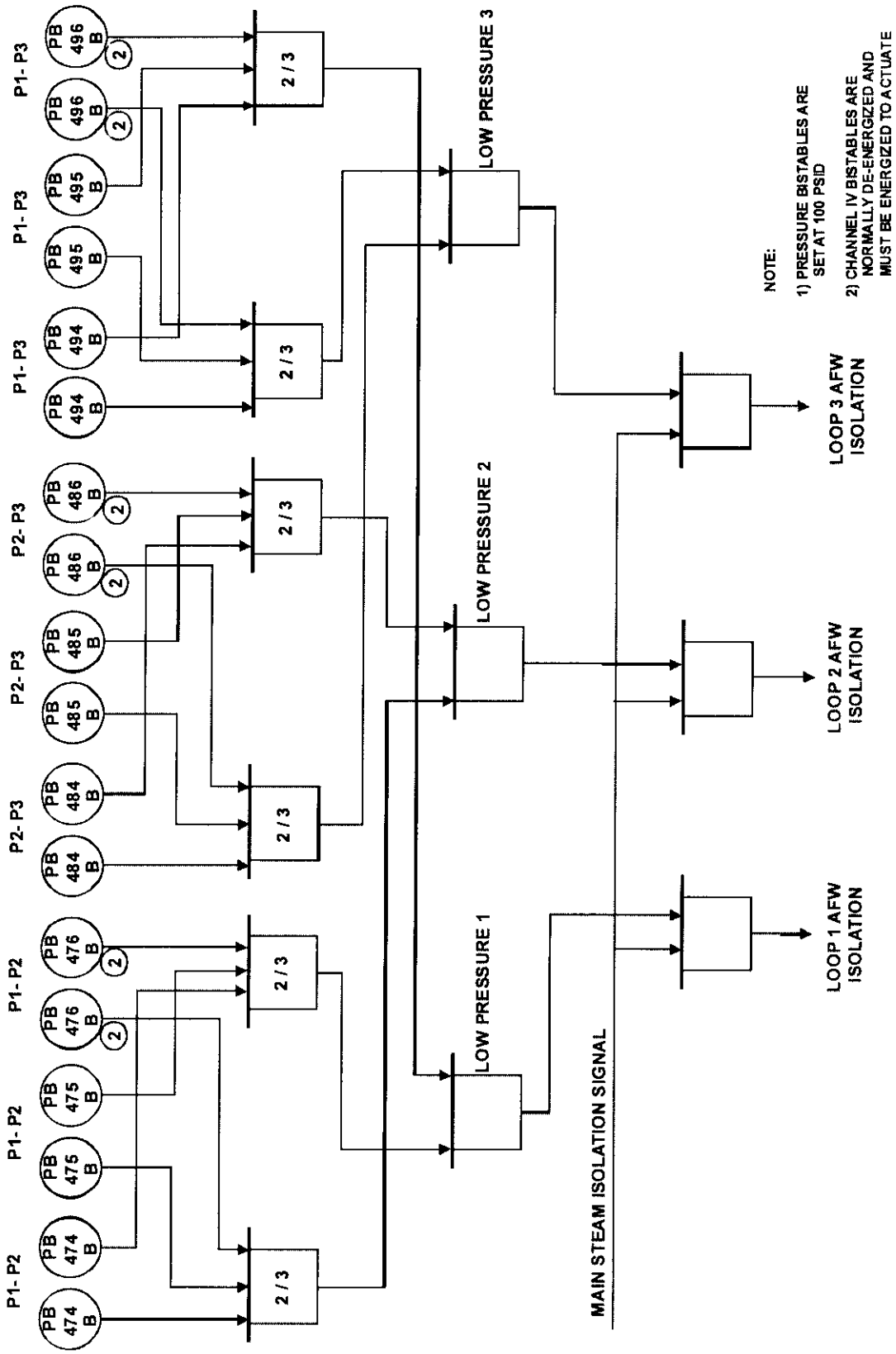
- Main Steam Isolation Signal

  AND

- High steam line differential pressure (faulted SG pressure 100 psid lower than other 2 SGs)

This minimizes the effects of feeding a faulted SG (RCS cooldown, containment pressurization, flooding, and so forth).

SD 137 - AFW ISOLATION LOGIC - FIGURE 7.6



35. 040 AK3.04 001/NEW/HIGHER/3/1/1/040AK3.04/RO/

The crew is terminating SI in EPP-014, Faulted SG isolation.

Which ONE (1) of the following describes the reason for opening FK-122.1, Charging Flow control valve a minimal amount, prior to isolating the BIT?

A. To prevent damage to the regenerative heat exchanger due to thermal shock.

B. To maintain seal injection flow within analyzed limits by maintaining appropriate backpressure on the seal injection throttle valves.

C. To prevent 'dead-heading' the running CSIP in the case where normal miniflow valves are not available..

D. To establish and maintain stable makeup flow for RCS inventory control.

When the BIT is isolated and normal miniflow valves unavailable, there would be no Charging flow path unless FK-122 was cracked open. The RHX is designed for high Delta T, and maintaining backpressure on seal injection is accomplished with HC-182. Inventory control is required via FK 122 after isolating BIT, but not the reason for opening under these conditions
Common 47

Tier 1 Group 1
K/A Importance Rating - RO 4.5

Knowledge of the reasons for the following responses as they apply to the Steam Line Rupture: Actions contained in EOPs for steam line rupture.

Reference(s) - EPP-014 Step 18 Note
Proposed References to be provided to applicants during examination - None
Learning Objective - LPEOP3-9, Obj 2
Question Source - New
Question History -
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).10
Comments -

040 AK3.04

Instructions	Response Not Obtained

NOTE: The following step contains an SI termination sequence for which CSIP normal miniflow is not available. The charging flow control valve is opened a minimal amount prior to isolating the BIT to ensure the running CSIP is not deadheaded.

18. Establish Minimum Charging Flow AND Isolate BIT Flow:

a.	Shut charging flow control valve: FK-122.1	
b.	Open charging line isolation valves: 1CS-235 1CS-238	
c.	Check CSIP suction - ALIGNED TO RWST	c. Set charging flow controller demand position to 12%. GO TO Step 18e.
d.	Set charging flow controller demand position to 30%.	
e.	Shut BIT outlet valves: 1SI-3 1SI-4	e. Locally shut OR isolate valves.
f.	Verify cold leg AND hot leg injection valves - SHUT 1SI-52 1SI-86 1SI-107	f. Locally shut valves.
g.	Establish and maintain at least 60 GPM flow through CSIP.	
h.	Observe CAUTION prior to Step 20 AND GO TO Step 20.	

36. 041 G2.4.50 001/NEW/HIGHER/3/2/2/041 G2.4.50/RO/

Given the following conditions:

- The plant is operating at 100% power when the following alarm is received:
  - APP-ALB-020-2-2, TURBINE RUNBACK OPERATIVE
- RCS Tavg has risen 9 degrees F and continues to rise.
- Steam Dumps indicate CLOSED.

Which ONE (1) of the following describes an indication that will verify a runback is in progress, and what action is required for operation of the steam dumps?

A. Runback is verified by control rod insertion; Observe steam dumps opening in automatic when the C-7A bistable illuminates

B. Runback is verified by Turbine First Stage pressure reduction on PI-446 and 447; Observe steam dumps opening in automatic when the C-7A bistable illuminates

C. Runback is verified by control rod insertion; Open steam dumps manually by placing the steam dump header pressure controller, PK-464.1, in MANUAL with the steam dump mode selector in TAVG

D. Runback is verified by Turbine First Stage pressure reduction on PI-446 and 447; Open steam dumps manually by placing the steam dump header pressure controller, PK-464.1, in MANUAL with the steam dump mode selector in STEAM PRESS.

APP-ALB-020-2-2 and AOP-015 indicate that observation of FSP will confirm the runback. Operation of rods only confirms a Tave/Tref mismatch. 9 degree difference should have started opening steam dumps already, and C-7A will not actually open the dumps, just arm them. Also, for these indications, C-7A should already be lit

QUESTIONS REPORT
for Harris RO Exam

Common 34

Tier 2 Group 2
K/A Importance Rating - RO 3.3

Emergency Procedures / Plan Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.

Reference(s) - APP-ALB-020-2-2, AOP-015
Proposed References to be provided to applicants during examination - None
Learning Objective - LPAOP3-15 Obj 4
Question Source - New
Question History -
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).7
Comments -

04/62.4.50

INSTRUCTIONS	RESPONSE NOT OBTAINED

3.0 OPERATOR ACTIONS

NOTE

This procedure contains NO immediate actions.

☐1. **IF** load rejection was caused by ANY of the following:

- Loss of ONE Main FW Pump at greater than 60% turbine load
- Both Heater Drain pumps TRIPPED

THEN GO TO AOP-010, Feedwater Malfunctions.

NOTE

Turbine runbacks are quickly identified by ALB-020-2-2, TURBINE RUNBACK OPERATIVE, in alarm and RUNBACK OPER light flashing on DEH Panel A.

✱☐2. **CHECK** DEH controlling Turbine Valves PROPERLY for event:

- Turbine Runback
- Load Rejection
- Turbine load change

GO TO Step 4.

☐2. **GO TO** Step 3.

INSTRUCTIONS	RESPONSE NOT OBTAINED

3.0 OPERATOR ACTIONS

3. (Continued)

NOTE

MANUAL NOT TRACK'G AUTO light may flash for several seconds during rapid load changes. If this light is flashing, a time delay of up to 20 seconds is prudent to allow for stabilization and prevent unnecessary Reactor trips.

☐ **f. CHECK** MANUAL NOT TRACK'G AUTO light is OFF.

f. PERFORM ONE of the following:

☐ • **WAIT** until MANUAL NOT TRACK'G AUTO light is OFF.

☐ • **GO TO** Step 3.h.

☐ **g. PLACE** DEH in TURBINE MANUAL.

☐ **h. CHECK** Turbine Valve transient TERMINATED.

☐ **h. TRIP** the Reactor **AND GO TO** EOP Path-1.

CAUTION

Misoperation of the Steam Dumps while in manual control can lead to excessive S/G swell or overcooling of the RCS.

☐ **4. CHECK** for proper Steam Dump valve operation by ALL of the following:

- Load rejection with power greater than 10%
- Steam Dumps in Tavg mode
- Steam Dumps operating to reduce temperature

4. IF control of RCS temperature is necessary, **THEN PERFORM** the following:

a. TAKE manual control of Steam Dump valves to control RCS temperature as follows:

☐ **(1) PLACE** PK-464.1, Steam Dump Header Pressure Controller, in MANUAL.

(Continued on Next Page)

INSTRUCTIONS	RESPONSE NOT OBTAINED

3.0 OPERATOR ACTIONS

4. **(Continued)**

☐ (2) **DEPRESS** DECREASE pushbutton to set controller output to 0%.

☐ (3) **PLACE** Steam Dump Mode Selector switch in RESET.

☐ (4) **PLACE** Steam Dump Mode Selector switch in STEAM PRESS.

☐ (5) Using PK-464.1, **MANUALLY CONTROL** steam header pressure using INCREASE and DECREASE pushbuttons to reduce Tavg to within 5°F of Tref.

☐ (6) **ADJUST** PK-464.1 as necessary to stabilize RCS temperature.

☐ **b. IF** temperature can NOT be STABILIZED, **THEN TRIP** the Reactor **AND GO TO** EOP Path-1.

☐5. **CHECK** Main Steam pressure less than PORV controller setpoint (nominally 1106 psig).

☐5. **VERIFY** proper operation of SG PORVs.

☐6. **CHECK** control rods INSERTING to reduce Tavg - Tref mismatch.

☐6. **INSERT** control rods to reduce Tavg-Tref mismatch to within 2°F.

☐7. **CHECK** SG levels TRENDING to between 52% and 62%.

☐7. **CONTROL** feedwater to maintain SG levels between 52% and 62%.

TURBINE RUNBACK OPERATIVE

AUTO ACTIONS

NOTE: Runback rate is 200% per minute during contact closure of the time delay relay, which gives an actual rate equivalent to 10% per minute for OTΔT and OPΔT, continuous for loss of Main Feed Pump/Heater Drain Pumps.

1. Turbine will runback until condition clears

CAUSES

1. Loss of one Main Feed Pump above nominal 60% load
2. Loss of both Heater Drain Pumps above 90% load
3. Reactor over temperature ΔT trip setpoint less 3.0% exceeded
4. Reactor over power ΔT trip setpoint less 1.9% exceeded
5. Logic malfunction
6. Alarm circuit or instrument malfunction.

OBSERVATIONS

1. Turbine first stage pressure PI-446,447
2. Feedwater pump indication
3. Heater drain pump indication
4. RX Coolant Loop ΔT setpoint indications versus actual Loop ΔT indications

ACTIONS

1. If RX trips, reference EOP PATH-1.
2. If Runback is due to High ΔT, reference AOP-15, Secondary Load Rejection.
3. If Runback is due to Pump Trip, reference AOP-10, Feedwater Malfunction and AOP-15, Secondary Load Rejection.
4. Prepare W/O for malfunctioning equipment.

DEVICE/SETPOINTS

1. PS-01MS-1005, — 333.4 PSIG (nominal 60% load)
   Turbine First Stage Press to Turbine Runback Logic
   (with a 1 out of 2 coincidence for the Main Feedwater pump breakers being open)

2. PS-01MS-1006, — 553.0 PSIG (nominal 90% load)
   Turbine First Stage Press to Turbine Runback Logic
   (with both Heater Drain pump breakers being open)

3. TS-01RC-0412CW(TB-412C), — Variable
   Reactor Coolant Overtemperature Loop 1

   TS-01RC-0422CW(TB-422C),
   Reactor Coolant Overtemperature Loop 2

   TS-01RC-0432CW(TB-432C),
   Reactor Coolant Overtemperature Loop 3
   (2 out of 3 coincidence)

4. TS-01RC-0412BW(TB-412B), — Variable
   Reactor Coolant Overpower Temp Diff Loop 1

   TS-01RC-0422BW(TB-422B),
   Reactor Coolant Overpower Temp Diff Loop 2

   TS-01RC-0432BW(TB-432B),
   Reactor Coolant Overpower Temp Diff Loop 3
   (2 out of 3 coincidence)

POSSIBLE PLANT EFFECTS

1. Reduction in plant load
2. RX Trip

REFERENCES

1. 6-B-401 1356, 0478, 0479, 1851, 1853
2. EOP PATH-1
3. 1364-000868
4. 1364-000878
5. AOP-10
6. AOP-15

37. 054 AK1.02 002/BANK/LOWER/2/1/1/054AK1.02/RO/YES

Given the following conditions:

- FRP-H.1, "Response to a Loss of Secondary Heat Sink," is being implemented.
- RCS bleed and feed has been initiated when Auxiliary Feedwater (AFW) capability is restored.
- All SGs are completely dry and depressurized.

Which 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

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
Common 48

Tier 1 Group 1
K/A Importance Rating - RO 3.6

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.

Reference(s) - FRP-H.1 Pg 47
Proposed References to be provided to applicants during examination - NONE
Learning Objective - 3.11-4
Question Source - Bank
Question History - 2004 NRC Exam RO 6
Question Cognitive Level - LOWER
10 CFR Part 55 Content - 41(b).10
Comments -

054 AK1.02

Attachment 1
Sheet 1 of 1
GUIDANCE ON RESTORATION OF FEED FLOW

NOTE: o A dry SG is one where the corresponding wide range level is less than 15% [30%].

Before RCS Bleed And Feed Using AFW:

Feed at least one intact SG, whose wide range level is greater than 15% [30%], with total feed flow to SGs greater than 210 KPPH.

Before RCS Bleed And Feed Using Main Feedwater:

Feed at least one intact SG, whose wide range level is greater than 15% [30%], without restriction on rate.

Before RCS Bleed And Feed Using Condensate:

IF wide range RCS Tcold is stable at OR trending to the saturation temperature corresponding to the depressurized SG pressure, THEN feed the depressurized SG without restriction on rate.

After RCS bleed And feed Using Any Feed Flow Method:

1. IF core exit TCs are stable OR decreasing, THEN feed one intact SG at 50 KPPH (for AFW) OR the lowest controllable rate (for main FW OR condensate). WHEN wide range level increases to greater than 15% [30%], THEN feed flow may be increased to maximum rate.

2. IF core exit TCs are increasing, THEN feed one intact SG at maximum rate until SG narrow range level is greater than 25% [40%]. Do NOT reduce feed flow if core exit TCs become stable OR decreasing.

3. WHEN RCS hot leg temperatures are decreasing, THEN check the SG being fed (active SG) for symptoms indicating a faulted OR ruptured condition.

4. IF the active SG is faulted OR ruptured, THEN perform the following:

   a. Establish feed flow to another intact SG.

   b. IF an intact SG does NOT exist, THEN a decision should be made to use the best available SG, which may be the currently active SG.

   c. WHEN the heat load has been transferred to a backup SG, THEN isolate the faulted OR ruptured SG to prevent further radiation releases.

5. Unless required by Step 4, feed flow should NOT be established to another dry SG except as directed by the plant operations staff.

38. 055 EA2.06 001/NEW/LOWER/3/1/1/0055EA2.06/RO/

Given the following conditions:

- A Station Blackout has occurred.
- The crew is performing actions of EPP-001, Loss of Power to 1A-SA and 1B-SB Buses.
- The USCO has directed performance of Attachment 1 to restore off-site power to emergency buses.
- The lockout relay is tripped on the Startup Xfrmr. A

Which ONE (1) of the following describes the requirement for restoring power?

A. Off-Site power may be restored without resetting the Startup Xfrmr lockout relay.

B. ✓ The Startup Xfrmr lockout must be reset after receiving permission from the Load Dispatcher.

C. The Startup Xfrmr must be isolated from the grid prior to restoration of power in accordance with Attachment 1.

D. Startup Xfrmr lockout relay reset is PROHIBITED. Attempt to restore EDGs.

When the reason for the lockout is known and the System Dispatcher authorizes reset of the lockout after ensuring the fault is cleared, then it may be reset. Offsite power comes through the startup transformer, so lockouts must be cleared to close breakers. If the transformer was isolated, then off-site power could not be supplied
Common 49

Tier 1 Group 1
K/A Importance Rating - RO 3.7

Ability to determine or interpret the following as they apply to a Station Blackout: Faults and lockouts that must be cleared prior to re- energizing buses.

Reference(s) - EPP-1, Attachment 1
Proposed References to be provided to applicants during examination - None
Learning Objective - LPEOP3-7, Obj 6
Question Source - New
Question History -
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).10
Comments -

055EA2.06

Attachment 1
Sheet 1 of 3
RESTORATION OF OFFSITE POWER TO EMERGENCY BUSES

****

CAUTION

Tripping of a Start Up XFMR lockout relay indicates a major fault on the XFMR. Re-energizing the XFMR may cause additional damage and should NOT be done without dispatcher's permission.

****

1. Obtain Load Dispatcher's permission prior to performing the following:

   a. Restoring offsite power to 6.9 KV buses

   b. Resetting any tripped Start Up XFMR lockout relays

NOTE: Steps 2 through 8 restore power to Bus A-SA and Steps 9 through 15 restore power to Bus B-SB.

---

2. At Start Up XFMR Protective Relay Panel 1A, verify off-site power to Start Up XFMR A:

   a. Verify the Start Up XFMR 1A Lockout SU 1A Relay is reset.

   b. Verify closed any of the following switch yard tie breakers to energize Start Up XFMR A:

      o Breaker 52-2
      o Breaker 52-3

3. Restore offsite power to 6.9 KV Aux Bus D:

   a. Place Start Up XFMR To Aux Buses A & D Synchronizer control switch to BREAKER 101 position.

   b. Close Start Up XFMR A To Aux Bus D Breaker 101.

   c. Place Start Up XFMR To Aux Buses A & D Synchronizer control switch to OFF.

4. Verify Aux Bus D To Emergency Bus A-SA Breaker 104 - CLOSED

5. Verify Diesel Generator A-SA Breaker 106 A SA - OPEN

39. 056 AA2.76 001/NEW/HIGHER/2/1/1/056AA2.76/RO/

Given the following conditions:

- A Loss of Off-Site power has occurred.
- All equipment is operating as designed.
- Prior to the trip, 'A' Reactor Makeup Water Pump was running.

Which ONE (1) of the following describes the operation of "A" Reactor Makeup Water Pump during this event?

"A" RW Makeup Pump...

A. must be reset by placing the control switch in OFF prior to restarting.

B. will remain running because it was sequenced back on after the EDG output breaker closed.

C. will remain running because it did not receive a load shed signal on the loss of off-site power.

D✓ will NOT be running unless bus 1A1 has been reenergized.

1A24 and 1B24 energized from safety busses. They must be manually reenergized after LOOP sequencer actuation. Pumps will operate same as prior to trip and LOOP once their bus is reenergized
Common 50

Tier 1 Group 1
K/A Importance Rating - RO 2.6

Ability to determine and interpret the following as they apply to the Loss of Offsite Power: Reactor makeup water pump (running).

Reference(s) - OP-102, LP-480V3-0
Proposed References to be provided to applicants during examination - None
Learning Objective - LP480V3-0, Obj A3
Question Source - New
Question History -
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).7
Comments -

Instructions	Response Not Obtained

****

CAUTION

Hydrogen will accumulate in battery rooms when batteries are recharging.

****

NOTE: Additional foldout item, "AFW SUPPLY SWITCHOVER CRITERIA", applies.

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32. Verify All Available 480 VAC Emergency Buses - ENERGIZED

a. Check 6.9 KV bus 1A-SA - ENERGIZED

a. WHEN bus energized, THEN do Step 32b.

Continue with Step 32c.

b. Verify 6.9 KV breakers from bus 1A-SA to 480 VAC emergency buses - CLOSED

480 VAC EMERGENCY BUS	BREAKER
1A3-SA	EMERGENCY BUS A-SA TO XFMR A3-SA BREAKER A3 A-SA
1A2-SA	EMERGENCY BUS A-SA TO XFMR A2-SA BREAKER A2 A-SA
1A1	EMERGENCY BUS A-SA TO XFMR A1 BREAKER A1 A-SA

c. Check 6.9 KV bus 1B-SB - ENERGIZED

c. WHEN bus energized, THEN do Step 32d.

Continue with Step 33.

d. Verify 6.9 KV breakers from bus 1B-SB to 480 VAC emergency buses - CLOSED

480 VAC EMERGENCY BUS	BREAKER
1B3-SB	EMERGENCY BUS B-SB TO XFMR B3-SB BREAKER B3 A-SB
1B2-SB	EMERGENCY BUS B-SB TO XFMR B2-SB BREAKER B2 A-SB
1B1	EMERGENCY BUS B-SB TO XFMR B1-SB BREAKER B1 A-SB

Instructions	Response Not Obtained

NOTE: The VCT makeup control should be set at greater than or equal to RCS boron concentration to prevent dilution.

27. Check If VCT Automatic Makeup Control Can Be Restored:

a. Restore VCT makeup system to automatic:

1) Check all of the following - AVAILABLE

- o At least one boric acid pump - AVAILABLE
- o At least one reactor water makeup pump - AVAILABLE
- o Instrument air - AVAILABLE
- o Control AND instrumentation power - AVAILABLE

(PP-1E211 required for FT-113.)

2) Align makeup system for automatic blender operations using OP 107, "CHEMICAL AND VOLUME CONTROL SYSTEM", Section 5.1

a. WHEN automatic makeup is available, THEN observe CAUTION prior to Step 28 AND do Step 28.

Continue with Step 29.

40. 056 G2.1.30 002/MODIFIED/LOWER/3.5/2/2/056G2.1.30/RO/

Given the following conditions:

- Failure of several cards in the Condensate Booster Pump controller cabinet has resulted in loss of all speed control of the 'B' Condensate Booster Pump from the MCB.
- Electrical power has been removed from the VSF coupling controller.
- You have been sent to take local manual control of the 'B' CBP scoop tube actuator.

Which one of the following correctly describes how to take local manual control?

A. Momentarily position the selector lever to AUTOMATIC then release it to NEUTRAL. Then use the RAISE and/or LOWER pushbuttons on the actuator to adjust CBP speed.

B. Position the selector lever to MANUAL and hold it in MANUAL. Then use the RAISE and/or LOWER pushbuttons on the CBP actuator to adjust CBP speed.

C. ✔ Hold the selector lever to MANUAL while turning the hand crank to engage, then release to NEUTRAL. Then use the actuator hand crank to adjust CBP speed.

D. Position the selector lever to MANUAL and hold it in MANUAL. Then use the actuator hand crank to adjust CBP speed while holding the lever in MANUAL.

Must place lever in manual until it is engaged, then operate in same manner as MOV.
There are no PBs asociated with this unit
Common 35

Tier 2 Group 2
K/A Importance Rating - RO 3.9

Conduct of Operations: Ability to locate and operate components, including local controls.

Reference(s) - OP-134, section 8.12
Proposed References to be provided to applicants during examination - None
Learning Objective - LPCFW3-0, Obj 4.c
Question Source - Modified Bank
Question History - CFW-A5 001
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).4, 10
Comments -

ORIGINAL

056 G 2.1.30

QUESTIONS REPORT
for SYSTEMSBNK

1. CFW-A5 001/////////

Failure of several cards in the CBP controller cabinet has resulted in loss of all speed control of the 'B' CBP from the MCB. The controller cabinet and scoop tube actuator still have electrical power supplied to them. An AO has been sent to take local manual control of the 'B' CBP scoop tube actuator. Which one of the following correctly describes how the AO will take local manual control?

A. AO will momentarily position the selector lever to AUTOMATIC then release it to NEUTRAL. AO will then use the RAISE and/or LOWER pushbuttons on the actuator to adjust CBP speed.

B. AO will position the selector lever to MANUAL and hold it in MANUAL. AO will then use the RAISE and/or LOWER pushbuttons on the CBP actuator to adjust CBP speed.

C. AO will momentarily position the selector lever to MANUAL then release it to NEUTRAL. AO will then use the actuator hand crank to adjust CBP speed.

D. ✔ AO will position the selector lever to MANUAL and hold it in MANUAL. AO will then use the actuator hand crank to adjust CBP speed.

08 G 2.1.30

8.12. Local Operation of Condensate Booster Pump Variable Speed Fluid Coupling

8.12.1. Initial Conditions

1. Communications has been established between the Main Control Room, the local operator at the A (B) VSF speed controller, and an operator at the VSF coupling controller power supply breaker. _____

2. Condensate Booster Pump A(B) can not be controlled from the MCB. _____

8.12.2. Procedural Steps

1. **VERIFY** the affected Condensate Booster Pump A (B) Speed Controller in MAN. _____

2. **COORDINATE** between the local operator at the A (B) VSF coupling speed controller, and the Main Control Room operator, then remove power from the A (B) VSF coupling controller:

   - For CBP 1A VSFC Instrumentation, UPP-1B-14, INSTRUMENT CABINET TI-C23 _____
   - (For CBP 1B VSFC Instrumentation, UPP-1B-16, INSTRUMENT CABINET TI-C24) _____

NOTE: Condensate Booster Pump A (B) Automatic/Manual selector is placed in manual by pulling the lever toward the front (or crank end) of the controller. Once the crank is engaged the lever will remain in the Manual position until power is restored to the controller.

3. **POSITION AND HOLD** Condensate Booster Pump A (B) Automatic/Manual selector in the MANUAL position while slowly turning the crank until it engages then release the selector. _____

NOTE: Clockwise rotation of the crank handle will increase Condensate Booster Pump speed while counter clockwise rotation will decrease speed.

NOTE: Over torquing of the crank is indicated to the left of the crank by a shaft which in the normal, non-over torqued, condition will be flush with it's housing. Overtorquing is indicated when the indicator is either protruding past the housing or is recessed into the housing, depending on the direction in which the crank is being moved.

NOTE: Refer to APP-ALB-016 and APP-ALB-019 for FW and CBP pressure trips

4. **ROTATE** Condensate Booster Pump A (B) crank handle in the desired direction to control pump speed. _____

CAUTION

Do not force the lever into the AUTOMATIC POSITION. Lever returns to this position automatically when the VSF coupling speed controller motor is energized

CAUTION

While transferred to LOCAL-MANUAL control, any attempt to adjust the affected Condensate Booster Pump demand signal from the MCB will affect the opposite Condensate Booster Pump's demand signal if its controller is in Automatic.

5. **WHEN** local control is no longer required,
THEN COORDINATE between the local operator at the A (B) VSF coupling speed controller, and the Main Control Room operator and then perform the following:

   a. **IF** both Condensate Booster Pumps are in service,
   THEN VERIFY the demand signal on the affected Condensate Booster Pump A (B) Speed controller is set to match the demand signal on the Condensate Booster Pump Speed Controller not affected. _____

   b. **IF** both Condensate Booster Pumps are in service,
   THEN LOCALLY ADJUST flow to match the non-affected pump flow. _____

41. 057 AA2.19 001/NEW/HIGHER/3/1/1/057AA2.19/RO/

The following conditions exist:

- A plant startup is in progress.
- Reactor power is currently 7%.
- A loss of Instrument Bus SII occurs.

Which ONE (1) of the following describes the effect on the plant?

A. Reactor trips due to loss of one Source Range instrument.

B. Source Range instruments energize prematurely.

C. Reactor trips due to loss of one Intermediate Range instrument.

D. Intermediate Range high flux reactor trip will NOT actuate if required.

Source Range is already deenergized for this event. 1 out of 2 logic required for IR trip. Trip bistables deenergize, causing a reactor trip on IR high flux. SR would not energize prematurely, because the remaining IR is indicating properly. IR high flux does trip.
Common 51

Tier 1 Group 1
K/A Importance Rating - RO 4.0

Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus: The plant automatic actions that will take place on loss of AC Instrument bus

Reference(s) - AOP-024
Proposed References to be provided to applicants during examination - None
Learning Objective - LPAOP3-24 Obj 3
Question Source - New
Question History -
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).7
Comments -

057 AA2.19

Attachment 2
Sheet 1 of 4

SII Instrument Bus Power Supplies and Loads

Normal Supply:	1B21-SB through 7.5 KVA Inverter Channel II
Backup Supply:	DP-1B-SB through 7.5 KVA Inverter Channel II
AC Bypass Supply:	1B211-SB
Power Dist Dwg:	2166-B-041 Sh 663

Loads:	Comment:
Source Range Nuclear Inst NI-32	During refueling, causes high flux at shutdown alarm in MCR and CNMT to lock in.
Intermediate Range Nuclear Inst NI-36	
Power Range Nuclear Inst NI-42	
SSPS and ESFAS CH2 A&B	
B-SG MDAFW PCV Hydromotor	
TDAFW Pump FCV Hydromotors	Alt. power from App. R Inverter PP-1B312-SB
ERFIS I/O Cabinet 51B-SB	
RVLIS B Train	
Neutron Flux Monitoring System Train B Cabinet	
Transfer Panel 1B (Section SB)	

PIC Cabinet 2 (Protection II) (Ref 1364-46575 S01):		
PT-474	Steam Line Press Loop A	
PT-484	Steam Line Press Loop B	
PT-494	Steam Line Press Loop C	
LT-487	SG B Level (WR)	
LT-475	SG A Level (NR)	
LT-485	SG B Level (NR)	
LT-495	SG C Level (NR)	
FT-415	RCS Flow Loop A	
FT-425	RCS Flow Loop B	
FT-435	RCS Flow Loop C	
TE-410	RCS Cold Leg Temp Loop A	
TE-420	RCS Cold Leg Temp Loop B	
TE-430	RCS Cold Leg Temp Loop C	

42. 059 AK3.01 001/NEW/HIGHER/4/1/2/059AK3.01/RO/

Given the following conditions:

- REM-01SW-3500A, SW from WPB to Circ Water radiation monitor is in alarm.
- Chemistry sample verifies high activity in the piping monitored by REM-01SW-3500A

Which ONE (1) of the following describes the action required, and the reason for that action, in accordance with AOP-005, Radiation Monitoring System?

A. Isolate Service Water to and from the WPB to determine the location of the leak. Place both trains of ESW in service to ensure cooling of essential plant equipment.

B. Direct the Radwaste Operator to initiate isolation of individual components to locate the leak, and isolate Service Water to and from the WPB.

C. Isolate Service Water to and from the WPB to determine the location of the leak. Place the running train of ESW in standby and shut down the standby train of ESW.

D. Initiate a plant shutdown in accordance with GP-006. When the reactor is tripped, isolate Service Water to and from the WPB to minimize any radiological releases.

AOP-005 directs a choice of actions, depending on the rad monitor in alarm. For this monitor, WPB components will be checked for leaks and NSW stopped. Would not place ESW in service or change state because ESW does not supply WPB components. Those actions are for a different rad monitor. Shutdown not required for a leak in this location of the unit
Common 61

Tier 1 Group 2
K/A Importance Rating - RO 3.5

Knowledge of the reasons for the following responses as they apply to the Accidental Liquid Radwaste Release: Termination of a release of radioactive liquid.

Reference(s) - AOP-005, AOP-008
Proposed References to be provided to applicants during examination - None
Learning Objective - LPAOP3-5 Obj 5
Question Source - New
Question History -
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).10
Comments -

059AK3.01

Attachment 7
Sheet 1 of 2

RAB CCW System / Service Water System Monitors

☐ 1. **MONITOR** the following CCW Radiation Monitors:

- REM-01CC-3501ASA, CCW Train A
- REM-01CC-3501BSB, CCW Train B

2. **IF** EITHER CCW Radiation Monitor indicates elevated radiation levels **OR** is in HIGH ALARM,
THEN GO TO the following:

☐ • AOP-014, Loss of Component Cooling Water

☐ • AOP-016, Excessive Primary Plant Leakage

☑ 3. **MONITOR** the following Service Water Radiation Monitors:

- REM-01SW-3500A, SW from WPB to Circ Water Monitor
- REM-01SW-3500B, RAB from Cont Turb Bldg to CW Monitor

Attachment 7
Sheet 2 of 2

RAB CCW System / Service Water System Monitors

4. **IF** a Service Water System release path is indicated,
THEN PERFORM the following:

☑ **a.** **NOTIFY** Chemistry to sample the Service Water discharge from plant components for activity.

b. **IF** necessary to isolate the leak, as indicated by Chemistry sample,
THEN PERFORM the following:

☑ **(1)** **DIRECT** Radwaste to isolate WPB equipment.

(2) **ISOLATE** Service Water to and from the WPB:

☑ • **SHUT** 1SW-301, Waste Processing Bldg NSW Supply Vlv.

☑ • **SHUT** 1SW-655, Waste Processing Bldg NSW Return Vlv.

☐ **(3)** **PLACE** the running train of ESW in standby using OP-139, Service Water System (Section 7.3, Placing ESW Header A/B in Standby).

☐ **(4)** **ISOLATE** the standby train of ESW using OP-139, Service Water System (Section 7.4, Isolating/Depressurizing ESW Header A/B).

☐ **(5)** **INFORM** Radwaste of required follow-up actions.

☐ **(6)** **REFER TO** applicable Tech Specs for the isolated system(s).

☐ **5.** **EXIT** this attachment.

NOT REQUIRED

GENERIC ACTIONS

-- END OF ATTACHMENT 7 --

43. 059 K4.17 001/NEW/HIGHER/3/2/1/059K4.17/RO/

Given the following conditions:

- A reactor trip occurred from 35% power.
- The crew is performing EPP-004, Reactor Trip Response.
- All equipment has responded as designed.
- RCS Tavg is 558 degrees F.
- The BOP determines that an increase in Main Feedwater flow is desired to maintain SG levels at 50% NR.

Which ONE of the following describes the method used to increase Main Feedwater flow?

A. Raising the automatic setpoint of the Main Feedwater Regulating Valve controllers

B. Manually adjusting the Main Feedwater Regulating Valve position

C. Raising the automatic setpoint of the Feed Reg Bypass valve controllers

D✓ Manually adjusting the Feed Reg Bypass valve position

Above the setpoint for P-4 and Low Tave, the FRV Bypass valves will be operated to control feed flow, unless AFW is in operation. Main Feed Reg Valves will be closed.
Common 16

Tier 2 Group 1
K/A Importance Rating - RO 2.5

Knowledge of MFW design feature(s) and/or interlock(s) which provide for the following: Increased feedwater flow following a reactor trip.

Reference(s) - EPP-004
Proposed References to be provided to applicants during examination - None
Learning Objective -
Question Source - New
Question History -
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).4, 7, 10
Comments -

059K4.17

Instructions	Response Not Obtained
5. Check Feed System Status:	
a. RCS Temperature - LESS THAN 564°F	a. WHEN RCS temperature less than 564°F, THEN do Steps 5b AND c. Continue with Step 6.
b. Verify feed reg valves - SHUT	
c. Check feed flow to SGs - GREATER THAN 210 KPPH	c. Perform the following: 1) Establish feed flow to SGs using any of the following: o AFW (Refer to OP-137, "AUXILIARY FEEDWATER SYSTEM" operation.) o Main feed flow using the feed reg bypass valves in MANUAL. 2) Maintain total feed flow greater than 210 KPPH until level greater than 25% in at least one SG.

44. 061 K2.02 001/BANK/HIGHER/4/2/1/061K2.03/RO/

Given the following conditions:

- The plant has experienced a loss of offsite power.
- Both EDGs are running.
- All three AFW pumps are running with all six FCVs throttled to 20%.

Which ONE (1) of the following describes how a loss of the B EDG would affect the AFW system?

A. ✔ Loss of the B MDAFW pump only.

B. Loss of the B MDAFW pump and the TDAFW pump only.

C. Loss of the B MDAFW pump and power to Main Steam C to Aux FW turbine, 1MS-72 SB.

D. Loss of the B MDAFW pump and a full open signal to all six FCVs.

B EDG supplies B MDAFW when it is carrying bus 1B-SB. TDAFW and steam supply would be lost on loss of DC power. All 6 FCVs would fail on loss of vital instrument bus.
Common 17

Tier 2 Group 1
K/A Importance Rating - RO 3.7

Knowledge of bus power supplies to the following: AFW electric driven pumps

Reference(s) - SD-137
Proposed References to be provided to applicants during examination - None
Learning Objective -
Question Source - Bank
Question History - AFS-R2 003
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).7
Comments -

061 K2.02

3.1 Condensate Storage Tank (continued)

The location of all connections to the CST are arranged to ensure that the minimum CST inventory required for AFW pump operation is preserved, all NNS piping connections are located above the minimum water level required for AFW supply.

3.2 Motor Driven Pumps

The motor driven pumps (MDP) are located on elevation 236 of RAB near row-column 26-C. The pumps are designed to operate in the prevailing environment during normal and accident conditions.

The MDPs are Ingersoll-Rand Model #3HMTA-9, nine-stage, horizontal, centrifugal pumps. Mechanical seals are utilized on each end of the pump within the stuffing box. The pump shaft is supported on oil lubricated ball bearings (oil rings and reservoir). The driver end of the pump has a single row ball bearing for radial loads, while the other end has a dual row ball bearing designed to take radial loads and transient thrust loads. Steady-state thrust loads are compensated for by a balance drum within the pump. Diffuser rings on the discharge of each stage direct the flow smoothly to the suction of the next stage and also help reduce radial loads on the pump shaft. The pumps are rated for 2940 feet of head (about 1265 psid) at 450 gpm.

The Westinghouse horizontal induction motors are rated for 500 hp at 3550 rpm with a 1.15 service factor. If the pumps are run out to the full service factor of the motor (575 hp), they can deliver about 2600 feet of head (about 1125 psid) at 600 gpm. The motors can be operated continuously at the full service factor; however, this is not a recommended practice. Run out operation may be limited by lack of net positive suction head available at the pump rather than by horsepower available from the electric motor.

MDP 1A-SA is powered from 6.9-kV Emergency Bus 1A-SA, Cubicle 4 and MDP 1B-SB is powered from 6.9-Kv Emergency Bus 1B-SB, Cubicle 3. Both pumps are controlled from Panel 1B1 on the Main Control Board or from the Auxiliary Control Panel (if transferred). The switches are the stop-normal-start, spring return to normal style.

3.3 Turbine Driven Pump

The Turbine Driven Pump (TDP) is located on elevation 236 of RAB near row-column 28-C. The pump is designed to operate in the prevailing environment during normal and accident conditions.

The TDP is an Ingersoll-Rand Model #4X9NH-7, seven stage, horizontal, centrifugal pump. The seal and bearing arrangement in this pump is similar to the MDPs (see previous section).

The pump is rated for 2940 feet of head (about 1265 psid) at 900 gpm. At this point, the TDP requires approximately 870 hp from the driving turbine.

4.2.2 Turbine Driven Pump

The TDP will start automatically on the following signals:

1. Low-low level in any two Steam Generators

2. Loss of power on either emergency bus

3. AMSAC

The loss of power on the emergency bus consists of less than 70% of rated voltage. This signal comes from each safety bus to ARP-19 (ASA or BSB) to the transfer panel (1ASA or 1BSB). An undervoltage signal from 6.9-Kv Bus 1A-SA will open 1MS-70 (SG B), while undervoltage on 6.9-Kv Emergency Bus 1B-SB will open 1MS-72 (SG C). The low-low level signal comes from SSPS tc ARP-19 to the transfer panel. It should be noted that if control is shifted from the Main Control Board to the Auxiliary Control Panel, then the automatic start feature is bypassed.

The normal, ready-to-start line up for the AFS turbine will be motor-operated steam supply valves shut with trip and throttle (T&T) valve latched and fully open. Upon a manual or automatic start signal the steam supply valves get an open signal. The governor valve on the turbine is spring loaded open, so the turbine will quickly pick up speed. When oil pressure from the gear driven lube oil pump builds up, the governor will be able to throttle down the governor valve and control turbine speed. See Section 4.2.2.1 for more details on speed control.

The T&T valve and the main steam supply valves are DC powered. The TDP flow control valves are AC powered from an uninterruptable power supply. As such, they are backed up by the DC emergency bus in the event of a loss of AC power.

The AFW turbine is a variable speed machine, thus it has a variable speed control or governor system. It consists basically of an EG-M electronic control box, an EG-R electro-hydraulic actuator, a hydraulic servo, governor valve, speed sensor, and ramp generator. All of these components are located in the local control panel or on the turbine (Figure 7.8).

45. 062 A1.03 001/NEW/LOWER/4/2/1/062A1.03/RO/
Given the following conditions:

- The plant is at 100% power.
- Recovery from a Loss of Instrument Bus 1DP-1A-S1 is in progress.
- The crew has de-energized the associated Process Instrumentation Cabinet in preparation for energizing Instrument Bus 1DP-1A-S1.
- The crew is evaluating bistable status prior to energizing the bus.

Which ONE (1) of the following describes the reason for checking bistable status?

A. When the Instrument Bus is energized, a reactor trip may occur due to the associated Process Instrumentation Cabinet being de-energized, if another bistable of the same parameter is tripped.

B. ✔ When the Process Instrumentation Cabinet is energized after the Instrument Bus, 'energize to actuate' bistables may experience a momentary inadvertent trip. Checking other bistables ensures an ESF actuation will not occur.

C. Bistables are checked to ensure that each parameter for Process or Protection goes to its required state when the Instrument Bus and Process Instrumentation Cabinet is energized.

D. Bistables are checked to ensure that all lights are out, verifying that the Process Instrumentation Cabinet normal and alternate supply breakers are open prior to reenergizing the Instrument Bus.

Directly from procedure, check bistables to ensure inadvertent actuation does not occur. A is incorrect because the concern is deenergize to actuate bistables. This would have caused a trip already. Bistables are checked for required state, but not prior to energizing a PIC. Also, breakers are checked for deenergizing PIC, not bistables

QUESTIONS REPORT
for Harris RO Exam

Common 18

Tier 2 Group 1
K/A Importance Rating - RO 2.5

Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the ac distribution system controls including: Effect on instrumentation and controls of switching power supplies.

Reference(s) - OP-156.02
Proposed References to be provided to applicants during examination - None
Learning Objective - LPAOP3-24 Obj 4c
Question Source - New
Question History -
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).10
Comments -

062 A1.03

5.7.2 Procedural Steps (continued)

7. At the respective 7.5 KVA Inverter (RAB 305), **PERFORM** the following:

   a. **PLACE** the Battery Input Bkr, 2CB, in the ON position. _____

   b. **DEPRESS** the Precharge push button, 1PB, for a minimum of 5 seconds. **CONTINUE** holding **AND PROCEED** to Step 5.7.2.7.c. _____

   c. After 5 seconds have elapsed, **AND** with the Precharge push button depressed, **PLACE** the Inv DC Input breaker, 3CB, in the ON position. _____

   d. **RELEASE** the Precharge push button. _____

NOTE: Proper inverter operation is indicated by voltage appearing on Inverter AC Voltmeter.

   e. **ALLOW** 5 to 10 seconds for automatic sequence starting of the inverter. _____

   f. **WHEN** Inverter AC Voltmeter, 2VM, indicates between 108 and 132 VAC,
   THEN PLACE the Inv AC Output Bkr, 4CB, in the ON position. _____

NOTE: The purpose of the following Step is to determine if any other channel has a bistable tripped. For energize to actuate bistables, there is a possibility that energizing the respective PIC may cause an inadvertent momentary trip. If another channel for that bistable were already tripped, an associated actuation would occur.

8. **EVALUATE** bistable status prior to energizing an instrument bus. _____

46. 062 A2.03 001/NEW/LOWER/2.5/2/1/062A2.03/RO/

Given the following conditions:

- A loss of Instrument Bus Inverter SI has occurred.
- The crew is performing action contained in AOP-024, Loss of Uninterruptible Power Supply.
- Transfer of Bus SI to the alternate supply is required in accordance with OP-156.02, AC Electrical Distribution.

Which ONE (1) of the following describes how improper sequencing of the Instrument Bus is prevented for this transfer?

A. The inverter will not allow transfer to the alternate supply if it is out of synch with the normal supply

B✔ The bus must be deenergized and a kirk key used for the alternate supply breaker prior to reenergization of the bus

C. The bus transfer switch is a 'break before make' contactor that will not allow two power sources to simultaneously supply the bus

D. The normal and alternate supply breakers are electrically interlocked so that only one may be closed at a time

In accordance with OP-156.02, B is correct. A is incorrect because it describes an automatic transfer. These instrument busses do not have a maintenance, or transfer switch. Two interlocked breakers supply the bus. The interlock is mechanical, not electrical
Common 19

Tier 2 Group 1
K/A Importance Rating - RO 2.9

Ability to (a) predict the impacts of the following malfunctions or operations on the ac distribution system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Consequences of improper sequencing when transferring to or from an inverter.

Reference(s) - OP-156.02, Pg 125-130
Proposed References to be provided to applicants during examination - None
Learning Objective - LPAOP3-24 Obj 5
Question Source - New
Question History -
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).7, 10
Comments -

062 A2.03

8.7.2 Procedural Steps (continued)

NOTE: The Secondary Power Supply should **NOT** be de-energized for PIC 17 and PIC 18 in the following Step. These PICs have Secondary Power Supplies from the Appendix R Inverters and should continue to function.

9. At the appropriate PIC, **VERIFY** the Primary Power Supply (Upper Power Supply) Off:

Instrument	Process Instrument Cabinet	
IDP-1A-SI	PIC Cab 17	_____
IDP-1B-SII	PIC Cab 18	_____

10. At designated Instrument Distribution Panel, **INSERT AND ROTATE** Kirk Key in Alternate Power Supply Breaker (Power Panel Supply). _____

NOTE: De-energizing an instrument bus will result in a loss of power to an ERFIS multiplexer cabinet. The computer group should be contacted to restore multiplexer cabinets when power is restored.

11. **PLACE** the appropriate Alternate Power Supply Breaker in the ON position.

- IDP-SI, Alternate Supply From PP-1A211-SA _____
- IDP-SII, Alternate Supply From PP-1B211-SB _____
- IDP-SIII, Alternate Supply From PP-1A311-SA _____
- IDP-SIV, Alternate Supply From PP-1B311-SB _____

47. 063 K2.01 002/BANK/LOWER/2/2/1/063K2.01/RO/

Following a loss of Emergency DC bus 1B-SB, which of the following components would have power available?

A. 1MS-72 SB, Main Steam C to Aux FW Turbine

B. Emergency Load Sequencer 1B-SB

C. TDAFW Pump control panel

D.✔ RM-1CR-3561B-SB, CNMT Ventilation Isolation Radiation Monitor

A, B,and C all have power from DC Bus 1B-SB. RM 3561B-SB gets power from DC Bus 3B-SB
Common 20

Tier 2 Group 1
K/A Importance Rating - RO 2.9

Knowledge of bus power supplies to the following: Major dc loads.

Reference(s) -
Proposed References to be provided to applicants during examination - NONE
Learning Objective -
Question Source - Bank
Question History - 2002 Audit Exam RO HNP 081
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).7
Comments -

063 K2.01

Attachment 2

Page 1 of 3

Emergency DC Bus Loads

125V DC Power Panel DP-1A-SA

Circuit Number	Component Description
1	Metering Compartment
2	6.9KV SWGR A-SA Cub 10 (Relays & Instrumentation)
3	Spare
4	DC Power For SWGR 1A2-SA (480V SWGR 1A2-SA Instrumentation)
5	DC Power For SWGR 1A3-SA (480V SWGR 1A3-SA Instrumentation)
6	Feed to DP-1A2-SA (125 VDC) (TDAFW Isolation Valves; MS-70 Main Steam to TDAFW pump fails as is)
7	DC Dist. Fuse to ARP-19ASA
8	Feed to ESS 1A (Train A)
9	Feed to ARP-1&4-SA
10	RCP 1A-SN Trip Coil A
11	RCP 1B-SN Trip Coil A
12	RCP 1C-SN Trip Coil A
13	MTC-2A-SA (Pnl 1)
14	Solid State Prot Rack A Output
15	Isolation Cab 1A (1A1)
16	MTC-11A-SA
17	Isolation Cabinet 1A (1A2)
18	Reactor Trip SWGR Cab 1A
19	Isolation Cab 3 (3A2)
20	DC to Transfer Panel 1A Sect 1A (Train A)
21	Isolation Cab 2A (2A1)
22	MTC-3A-SA
23	Isolation Cab 3 (3A1)
24	DC Dist. Fuse to ARP-1A-SA
25	DC Dist. Fuse to ARP-1A-SA
26	DC Dist. Fuse to ARP-3A-SA
27	MTC-1 A-SA
28	DC Bkr to Inverter Channel I
29	DC Bkr to Inverter Channel III
30	Fdr Bkr to Battery Charger 1A-SA
31	Fdr Bkr to Battery Charger 1B-SA
32	Spare
33	Aux Transfer Panel "SA" (App R)
34	Feed to DP-1A1-SA (125V DC Panel) (EDG A-SA Controls)
35	480V SWGR 1A1 (in series with Ckt No 36 Fuse)
36	480V SWGR 1A1 Instrumentation (Series Fuses)
37	DC to Transfer Panel 1A Sect SA (Train A)
38	Disconnect (No Fuses)

Attachment 2

Page 2 of 3

Emergency DC Bus Loads

125V DC Power Panel DP-1B-SB

Circuit Number	Component Description
1	Metering Compartment
2	6.9KV SWGR B-SB Relays & Instrumentation
3	Spare
4	FHB ARP 1&4B-SB
5	DC Power for SWGR 1B2-SB (480V SWGR Instrumentation)
6	DC Power for SWGR 1B3-SB (480V SWGR Instrumentation)
7	DC to Transfer Panel 1B Sect SB
8	Feed to ESS 1B (Train B)
9	Spare
10	RCP 1A-SN Trip Coil B
11	RCP 1B-SN Trip Coil B
12	RCP 1C-SN Trip Coil B
13	Feed to MTC-2B-SB Panel 2
14	Feed to Solid State Prot. Rack B Output #2
15	DC Dist Fuse to ARP-19BSB
16	MTC-3B-SB
17	Isolation Cab. 1B (1B2)
18	Feed to Reactor Trip SWGR Cab 1B
19	Feed to MTC-11B-SB
20	DC to Transfer Panel 1B Sect SB (TDAFW Pump Control)
21	Feed to Isolation Cab 2B (2B1)
22	Isolation Cab 1B (1B1)
23	Spare
24	Feed to Isolation Cab. 3
25	DC Dist. Fuse to ARP-1 B-SB
26	DC Dist. Fuse to ARP-1 B-SB
27	DC Dist. Fuse to ARP-3 B-SB
28	DC Bkr to Inverter Channel II
29	DC Bkr to Inverter Channel IV
30	Battery Charger A-SB
31	Battery Charger B-SB
32	125V DC MCC-DP-1B2-SB
33	Feed to Aux Transfer Panel SB (App R)
34	Spare
35	Spare
36	Feed to 480V SWGR 1B1 (Series W/Ckt. 37 Fuse)

(Continued on Next Page)

Attachment 2

Page 3 of 3

Emergency DC Bus Loads

125V DC Power Panel DP-1B-SB

Circuit Number	Component Description
37	DC power to Bus 1B1 (480V SWGR 1B1 Instrumentation) (Series Fuses)
38	Feed to DP-1B1-SB (125V DC) (MS-72 Main Steam to TDAFW Pump fails as is)
39	Feed to Isolation Cab. 2B (2B2)
40	MTC-1B-SB

48. 064 A2.16 001/BANK/HIGHER/3/2/1/064A2.16/RO/
Given the following conditions:

- The unit is operating at 25% power.
- Emergency Diesel Generator (EDG) A-SA is loaded to 3800 KW while operating in parallel with the grid during the performance of OST-1013, "A-SA Emergency Diesel Generator Operation."

If a loss of offsite power occurs, EDG A-SA output breaker would ...

A. remain closed with EDG A-SA load less than 3800 KW. Trip the EDG to initiate load sequencing.

B. remain closed with EDG A-SA load greater than 3800 KW. Trip the EDG to initiate load sequencing.

C. open and then reclose to allow the sequencer to load. Verify automatic load sequencing occurs .

D. open and remain open. Reset and restart the EDG to initiate automatic load sequencing.

DG Sequencer will initiate a trip of the DG output breaker when off-site power is lost. Once the breaker is open, the sequencer starts its process for reclosing the breaker and placing appropriate loads on the bus
Common 21

Tier 2 Group 1
K/A Importance Rating - RO 3.3

Ability to (a) predict the impacts of the following malfunctions or operations on the ED/G system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of Offsite power during full load testing of EDG

Reference(s) - OP-155
Proposed References to be provided to applicants during examination - NONE
Learning Objective -
Question Source - Bank
Question History - 2004 Audit RO 04 051
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).7
Comments -

064A2.16

4.0 PRECAUTIONS AND LIMITATIONS (continued)

21. Verify UPP-1A is aligned to its normal power source (the inverter) before EDG parallel operation with offsite power. If UPP-1A cannot be aligned to its normal power source, EDG parallel operation with offsite power may proceed if the EDG is declared inoperable.

22. Verify that annunciator window ALB-15-4-1, "ISOL CABINET TRAIN A/B DOOR OPEN OR POWER FAILURE" is unlit before EDG parallel operation with offsite power. If lit, EDG parallel operation with offsite power may proceed if the EDG is declared inoperable during the parallel operation.

R 23. An EDG should only be operated in parallel with offsite power for short periods of time for the sole purpose of EDG testing. (Reference 2.8.1)

24. If a loss of offsite power (LOOP) occurs while an EDG is paralleled to the grid, breakers 105 (125) and 106 (126) should automatically trip open, which will leave the diesel running unloaded. Breaker 106 (126) should then automatically reclose and the sequencer start to load. If breaker 106 (126) fails to open, operator action is required to manually open the breaker.

    The LOOP signal to open breakers 105 (125) and 106 (126) is generated by:

    Both breakers 101 (121) and 102 (122) open

    OR

    Breaker 101 (121) open and either main generator lockout tripped

    Indication that this circuit has actuated properly include proper sequencer operation, or indication that the EDG is running in the emergency mode.

    If these conditions occur while the EDG is paralleled to the grid, and breaker 106 (126) fails to open, (that is, no indication of proper actuation as described above exists), the breaker must be manually tripped from the MCB or, if control is transferred to the local Generator Control Panel (GCP), from the GCP. Since occurrence of a LOOP may not be obvious at the GCP, action to trip breaker 106 (126) from the GCP must be directed from the Main Control Room.

25. The automatic closure of breaker 106 (126) on a LOOP is a one shot signal. Further automatic closure is blocked by the UVX relay of the sequencer. If breaker 106 (126) is inadvertently opened after sequencer actuation, manual operation will be required to open breakers that have been sequenced on and reclosing breaker 106 (126).

R 26. If an EDG is operating in parallel with off-site power and the off-site power reliability or performance becomes questionable, disconnect the EDG from the off-site power source. (Reference 2.8.1)

49. 064 A3.05 001/NEW/HIGHER/4/2/1/064A3.05/RO/

Given the following conditions:

- EDG 1A-SA is operating in parallel with its associated bus with voltage and frequency control in AUTO.
- Current parameters are as follows:

  -Voltage and current are normal.
  -The EDG is loaded to 3.2 MW
  -Reactive load is 0.8 MVAR

If a 150 HP motor is started on the bus, which ONE (1) of the following describes the EDG parameters from steady state to steady state operation?

A. Voltage and frequency are reduced

B. Voltage is reduced, frequency remains the same

C. MW output and MVAR output are raised

D. MW output is raised, MVAR output remains the same.

C is correct. In parallel, voltage and frequency will stay constant from steady state to steady state. Voltage will remain constant due to automatic excitation, and frequency will remain the same because the EDG is locked into the grid at 60 Hz. When load is added, MW output must increase for a constant frequency, and the increase in excitation shows itself in a higher VARS OUT
Common 22

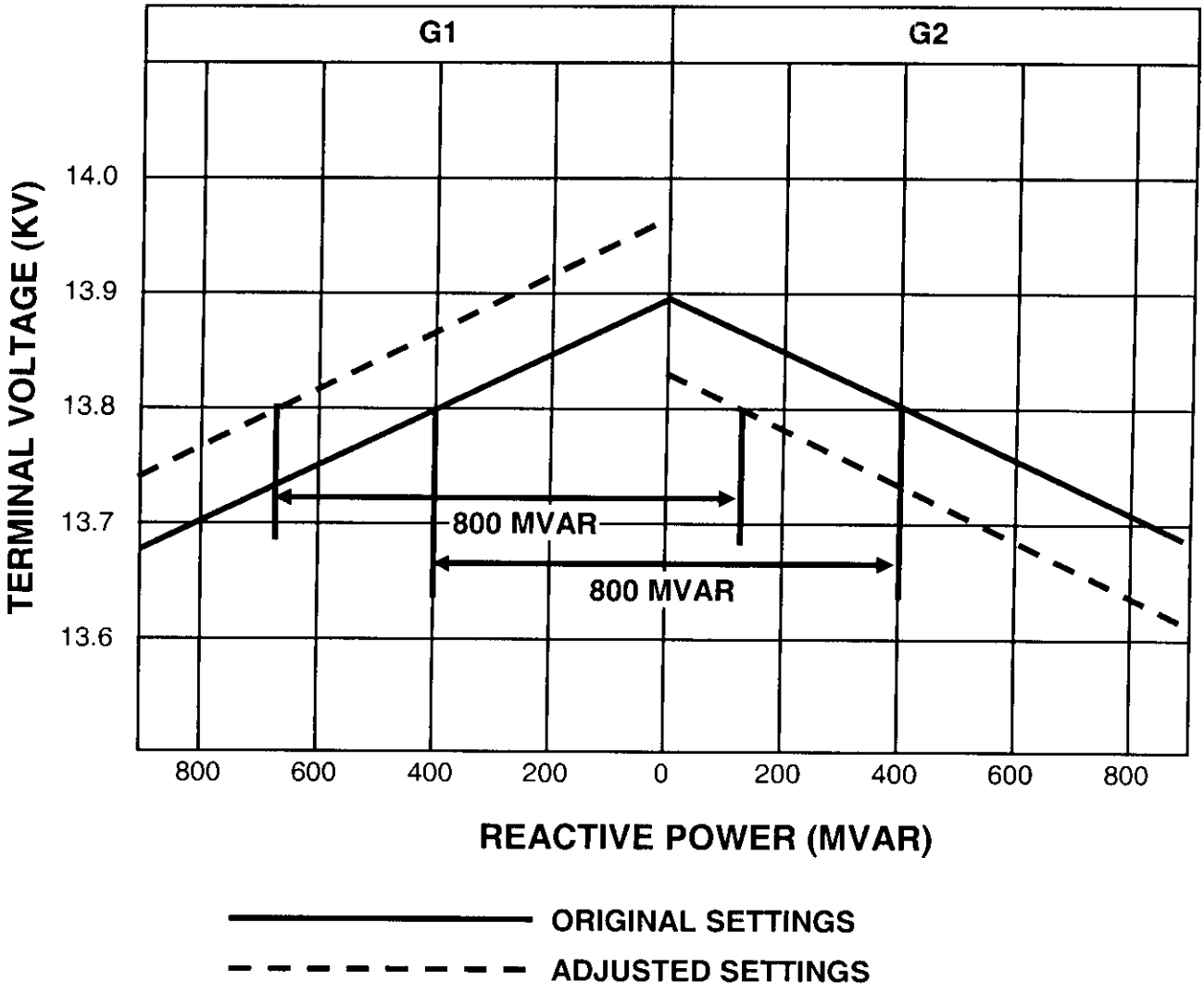
Tier 2 Group 1
K/A Importance Rating - RO 2.8

Ability to monitor automatic operation of the ED/G system, including: Operation of the governor control of frequency and voltage control in parallel operation.

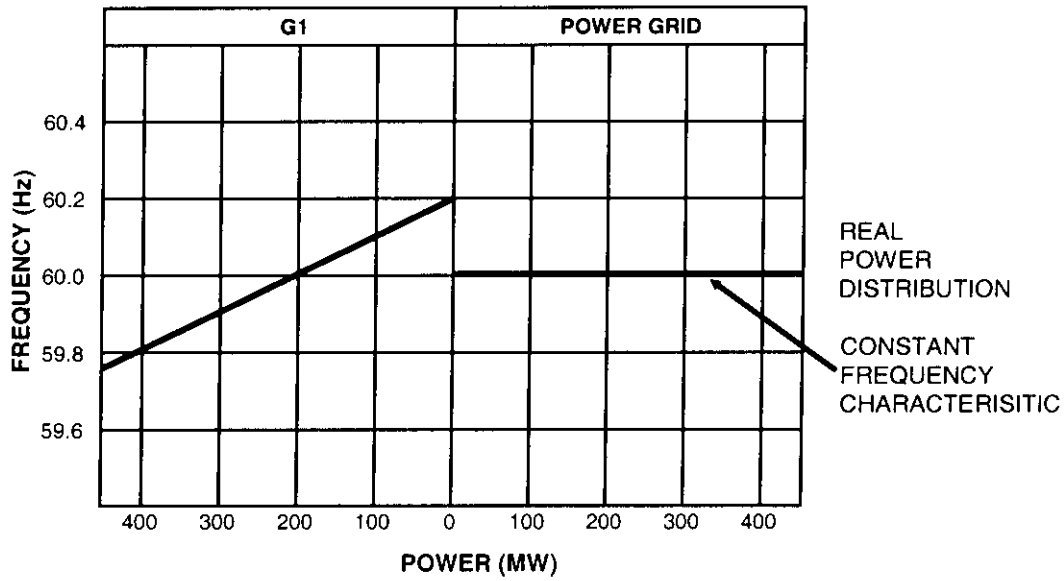
Reference(s) - Electrical Theory
Proposed References to be provided to applicants during examination - NONE
Learning Objective -
Question Source - New
Question History -
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).5
Comments -

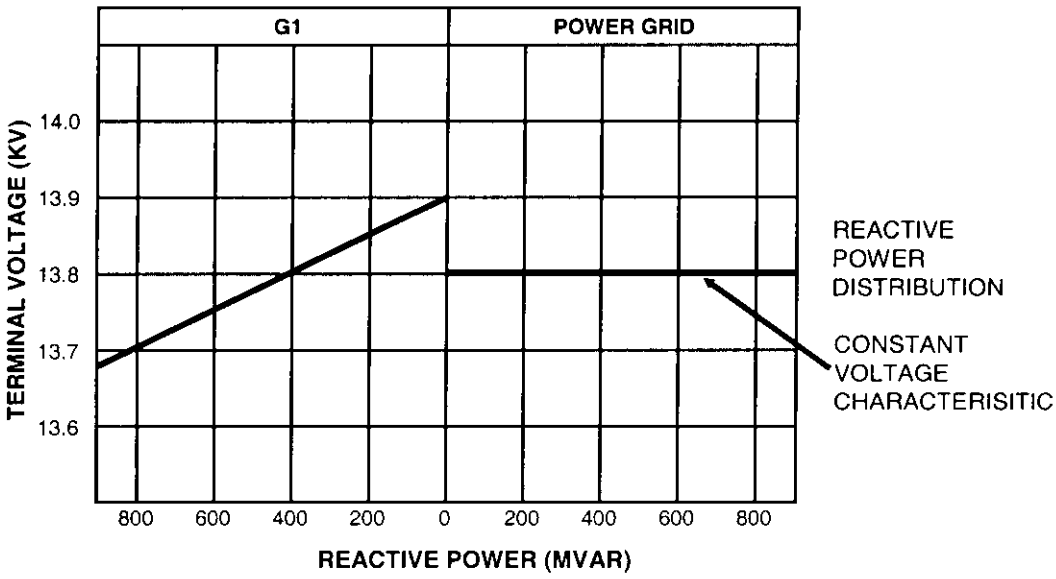
064 A3.05

REACTIVE SHARING



PARALLEL OPERATION OF A SINGLE GENERATOR WITH A LARGE POWER GRID





50. 065 AA2.06 001/NEW/LOWER/2/1/1/065 AA2.06/RO/

Given the following conditions:

- The plant is at 80% power.
- A Loss of Instrument Air has occurred.
- Instrument Air pressure is 80 psig and lowering.
- The crew has entered AOP-017, Loss of Instrument Air.

Which ONE (1) of the following describes the plant conditions that will require an immediate reactor trip?

A. Loss of Instrument Air pressure to Containment

B✓ Any SG level below 30% with loss of feedwater control

C. Loss of VCT makeup capability with VCT level below 20%

D. Loss of any 2 Instrument Air Compressors

B is correct. Any SG below 30% requires a reactor trip. Containment air may be isolated if a leak is in that area. VCT makeup may be lost, and a subsequent shutdown may be required, but not a reactor trip. Loss of 2 IACs does not require a trip unless air pressure cannot be held above 35 psig or to allow for Feedwater control
Common 52

Tier 1 Group 1
K/A Importance Rating - RO 3.6

Ability to determine and interpret the following as they apply to the Loss of Instrument Air: When to trip reactor if instrument air pressure is de-creasing.

Reference(s) - AOP-017
Proposed References to be provided to applicants during examination - NONE
Learning Objective - LPAOP3-17, Obj 4
Question Source - NEW
Question History -
Question Cognitive Level - LOWER
10 CFR Part 55 Content - 41(b).4
Comments -

065 AA2.06

INSTRUCTIONS	RESPONSE NOT OBTAINED

3.0 OPERATOR ACTIONS

NOTE

- This procedure contains no immediate actions.
- FW regulating valves receive a shut signal when pressure falls to 60 psig on the Control Air header

INSTRUCTIONS	RESPONSE NOT OBTAINED
✸☐1. **MAINTAIN** BOTH of the following: • ALL Steam Generator levels greater than 30% • Main Feedwater flow to ALL Steam Generators	1. **PERFORM** the following: ☐ a. **IF** Reactor is ABOVE POAH, **THEN TRIP** the Reactor **AND PERFORM** EOP Path-1 while continuing with this AOP. b. **IF** BELOW POAH, **THEN**: ☐ (1) **VERIFY** AFW capable of feeding Steam Generators. ☐ (2) **MAINTAIN** Steam Generator levels as required by current plant conditions.
✸☐2. **CHECK** Instrument Air pressure MAINTAINED ABOVE 35 PSIG.	2. **PERFORM** the following: ☐ a. **IF** Reactor is CRITICAL, **THEN TRIP** the Reactor **AND PERFORM** EOP Path-1 while continuing with this AOP.
	NOTE Depressurizing Instrument Air precludes spurious valve actuations.
	☐ b. **STOP** ALL air compressors. ☐ c. **VENT** Instrument Air System until depressurized.

(Continued on Next Page)

51. 069 AK3.01 001/BANK/HIGHER/4/1/2/069AK3.01/RO/

Given the following conditions:

- A LOCA has occurred.
- Due to several component failures, the crew was required to perform EPP-012, Loss of Emergency Coolant Recirculation.
- The Crew is now entering FRP-J.1, Response to High Containment Pressure.
- Containment pressure is 45 psig and STABLE.
- BOTH Containment Spray Pumps are OFF.
- RWST Level is 2%.

Which ONE (1) of the following describes the actions required and the reason for the current strategy for reducing Containment Pressure?

A. START both Containment Spray Pumps in accordance with FRP-J.1. RED CSF conditions take precedence over EPP-012 actions.

B. OPERATE Containment Spray Pumps in accordance with the guidance in EPP-012, as directed by FRP-J.1. Conservation of RWST inventory takes precedence over Containment heat removal concerns.

C. Perform ONLY the FRP-J.1 actions that do NOT conflict with or undo the action taken in EPP-012. Two Containment Fan Coolers will provide adequate depressurization to meet the Containment Safety Function requirements.

D. Do NOT perform actions of FRP-J.1 until the RWST EMPTYalarm is clear and Containment Spray Pumps may be restarted. Ensure all other automatic actions related to containment isolation have occurred as required to ensure maintenance of minimum safety function.

A. Incorrect. FRP-J.1 Step 3 says operate IAW EPP-012.
B. Correct.
C. Incorrect. First part is true, but 2 Containment Coolers will NOT meet safety function.
D. Incorrect. No restriction on RWST level.

Common 62

Tier 1 Group 2
K/A Importance Rating - RO 3.8

Knowledge of the reasons for the following responses as they apply to the Loss of Containment Integrity: Guidance contained in EOP for loss of containment integrity.

Reference(s) - FRP-J.1 Background
Proposed References to be provided to applicants during examination - None
Learning Objective - LPEOP3-13 OBJ 4
Question Source - Bank
Question History - Callaway 2005
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).10
Comments -

069AK3.01

Instructions	Response Not Obtained
3. Check If CNMT Spray Is Required:	
a. Check CNMT pressure - HAS INCREASED TO GREATER THAN 10 PSIG	a. RETURN TO procedure and step in effect.
b. Check EPP-012, "LOSS OF EMERGENCY COOLANT RECIRCULATION" - IN EFFECT	b. GO TO Step 3e.
c. Operate CNMT spray using EPP-012, "LOSS OF EMERGENCY COOLANT RECIRCULATION".	
d. GO TO Step 4.	
e. Verify CNMT spray pumps - RUNNING	
f. Verify CNMT spray system valves aligned for injection: o Verify the following valves - OPEN: 1CT-26 1CT-71 1CT-50 1CT-88 1CT-11 1CT-12	
g. Verify Phase B isolation valves - SHUT. (Refer to OMM-004, "POST TRIP/SAFEGUARDS REVIEW" Attachment 9.)	
h. Stop all RCPs.	

STEP DESCRIPTION TABLE FOR FR-Z.1 Step 3 - CAUTION

CAUTION: If ECA-1.1, LOSS OF EMERGENCY COOLANT RECIRCULATION, is in effect, containment spray should be operated as directed in ECA-1.1 rather than step 3 below.

PURPOSE: To ensure containment spray pumps are operated as directed in ECA-1.1 instead of this guideline, if ECA-1.1 is in effect

BASIS:

This caution warns the operator that the operation of the containment spray pumps indicated in guideline ECA-1.1 takes precedence over that noted in Step 3 of this guideline. This guideline specifies maximum available heat removal system operability in order to reduce containment pressure. Guideline ECA-1.1 uses a less restrictive criteria, which permits reduced spray pump operation depending on RWST level, containment pressure and number of emergency fan coolers operating. The less restrictive criteria for containment spray operation is used in guideline ECA-1.1 since recirculation flow to the RCS is not available and it is very important to conserve RWST water, if possible, by stopping containment spray pumps.

ACTIONS:

Determine if ECA-1.1, LOSS OF EMERGENCY COOLANT RECIRCULATION, is in effect

INSTRUMENTATION:

N/A

CONTROL/EQUIPMENT:

N/A

KNOWLEDGE:

N/A

PLANT-SPECIFIC INFORMATION:

N/A

52. 072 K1.02 001/NEW/LOWER/2/2/1/072K1.02/RO/

Which ONE (1) of the following automatically takes place for a high alarm on RM-1CR-3561A-D, Containment Ventilation Isolation Area Radiation Monitors?

A. ✔ Containment Vacuum Relief Isolation Valves receive a CLOSE signal.

B. Airborne Radioactivity Removal (ARR) fans S-1A and B receive a TRIP signal.

C. Containment Isolation Phase "A" isolation valves receive a CLOSE signal.

D. Containment Fan Coil Units AH-37, 38, and 39 receive a TRIP signal.

3561A-D will initiate a Containment Ventilation Isolation signal. Vacuum Relief valves will close. ARR fans trip on high temperature. Phase A trips on high ctmt pressure or SI actuation. AH-37-39 receive signal from sequencer, not from rad monitors
Common 37

Tier 2 Group 2
K/A Importance Rating - RO 3.5

Knowledge of the physical connections and/or cause-effect relationships between the ARM system and the following systems: Containment Isolation.

Reference(s) - OMM-004
Proposed References to be provided to applicants during examination - None
Learning Objective - LPCVS3-0 R1
Question Source - New
Question History -
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).7
Comments -

072 K1,02

Attachment 7 - Containment Ventilation Isolation Verification

Sheet 1 of 1

CAUTION

If a Containment Ventilation Isolation signal has occurred, Tech Spec 3.0.3 is applicable, since both Trains of Containment Vacuum Relief are inoperable.

TRAIN - A Components	REQ POS	POS CK	TRAIN - B Components	REQ POS	POS CK
MAIN CONTROL BOARD					
1CB-2 SA VACUUM RELIEF	SHUT		1CB-6 SB VACUUM RELIEF	SHUT	
CB-D51 SA VACUUM RELIEF	SHUT		CB-D52 SB VACUUM RELIEF	SHUT	
1CP-9 SA NORMAL PURGE INLET	SHUT		1CP-6 SB NORMAL PURGE INLET	SHUT	
1CP-5 SA NORMAL PURGE DISCH	SHUT		1CP-3 SB NORMAL PURGE DISCH	SHUT	
1CP-10 SA PRE-ENTRY PURGE INLET	SHUT		1CP-7 SB PRE-ENTRY PURGE INLET	SHUT	
1CP-4 SA PRE-ENTRY PURGE DISCH	SHUT		1CP-1 SB PRE-ENTRY PURGE DISCH	SHUT	
ACTUATED BY EITHER TRAIN A OR B	E-5A CNMT PRE-ENTRY PURGE EXHAUST FAN			STOP	
	E-5B CNMT PRE-ENTRY PURGE EXHAUST FAN			STOP	
	AH-82 A NORMAL PURGE SUPPLY FAN			STOP	
	AH-82 B NORMAL PURGE SUPPLY FAN			STOP	

Comment No. Description

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

Signature: _____ Time _____ Date _____

53. 073 K4.01 001/BANK/LOWER/3/2/1/073K4.02/RO/

Which of the following is the correct automatic action that takes place in response to a high radiation (red) alarm on the TB drain monitor?

A. ✔ Shuts 1MD-285, Indus Waste to the Oil Separator, and trips TB condensate pump area sump pumps

B. Shuts 1SWT-420, Indus Waste to LC Hold-Up Tank Isol Vlv, and trips TB condensate pump area sump pumps

C. Shuts 1SWT-420, Indus Waste to LC Hold-Up Tank Isol Vlv, and trips industrial waste sump pumps

D. Shuts 1MD-285, Indus Waste to the Oil Separator, and trips the tank area drain transfer pumps

MD-285 will close and TB sump pumps will stop. Different rad monitors perform the other functions
Common 23

Tier 2 Group 1
K/A Importance Rating - RO 4.0

Knowledge of PRM system design feature(s) and/or interlocks which provide for the following: Release termination when radiation exceeds setpoint.

Reference(s) - AOP-005
Proposed References to be provided to applicants during examination - None
Learning Objective - LPRMS3-0 9a
Question Source - Bank
Question History -
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).7, 11
Comments -

Attachment 9
Sheet 1 of 3
Liquid Waste Effluent Monitors

1. **REFER TO** the following table to determine applicable step(s):

	IF ANY of the following monitors are in HIGH ALARM,	**THEN GO TO** Step(s):
☐	REM-01MD-3528, Turbine Building Drains	2
☐	REM-01MD-3530, Tank Area Drain Transfer Pumps	3
☐	REM-*1WL-3540, Treated Laundry and Hot Shower Tank Pump Discharge	4
☐	REM-21WL-3541, WST Tank Discharge	5
☐	REM-21WS-3542, Secondary Waste Sample Tank Pump Discharge	6

2. **PERFORM** the following for REM-01MD-3528, Turbine Building Drains Monitor, in HIGH ALARM:

☐ **a.** **VERIFY** 1MD-285, TB Indus Waste to Yard Oil Separator valve, SHUT.

b. **IF** 1SWT-420, TB Indus Waste to WS Treatment Isol Vlv, is SHUT, **THEN VERIFY** ALL of the following pumps STOPPED:

☐ • TB Condensate Pump Area Sump Pump 1A

☐ • TB Condensate Pump Area Sump Pump 1B

☐ • TB Industrial Waste Sump Pump 1A

☐ • TB Industrial Waste Sump Pump 1B

☐ • TB Industrial Waste Sump Pump 1C

☐ • TB Industrial Waste Sump Pump 1D

☐ **c.** **REFER TO** OP-124, Secondary Drains and Oily Waste Collection and Separation System (Section 5.6, Turbine Building Drains Startup).

☐ **d.** **GO TO** Step 7.

54. 075 A4.01 002/BANK/HIGHER/3/2/2/075A4.01/RO/

Given the following conditions:

- The plant is at 100 percent power with the following SW alignment:
  - "A" and "B" Emergency Service Water Pumps are off.
  - "A" & "B" Emergency Service Water header supplied from Normal Service Water.
  - "A" Normal Service Water Pump running.
  - "B" Normal Service Water Pump off.
- Power is lost to Bus 1A-SA.
- The A EDG starts, re-energizes the bus, and sequences loads as designed.

Which ONE (1) of the following describes the effect on Service Water system alignment?

A. "A" NSW Pump remains as the only pump in service since Bus 1A remained energized.

B. The B NSW pump is now running with the same alignment.

C. ✔ The A ESW pump is now running supplying the A ESW header.

D. The B ESW pump started on low pressure and is supplying the B ESW header.

A NSW will be running, but not the only pump. A ESW will start on the LOOP. B NSW will not receive a start signal for this event, and B ESW does not start because there was no LOOP on Train B
Common 38

Tier 2 Group 2
K/A Importance Rating - RO 3.2

Ability to manually operate and/or monitor in the control room: Emergency/essential SWS pumps.

Reference(s) - ESW LP 3.0/5.0
Proposed References to be provided to applicants during examination - None
Learning Objective - LP ESWS3-0 R7a
Question Source - Bank
Question History -
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).4, 7
Comments -

1) Inside is epoxy paint, outside is coal tar

(f) Gravity flows to respective ESW pump bay in ESW and cooling tower makeup intake structure

(2) Backup supply flow path

(a) Flows from main reservoir via ESW and CTMU Intake structure

(b) Flow divided by structure into bays

(c) Within each bay, water flows through stationary coarse screen and traveling screen as in the ESW Intake screening structure

(d) Main reservoir water is stopped from flowing into ESW pump suction bay by normally closed manually operated 8 ft x 10 ft rectangular butterfly valve

(e) To shift suction, 8-ft x 10-ft valves are opened and 30-inch manually-operated butterfly valves in suction lines from auxiliary reservoir are shut

1) Suction source is always available

2) Some sluicing of water between reservoirs will occur while both suction sources are open

b. ESW pumps

(1) Design parameters—pump

(a) Design capacity—20,000 gpm at 225-ft head.

(b) Minimum flow—7500 gpm.

(c) Runout capacity—25,000 gpm at 140-ft head

(2) Design parameter—motor

(a) Voltage—6.9 kV

(b) Power—1300

(c) 885 rpm

(d) Power supplies

1) ESW Pump 1A-SA—emerg Bus 1A-SA

2) ESW Pump 1B-SB—emerg Bus 1B-SB

(3) Starting duties

(a) Cold: 2 consecutive starts

(b) Hot: 1 consecutive start. An interval of 30 minutes with motor running or 60 minutes with motor not running must elapse before an additional start

AO Objective 4b

ESWS-TP-9.0

(4) Seal water supplied from discharge of screen wash pumps

RO Objective 4

(5) Instrumentation and control

(a) Start signals

1) Manual—control switch to start (Controls at MCB and ACP)

2) Sequencer—LB-3 (single shot—5 seconds)

a) SI

b) Loss of Off-Site Power (LOSP)

3) Low ESW header pressure

a) Setpoint—53 psig (20-second time delay to allow alternate NSW pump to start)

b) Single shot—3 seconds

c) Blocked from sequencer activation until LB-9

(b) Stop signals

1) Manual

2) Trips—electrical fault

a) Bus differential

55. 076 A3.02 002/BANK/LOWER/3/2/1/076A3.02/RO/

Given the following conditions:

A reactor trip and safety injection actuation have occurred.

Which one of the following sets of components are being supplied by the Emergency Service Water system?

A. Containment fan coolers (AH-1, 2, 3, 4)
CSIP oil coolers
RHR heat exchangers

B. RCP bearing oil coolers
Diesel Generator coolers
CCW heat exchangers

C. ✔ AFW pump emergency makeup
CSIP oil coolers
CCW heat exchangers

D. Containment fan coil units (AH-37, 38, 39),
AFW pump emergency makeup,
Diesel Generator coolers.

A is wrong. RHR HX supplied by CCW
B is wrong. RCP bearings supplied by CCW
D is wrong. AH-37-39 supplied by NSW
Common 25

Tier 2 Group 1
K/A Importance Rating - RO 3.7

Ability to monitor automatic operation of the SWS, including: Emergency heat loads.

Reference(s) - SD-139
Proposed References to be provided to applicants during examination - None
Learning Objective - LP ESWS3-0 A2
Question Source - Bank
Question History - ESW-A2-002
Question Cognitive Level -
10 CFR Part 55 Content - 41(b).8
Comments -

076 A3.02

2.1.3 ESW Branch Flow Paths

2.1.3.1 CVCS Chiller

The branch to the CVCS chiller contains air-operated valves that shut automatically on a Safety Injection (SI) signal. Thus, during an emergency this flow path would be isolated. During normal operation, the CVCS chiller is aligned to only one train at a time.

2.1.3.2 Auxiliary Feed Pump

The turbine-driven auxiliary feed pump branch contains normally-shut, motor-operated valves. In the event Emergency Service Water is needed for auxiliary feedwater, the control room operator would select which ESW header to use, open the appropriate supply valves, and have an auxiliary operator shut the associated loop seal line isolation valve. The valves from both headers would not be opened at the same time since a piping failure on one service water train could affect the flow in the other train.

2.1.3.3 Charging Pump Oil Coolers

The charging pump oil cooler branches contain only manual isolation valves. These lines are sized (1[illegible] inch diameter) such that a failure of these lines would not materially affect the service water flows to other components.

2.1.3.4 Component Cooling Water Heat Exchangers, Diesel Generator Coolers, RAB HVAC Chiller

The branch flow path from the A supply header to the component cooling heat exchanger, diesel generator jacket water coolers, and auxiliary building HVAC chiller condensers is independent of the B service water header. There are manual butterfly isolation valves with this equipment.

2.1.3.5 Containment Fan Cooler Units

The branch flow path to the containment fan cooler units contains the service water booster pump, which starts on an emergency (SI) signal. During normal operation, service water flow bypasses the idle booster pump, enters containment through the motor-operated butterfly isolation valves, flows through the fan cooler coils and back to the ESW return header through the containment isolation valves and a flow control orifice. This flow control orifice has an air-operated, normally-open bypass valve in parallel such that if the booster pump is off, the flow restriction is minimal. However, when the booster pump starts, this valve shuts, forcing all the fan cooler return flow through the orifice. The purpose of the booster pump and orifice is to ensure that, during a design basis Loss of Coolant Accident, the service water pressure inside containment is higher than containment pressure. This ensures any leakage will be from service water into containment and will prevent the release of containment radioactivity via the ESW System.

56. 076 AA2.02 001/BANK/HIGHER/4/1/2/076AA2.02/RO/

Given the following conditions:

- A rapid load reduction from 100% power to 65% power was performed approximately 3 hours ago.
- The RCS Gross Failed Fuel detector is in alarm.
- Charging Pump Room Fuel Breach Area Radiation Monitors are in alarm.
- Chemistry confirms RCS activity exceeds Technical Specification limits.

The USCO directs a plant shutdown be performed.

Which ONE (1) of the following actions is designed to limit the release of radioactivity in the event of a subsequent SGTR?

A. MSIVs are closed.

B. All SG PORV setpoints are raised.

C. RCS is cooled down below 500°F.

D. Maximum number of Condensate Polishing Demineralizers are placed in service.

A Incorrect. Closing MSIVs would contribute to rad release through SG PORVs and Safeties if cooldown and depressurization was not performed in a timely manner.
B Incorrect. PORV setpoints are normally raised in SGTR procedure.
D Incorrect. Condensate polishing would help clean the secondary plant but not an action performed in accordance with the ARPs.

Common 63

Tier 1 Group 2
K/A Importance Rating - RO 2.8

Ability to determine and interpret the following as they apply to the High Reactor Coolant Activity: Corrective actions required for high fission product activity in RCS.

Reference(s) - TS, AOP-032 background
Proposed References to be provided to applicants during examination - NONE
Learning Objective - LP AOP32 Obj 2
Question Source - Bank
Question History - 18813, IP3 2003 NRC
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).5, 10
Comments -

0°6 AA2-02

REACTOR COOLANT SYSTEM

3/4.4.8 SPECIFIC ACTIVITY

LIMITING CONDITION FOR OPERATION

3.4.8 The specific activity of the reactor coolant shall be limited to:

a. Less than or equal to 1 microCurie per gram DOSE EQUIVALENT I-131, and

b. Less than or equal to 100/$\bar{E}$ microCuries per gram of gross radioactivity.

APPLICABILITY: MODES 1, 2, 3, 4, and 5.

ACTION:

MODES 1, 2 and 3*:

a. With the specific activity of the reactor coolant greater than 1 microCurie per gram DOSE EQUIVALENT I-131 for more than 48 hours during one continuous time interval or exceeding 60.0 microCurie per gram DOSE EQUIVALENT I-131, be in at least HOT STANDBY with T_{avg} less than 500°F within 6 hours. The provisions of Specification 3.0.4 are not applicable.

b. With the specific activity of the reactor coolant greater than 100/$\bar{E}$ microCuries per gram, be in at least HOT STANDBY with T_{avg} less than 500°F within 6 hours.

MODES 1, 2, 3, 4, and 5:

With the specific activity of the reactor coolant greater than 1 microcurie per gram DOSE EQUIVALENT I-131 or greater than 100/$\bar{E}$ microCuries per gram, perform the sampling and analysis requirements of Item 4.a) of Table 4.4-4 until the specific activity of the reactor coolant is restored to within its limits.

SURVEILLANCE REQUIREMENTS

4.4.8 The specific activity of the reactor coolant shall be determined to be within the limits by performance of the sampling and analysis program of Table 4.4-4

*With T_{avg} greater than or equal to 500°F

57. 078 K1.05 001/BANK/LOWER/3/2/1/078K1.05/RO/

Which one of the following statements correctly describes how to locally shut the MSIVs from outside the Control Room?

A. On the 236 level in the RAB, isolate air by closing 1IA-814, then remove cap and open drain valve 1IA-1876

B. On the 236 level in the RAB, remove the cap and open the drain for valve on 1IA-1876 then isolate air by closing 1IA-814.

C.✔ On the 261 level in the RAB, isolate air by closing 1IA-814, then remove cap and open drain valve 1IA-1876

D. On the 261 level in the RAB, remove the cap and open the drain for valve on 1IA-1876 then isolate air by closing 1IA-814.

IAW EPP_014, procedure to locally perform this action is to isolate IA and then vent the line
Common 26

Tier 2 Group 1
K/A Importance Rating - RO 3.4

Knowledge of the physical connections and/or cause-effect relationships between the IAS and the following systems: MSIV air.

Reference(s) - EPP-014
Proposed References to be provided to applicants during examination - NONE
Learning Objective - LP MSSS3-0 A5
Question Source - Bank
Question History - Systems Bank MSSS-3.0-A5 004
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).4, 10
Comments -

078K1.05

Instructions	Response Not Obtained

****

CAUTION

- At least one SG must be maintained available for RCS cooldown.
- Any faulted SG OR secondary break should remain isolated during subsequent recovery actions unless needed for RCS cooldown.

****

1. Implement Function Restoration Procedures As Required.

2. Check MSIVs AND Bypass Valves:

   a. Verify all MSIVs - SHUT

   a. Perform the following:

      1) Locally shut instrument air supply to RAB 261:

         1IA-814 (north of AH-19 1A-SA)

      2) Locally remove cap AND open drain valve:

         1IA-1876 (located in corridor outside VCT valve gallery)

   b. Verify all MSIV bypass valves - SHUT

   b. Locally shut OR isolate valve(s).

3. Check Any SG NOT Faulted:

   a. Any SG pressure - STABLE OR INCREASING

   a. GO TO EPP-015, "UNCONTROLLED DEPRESSURIZATION OF ALL STEAM GENERATORS", Step 1.

58. 103 A1.01 001/BANK/HIGHER/3/2/1/103A1.01/RO/

Given the following conditions:

- The plant is in Mode 5.
- Containment Pre-Entry Purge Makeup and Exhaust is in operation.
- The Personnel Airlock and Equipment Hatch are closed.
- The Containment Pre-Entry Purge Exhaust Isolation valve is inadvertently closed.
- NO other components reposition.

Which ONE (1) of the following describes the containment parameter MOST affected by this failure?

A✔ Pressure

B. Temperature

C. Radiation Level

D. Humidity Level

A. Correct.
B. B. Incorrect. Temperature will remain constant since the Purge system does not provide a cooling function
C. C. Incorrect. Radiation levels would only rise to cause a purge isolation, they would not rise because of an isolation
D. Incorrect. Humidity is a function of the containment temperature and dewpoint, which are unaffected by purge control operation.
Common 28

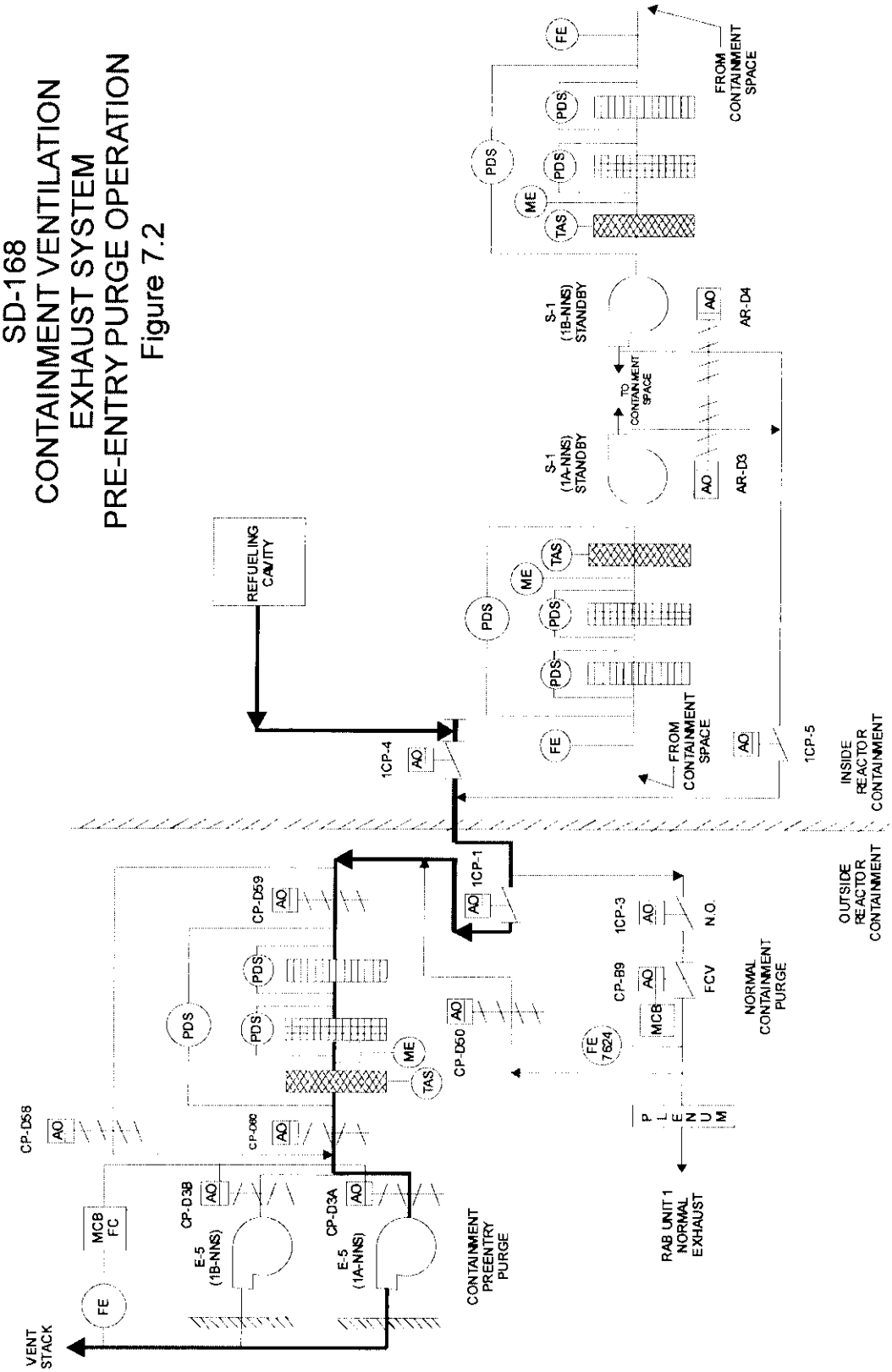
Tier 2 Group 1
K/A Importance Rating - RO 3.7

Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the containment system controls including: Containment pressure, temperature, and humidity.

Reference(s) - SD-168
Proposed References to be provided to applicants during examination - None
Learning Objective - LP CVS3-0 A2
Question Source - Bank
Question History - SONGS 10/2005 NRC
Question Cognitive Level -
10 CFR Part 55 Content - 41(b).9
Comments -

103 A1.01

SD-168
CONTAINMENT VENTILATION
EXHAUST SYSTEM
PRE-ENTRY PURGE OPERATION
Figure 7.2



59. 103 A4.04 001/BANK/HIGHER/3/2/1/103A4.04/RO/

Given the following conditions:

- A LOCA has occurred.
- RCS pressure is 300 psig and stable.
- Containment pressure is 16 psig and lowering slowly.
- All equipment is operating as designed.
- The crew is performing actions contained in PATH-1, preparing to reset ESF Actuation signals.

Which ONE (1) of the following describes the conditions required to be met, if any, to reset Containment Isolation Phase A and B?

A. ✔ Phase A and Phase B may be reset manually without additional conditions.

B. Phase A may be reset manually at this time. Containment Spray must be reset prior to resetting Phase B.

C. Phase B will NOT reset until Phase A is reset. Phase A may be reset at this time.

D. Phase A will NOT reset until Safety Injection is reset. Phase B will NOT reset until containment pressure is below the actuation setpoint.

Manual resets for CIA and CIB may be performed even with actuating signal present.
Common 27

Tier 2 Group 1
K/A Importance Rating - RO 3.5

Ability to manually operate and/or monitor in the control room: Phase A and phase B resets.

Reference(s) - SD-103
Proposed References to be provided to applicants during examination - None
Learning Objective - LP ESFAS3-0 OBJ 2
Question Source - New
Question History -
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).7, 9
Comments -

4.0 OPERATIONS (continued)

4.3.3 Manual Phase A

Manual initiation of Phase A Isolation is accomplished by turning 1 of 2 manual phase A switches located on Main Control Board Vertical Panels 1A1 and 1C.

Phase A actuation also initiates Containment Ventilation Isolation.

The isolation Phase A signal can be reset from the Main Control Board by activating both the Train A reset and the Train B reset switches located on Panel 1A1 Vertical Section Right.

4.4 Containment Isolation Phase B

Refer to Figure 7.2 and Section 8.1 for the following discussion.

The Containment Isolation Phase B actuation ("P" signal) isolates component cooling water to the Reactor Coolant Pump thermal barriers and bearing oil heat exchangers. This signal is generated on a Hi-3 containment pressure of 10 psig from 2 out of 4 pressure channels. Pressure Loops P-950A, P-951A, P-952A and P-953A sense and transmit signals to the SSPS. Phase B initiation on Hi-3 rather than Hi-1 allows the Reactor Coolant Pumps to run during Safety Injection System operation and prevents RCP failure due to the lack of component cooling water to the heat exchangers and thermal barriers. The interval allows sufficient time for operator to manually trip the pumps to prevent overheating.

Initiation of Phase B Isolation also occurs on manual initiation of Containment Spray (CS). 1 out of 2 Containment Spray channels is necessary for actuation. Each CS channel has 2 control switches located on Main Control Board Panel 1A1 Vertical Section Left. Two associated controls must be turned simultaneously for actuation of both trains.

Phase B actuation can be reset by turning both the Train A reset and Train B reset switches located on Main Control Board Panel 1AA Desk Section.

Phase B Isolation is annunciated on the MCB Auxiliary Systems Annunciator Panel window 4-6.

4.5 Containment Ventilation Isolation

Refer to Figure 7.3 and Section 8.1 for the following discussion.

Containment Ventilation Isolation closes lines in the Containment Atmosphere Purge Systems, and the Containment Vacuum Relief System, to prevent release of potentially contaminated air following an accident.

60. E03 EK3.4 001/BANK/LOWER/2/1/2/E03EK3.4/RO/

Which ONE (1) of the following describes the preferred method of operating RCPs and the reason during performance of EPP-009, Post LOCA Cooldown and Depressurization?

A. Starting any RCP is undesirable because starting an RCP during Natural Circulation may cause a SG safety valve to lift.

B✔ Starting one RCP is desirable to provide pressurizer spray flow and mix the RCS.

C. Starting any RCP is undesirable because the heat input will delay RCS cooldown.

D. Starting 2 or more RCPs is desirable because it collapses RCS voids and allows true measurement of RCS inventory.

A. Incorrect. SG SV may lift but not a reason to keep RCPs off

B. Correct

C. Incorrect. Not an event where heat input is a consideration

D.Incorrect. Only 1 RCP required to perform these functions

Common 64

Tier 1 Group 2
K/A Importance Rating - RO 3.5

Knowledge of the reasons for the following responses as they apply to the (LOCA Cooldown and Depressurization) RO or SRO function as a within the control room team as appropriate to the assigned position, in such a way that procedures are adhered to and the limitations in the facilities license and amendments are not violated.

Reference(s) - EPP-009 Background
Proposed References to be provided to applicants during examination - NONE
Learning Objective - LPEOP3-5, 3B
Question Source - Bank
Question History - Robinson 2002 NRC 95
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).10
Comments -

E03 EK3.4

After these actions and checks are performed, a cooldown to cold shutdown (200°F) is initiated. With continued cooldown, subsequent actions can be performed when specified RCS subcooling criteria are satisfied.

o Depressurize RCS to Refill PRZR

This action is performed prior to RCP restart or before/after an SI reduction action. As RCS pressure decreases, RCS injection flow will increase relative to break flow. Consequently, this depressurization action should be sufficient for restoring PRZR level if the LOCA is small. A "small" LOCA is first ensured by requiring RCS subcooling before depressurization. If subcooling is lost during the depressurization, it should be restored as the cooldown continues. Prior to restoring PRZR level, all PRZR heaters are turned off.

o Start One RCP/Stop All But One RCP

Once RCS subcooling, PRZR level, and other RCP support conditions are established, an RCP can be started if no RCPs are running. If more than one RCP are running, all but one are stopped to minimize RCS heat input. The RCP restarted (or left running) is used to provide normal PRZR spray and mix the RCS.

o Reduce RCS Injection Flow

As RCS subcooling builds up to specified values (see document SI REDUCTION SEQUENCE EVALUATION in the Generic Issue section of the Executive Volume), the charging/SI and high-head SI pumps are stopped one at a time in a predetermined sequence. Subcooling criteria are specified such that a minimum RCS subcooling will be maintained after the injection flow is reduced.
The SI reduction sequence selected for the guideline is:

- o stop first charging/SI pump
- o stop first high-head SI pump
- o stop last high-head SI pump
- o align last charging/SI pump to normal charging

61. E04 EK3.1 001/MODIFIED/LOWER/3/1/1/E04EK3.1/RO/

Given the following conditions:

- A LOCA outside containment has occurred.
- The crew is performing the actions in EPP-013, LOCA Outside Containment.

Which ONE of the following indications is used to determine if the leak has been isolated in accordance with EPP-013?

A✓ RCS pressure, because SI flow will repressurize the RCS with the break isolated.

B. Pressurizer level, because with the break isolated, RCS inventory will rapidly rise.

C. RVLIS indication, because as RCS inventory and pressure rise, vessel head and plenum voiding will immediately be reduced.

D. Safety injection flow, because as RCS pressure rises, it is the first parameter that will change.

A-Correct.
B-Incorrect. RCS inventory will increase, but may not immedaitely show up on PRZ level
C-Incorrect. RVLIS may indicate 100% at the start, so may not provide indication of isolation at all
D-Incorrect. SI Flow is a good confirmatory indication when RCS pressure rises, because it will be reduced, but RCS pressure rise is the only immediate indication
Common 53
Tier 1 / Group 1
K/A Importance Rating - RO 3.2

Knowledge of the reasons for the following responses as they apply to the (LOCA Outside Containment) Facility operating characteristics during transient conditions, including coolant chemistry and the effects of temperature, pressure, and reactivity changes and operating limitations and reasons for these operating characteristics.

Reference(s) - EPP-13 and basis
Proposed References to be provided to applicants during examination - None
Learning Objective -
Question Source - Modified
Question History -
Question Cognitive Level - Comprehension
10 CFR Part 55 Content - 41(b).5
Comments -

ORIGINAL

E04 EK3.1

QUESTIONS REPORT
for PROCEDURES

1. EOP-3.3 024////////

EPP-013, LOCA Outside Containment, select the two symptoms that indicate the leak is isolated.

a) RCS pressure increasing.

b) PRZ level increasing.

c) Local observation.

d) RAB radiation decreasing.

E04 EK3.1

3. RECOVERY/RESTORATION TECHNIQUE

The objective of the recovery/restoration technique incorporated into guideline ECA-1.2 is to provide actions to identify and isolate a LOCA outside containment.

The following subsection provides a summary of the major categories of operator actions for guideline ECA-1.2, LOCA OUTSIDE CONTAINMENT.

3.1 High Level Action Summary

A high level summary of the actions performed in ECA-1.2 is given on the following page in the form of major action categories. These are discussed below in more detail.

o Verify Proper Valve Alignment

The first instruction given to the operator is to verify that all normally closed valves in lines that penetrate containment are closed. If a normally closed valve is open, this action may isolate the break.

o Identify and Isolate Break

The operator then attempts to identify and isolate the break by sequentially closing all normally open valves in paths that penetrate containment.

o Check If Break Is Isolated

RCS pressure is monitored to determine if the break has been isolated. A significant increase in RCS pressure indicates the break is isolated and the operator is sent to guideline E-1, LOSS OF REACTOR OR SECONDARY COOLANT. If the break is not isolated, the operator transfers to guideline ECA-1.1, LOSS OF EMERGENCY COOLANT RECIRCULATION, for further recovery actions.

62. E05 EK2.1 001/BANK/HIGHER/3/1/1/E05EK2.1/RO/

Given the following conditions:

- A Loss of Heat Sink has occurred.
- The crew is establishing RCS 'Bleed and Feed' in accordance with FRP-H.1, Loss of Secondary Heat Sink.
- The RO opens one PRZ PORV. He reports that NEITHER of the other two PORVs will open.

Which ONE (1) of the following describes the consequences of the PORV failures?

A. A Red Path on the Core Cooling CSF will develop due to loss of RCS Inventory with no available makeup.

B. RCS 'Feed and Bleed' cooling must be established to ensure sufficient SI flow at the operable PORV setpoint.

C✓ The RCS may not depressurize quickly enough to ensure sufficient SI flow to provide RCS heat removal, and other RCS openings may have to be established.

D. 'Bleed and Feed' cooling of the RCS must be terminated and secondary depressurization to inject Condensate pump flow must be immediately initiated.

A. Incorrect. Although a red condition on Core Cooling may eventually occur, there is available makeup with HHSI
B. Incorrect. Bleed and Feed is preferable, because SI flow may NOT be adequate at the PORV setpoint
C. Correct.
D. Incorrect. Action to align condensate pumps is already taken, and not as a contingency to Bleed and Feed

Common 54

Tier 1 Group 1
K/A Importance Rating - RO 3.7

Knowledge of the interrelations between the (Loss of Secondary Heat Sink) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Reference(s) - FRP-H.1 and Background doc
Proposed References to be provided to applicants during examination - None
Learning Objective - LP EOP3-11 4D
Question Source - Bank
Question History - 2002 BVPS-1
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).10
Comments -

E05 EK2.1

STEP DESCRIPTION TABLE FOR FR-H.1 Step 16

STEP: Verify Adequate RCS Bleed Path

PURPOSE: To verify that an adequate RCS bleed path is established and, if not, to establish alternative bleed path or cooling methods

BASIS:

After manually opening the pressurizer PORVs, the operator should check that both pressurizer PORVs are maintained in the open position. If both valves are maintained open, sufficient RCS bleed flow exists to permit RCS heat removal.

If both PRZR PORVs are not maintained open, the RCS may not depressurize sufficiently to permit adequate feed of subcooled SI flow to remove core decay heat. If core decay heat exceeds RCS bleed and feed heat removal capability, the RCS will repressurize rapidly, further reducing the feed of subcooled SI flow and resulting in a rapid decrease of RCS inventory.

Although only one open PRZR PORV may not be sufficient to maintain adequate RCS bleed flow, the operator should maintain one PRZR PORV open, if possible, and open all RCS high point vents to provide additional bleed path capability. In addition, the operator should align any available low pressure water source to the SG(s). The operator should then attempt to open a steam generator PORV for at least one intact SG and depressurize that SG to atmospheric pressure to inject the low pressure water source to restore secondary heat removal. If a low pressure water source can not be aligned, a SG should not be depressurized in order to minimize the risk of tube creep rupture that can occur following a severe accident where the SG tubes are subjected to high RCS temperatures and large primary-to-secondary pressure differences. It should be noted that RCS inventory depletion will occur from the open single PRZR PORV, the PRZR safety valves, and high point vents as the steam generator(s) is being depressurized to atmospheric pressure.

ACTIONS:

- o Determine if at least two PRZR PORVs are open
- o Open all RCS high point vents
- o Align any available low pressure water source to the SG(s)
- o Determine if no low pressure water source can be aligned
- o Depressurize at least one intact SG to atmospheric pressure using SG PORV to inject low pressure water source

63. E09 EA1.3 001/BANK/LOWER/3/1/2/E09EA1.3/RO/

Given the following conditions:

- A MANUAL reactor trip was initiated due to Component Cooling Water problems.
- All RCP's are stopped.
- The crew has transitioned to EPP-004, REACTOR TRIP RESPONSE.

Which ONE (1) of the following pairs of parameters is indicative that natural circulation cooling is occurring?

A. SG pressure stable and CET's decreasing.

B. SG pressure stable and Thot increasing.

C. SG pressure increasing and RCS subcooling decreasing.

D. SG pressure increasing and Tcold trending to saturation for SG pressure.

B Incorrect. Thot should not be increasing.
C Incorrect. Both are contrary indicators.
D Incorrect. Both are contrary indictors.

Common 65

Tier 1 Group 2
K/A Importance Rating - RO 3.5

Ability to operate and / or monitor the following as they apply to the (Natural Circulation Operations) Desired operating results during abnormal and emergency situations.

Reference(s) - EPP-004
Proposed References to be provided to applicants during examination - NONE
Learning Objective -
Question Source - Bank
Question History - 18708, IP3 2003
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).5
Comments -

E09 EA1.3

Instructions	Response Not Obtained

NOTE: RCPs should be run in order of priority (B,A,C) to provide normal PRZ spray.

17. Check RCP Status:

a. Check RCPs - AT LEAST ONE RUNNING	a. GO TO Step 17c.
b. GO TO Step 18.	
c. Check all of the following - IN SERVICE o CCW to motor oil coolers o CCW to thermal barrier HXs o Seal injection	c. Establish cooling to RCPs using OP-100, "REACTOR COOLANT SYSTEM", Section 8.10.
d. Establish support conditions AND start one RCP: 1) Establish conditions for running an RCP using OP-100, "REACTOR COOLANT SYSTEM", Section 8.11. 2) Start one RCP using OP-100, "REACTOR COOLANT SYSTEM", Section 8.12.	d. Verify natural circulation from trended values: o RCS subcooling - GREATER THAN 10°F - C 20°F - M o Steam pressure - STABLE OR DECREASING. o RCS hot leg temperature - STABLE OR DECREASING o Core exit TCs - STABLE OR DECREASING o RCS cold leg temperature - TRENDING TO OR AT SATURATION TEMPERATURE FOR STEAM PRESSURE IF natural circulation NOT verified, THEN increase dumping steam from intact SGs.

64. E11 EK2.1 001/NEW/HIGHER/3/1/1/E11EK2.1/RO/

Given the following conditions:

- A LOCA has occurred.
- Multiple failures have resulted in a transition to EPP-012, Loss of Emergency Coolant Recirculation.
- RWST level is 4%.
- The crew is preparing to make up to the RWST per EPP-012.

Which ONE (1) of the following describes the effect on the plant of the RO resetting the SI Auto Suction Switchover in accordance with EPP-012?

A. Allows resetting of the SI signal and manual realignment of safeguards equipment.

B. Allows manual operation of Containment Spray pump discharge and chemical addition valves

C. RHR Pump Miniflow Isolation Valves will NOT automatically open or shut as required.

D. CSIP Alternate Miniflow Isolation Valves will NOT automatically open or shut as required.

SI reset is performed inependently. CS discharge valves may be operated after resetting Phase B and Spray. RHR miniflow valves are not part of this circuit
Common 55

Tier 1 Group 1
K/A Importance Rating - RO 3.6

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.

Reference(s) - EPP-012, Note prior to step 4
Proposed References to be provided to applicants during examination - None
Learning Objective -
Question Source - New
Question History -
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).7
Comments -

E11 EK 2.1

Instructions	Response Not Obtained

NOTE: Foldout applies.

1. Restore Emergency Coolant Recirculation Equipment.

2. Reset SI.

3. Manually Realign Safeguards Equipment Following A Loss Of Offsite Power.

   (Refer to PATH-1 GUIDE, Attachment 2.)

NOTE: Resetting the SI suction auto switchover signal also defeats the automatic open and shut signals to the CSIP alternate miniflow isolation valves.

4. Reset SI Suction Auto Switchover.

5. Add Makeup To RWST Using OP-107, "CHEMICAL AND VOLUME CONTROL SYSTEM", Section 8.7.

   Consult plant operations staff for alternate makeup sources.

6. Check Intact SG Levels:

   a. Any level - GREATER THAN 25% [40%]

      a. Maintain total feed flow greater than 210 KPPH until level greater than 25% [40%] in at least one intact SG.

   b. Control feed flow to maintain all intact levels between 25% and 50% [40% and 50%].

65. E12 EK3.1 001/BANK/LOWER/2/1/1/E12EK3.1/RO/

In procedure EPP-015, Uncontrolled Depressurization of All Steam Generators, the Operator is directed to establish feed flow to all three Steam Generators.

What is the setpoint and basis for establishing flow in this range?

A. 12.5 KPPH, maintain minimum feed flow to ensure CST inventory is maintained until RHR can be placed in service.

B. 210 KPPH, maintain a minimum required feed flow to ensure adequate heat sink is maintained.

C. 12.5 KPPH, establish a minimum verifiable flow to ensure components remain wet so that thermal stresses are minimized upon a feed flow increase.

D. 210 KPPH, establish a minimum verifiable flow to ensure components remain wet so that thermal stresses are minimized upon a feed flow increase.

A Incorrect. 12.5 KPPH is the correct feed flow; however basis incorrect.
B Incorrect. Feed flow range incorrect and basis incorrect.
D Incorrect. Feed flow range incorrect, basis is correct.

Common 56

Tier 1 Group 1
K/A Importance Rating - RO 3.5

Knowledge of the reasons for the following responses as they apply to the (Uncontrolled Depressurization of all Steam Generators) Facility operating characteristics during transient conditions, including coolant chemistry and the effects of temperature, pressure, and reactivity changes and operating limitations and reasons for these operating characteristics.

Reference(s) - EPP-015
Proposed References to be provided to applicants during examination - NONE
Learning Objective -
Question Source - Bank
Question History - WTSI 18579 Robinson 2002
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).4, 10
Comments -

E12 EK3.1

Instructions	Response Not Obtained

NOTE: As SG pressure and steam flow decrease, RCS hot leg temperatures will eventually stabilize and may increase. Adjusting feed flow and steam dump will control RCS hot leg temperatures.

3. Control RCS Temperature:

a. Check RCS cooldown rate - LESS THAN 100°F/HR	a. Decrease feed flow to 12.5 KPPH to each SG. GO TO Step 3c.
b. Check all SG levels - LESS THAN 50%	b. Control feed flow to maintain levels less than 50% in all SGs.
c. Check RCS hot leg temperatures - STABLE OR DECREASING	c. Control feed flow OR steam dump to stabilize RCS hot leg temperatures.

4. Maintain RCP Seal Injection Flow Between 8 GPM And 13 GPM.

5. Check RCP Trip Criteria:

a. Check RCPs - AT LEAST ONE RUNNING	a. GO TO Step 6.
b. Check all of the following:	b. GO TO Step 6.
o SI flow - GREATER THAN 200 GPM	
o Check RCS pressure - LESS THAN 1400 PSIG	
o Check RCS hot leg temperatures - STABLE OR INCREASING	
c. Stop all RCPs.	

STEP DESCRIPTION TABLE FOR ECA-2.1

Step 2

STEP: Control Feed Flow To Minimize RCS Cooldown:

PURPOSE: To control feed flow to minimize the effects of the cooldown due to the secondary depressurization and to subsequently control the transient.

BASIS:

Depending upon the size of the effective break areas for the steam generators, the cooldown rate experienced after reactor trip could exceed 100°F/hr. A reduction of feed flow to the steam generators has three primary effects:

1) To minimize any additional cooldown resulting from the addition of feedwater,
2) To prevent steam generator tube dryout by maintaining a minimum feed flow to the steam generators and,
3) To minimize the water inventory in the steam generators that eventually is the source of additional steam flow to containment or the environment.

The minimum feed flow of (S.04) gpm represents the value in plant specific units corresponding to 25 gpm. The 25 gpm value is representative of a minimum measurable feed flow to a steam generator. Plant specific values may depend upon flow instrumentation and the sensitivity of the controls on the feed flow.

As steam flow rate drops, the feed flow will eventually increase the steam generator inventory. Feed flow is controlled to maintain steam generator narrow range level less than 50% to prevent overfeeding the steam generators.

In addition, as SG pressure and steam flow rate drop, RCS hot leg temperatures will stabilize and start increasing. The operator controls feed flow or dumps steam to stabilize the RCS hot leg temperatures. This allows the safety injection flow to establish conditions for SI termination and minimizes thermal stresses that may be generated.

ACTIONS:

- o Determine if cooldown rate in RCS cold legs is less than 100°F/hr
- o Determine if narrow range level in all SGs is less than 50%
- o Determine if RCS hot leg temperatures are stable or decreasing
- o Decrease feed flow to (S.04) gpm to each SG
- o Control feed flow to maintain narrow range level less than 50% in all SGs
- o Control feed flow or dump steam to stabilize RCS hot leg temperatures

66. G2.1.11 004/NEW/LOWER/3/3/1/G2.1.11/RO/

The plant is operating at 100% power.

Which ONE (1) of the following requires the EARLIEST action in accordance with Technical Specifications?

A. One Containment Isolation Valve is declared inoperable.

B. Containment Average Air Temperature is 122 degrees F.

C. Containment Vacuum is -1.2 inches water gauge.

D. Containment Pressure is 1.2 psig.

C is correct because action is required to restore to < 1.0 inches H2O within 1 hour.
A allows for 4 hours
B allows for 8 hours
D is within required specification for pressure
Common 66

Tier 3 Group 1
K/A Importance Rating - RO 3.0

Knowledge of less than one hour technical specification action statements for systems.

Reference(s) - TS 3.6.1.1 through 3.6.1.5, and 3.6.3
Proposed References to be provided to applicants during examination - NONE
Learning Objective - LP CONT3-0 R2A
Question Source - New
Question History -
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).9, 43(b).2
Comments -

G2.1.11

CONTAINMENT SYSTEMS

INTERNAL PRESSURE

LIMITING CONDITION FOR OPERATION

3.6.1.4 Primary containment internal pressure shall be maintained between -1.0 inches water gauge and 1.6 psig.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

With the containment internal pressure outside of the limits above, restore the internal pressure to within the limits within 1 hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.6.1.4 The primary containment internal pressure shall be determined to be within the limits at least once per 12 hours.

67. G2.1.23 001/BANK/LOWER/2/3/1/G2.1.23/RO/

While implementing an AOP, the crew encounters a step that directs them to 'REFER TO' a different procedure.

At this point the crew will...

A. immediately transition to the new procedure and perform applicable actions.

B. reference the current AOP Basis Document to determine applicable actions.

C. ✔ use the other procedure as necessary in conjunction with the procedure in effect.

D. perform and complete the referenced procedure prior to exiting the current AOP.

A is a 'Go To' action
B may be performed at any time at SRO discretion
C is correct
D would apply to a 'Go To' step
Common 68

Tier 3 Group 1
K/A Importance Rating - RO 3.9

Ability to perform specific system and integrated plant procedures during all modes of plant operation.

Reference(s) - OMM-027
Proposed References to be provided to applicants during examination - None
Learning Objective - LP AOP3-0 OBJ 3
Question Source - Bank
Question History -
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).10
Comments -

G 2.1.23

5.2 Action Steps (continued)

5. Referencing and Branching

Referencing is used to allow guidance provided in another procedure, attachment, or steps in another part of the same procedure to be used as a supplement to the procedure in use.

- REFER TO directs the user to use other guidance concurrently with the procedure in use.

Branching is used to direct the user to exit the procedure in use and not return unless otherwise directed.

- GO TO directs the user to exit the procedure in use.

6. Use of Operating Procedures

Operating procedures may be in progress when an AOP is implemented. When these procedures contradict the status established or assumed by the AOP, the AOP should be followed. If necessary, the transition to the AOP should be implemented and the discrepancy resolved, as determined by the S-SO.

In most cases, when system manipulations or alignments are required by AOPs, step by step instructions are provided. In some cases it is more efficient to direct the operator to the appropriate operating procedure to accomplish an action rather than repeating numerous steps in the AOPs. The operator may be directed to either USE or REFER TO a particular procedure and section to accomplish a particular task.

If the word USE or USING is contained in the AOP step, the procedure section cited should be performed as written.

Example: Establish conditions for running an RCP using OP-100, Reactor Coolant System, Section 8.11.

In this example it is intended that operators obtain a copy of OP-100, Section 8.11 and perform it as written. Because of the unusual plant conditions, all prerequisites and initial conditions for the referenced procedure may not be met. If this is the case, it should be evaluated whether the absence of a prerequisite prevents performance of the procedure.

5.2 **Action Steps** (continued)

6. (continued)

If the words REFER TO are used, procedure performance is at the discretion of the operator. It may be implemented in its entirety, used for guidance, or not used at all depending on plant conditions and familiarity of the operator with its steps. Generally, the referenced procedure will contain useful information, but may not be written to address abnormal plant conditions. This type of reference may also be used for those actions that operators might feel comfortable performing without actually using the procedure (e.g., transferring steam dump to the steam pressure mode, starting a CSIP, etc.).

In other cases, just the action may be given, as in "VERIFY proper valve alignment." When no step by step instructions or reference to an operating procedure are given, it is assumed that the action specified can be accomplished by a licensed operator without reference to a procedure. If the operator has any question on how to accomplish the action, the appropriate procedure should be referred to.

7. Continuous Action Step Identification

Continuous action steps are identified to the left of the step number by a large asterisk. These steps are non-sequential and are intended to be performed continuously or are intended to be performed when specified conditions are met. The requirement to perform these steps may be repeated periodically by the Unit SCO to keep the operator apprised of the requirements.

It is not intended that continuous action steps be memorized. Continuous action steps allow the implementor to perform the required continuous actions when the appropriate conditions are reached, even though the implementor may be well past the step in the procedure progression.

The following are conditions that may require repeating the requirements:

- A significant sequence of steps may have distracted the operators from the previous time the step was read.
- The Unit SCO may expect the condition to occur based on approaching the stated condition.

When an action step is worded to MAINTAIN, MONITOR, or CONTROL a parameter, the operator is expected to implement the actions of that step during the performance of subsequent actions in that procedure.

68. G2.1.9 001/NEW/LOWER/4/3/1/G2.1.9/RO/

The plant is in Mode 3.

The RO may direct that the STA perform all of the following tasks EXCEPT...

A. Silence control room annunciators

B. Operate Radiation Monitoring System controls

C. Operate the Source Range Audio Count Rate Drawer

D. Operate the Metal Impact Monitoring System (MIMS)

OMM-001, Section 3.2.7.9
Common 67

Tier 3 Group 1
K/A Importance Rating - RO 2.5

Ability to direct personnel activities inside the control room.

Reference(s) - OMM-001
Proposed References to be provided to applicants during examination - None
Learning Objective -
Question Source - New
Question History -
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).10
Comments -

G2.1.9

3.2.7 Shift Technical Advisor (continued)

8. The STA may participate in any activity that does not distract from their responsibilities.

9. The STA can silence alarms and operate Radiation Monitoring Panels, ERFIS, Audio Count Rate Drawer, the Scaler Timer as directed in procedures. The manipulations shall only be done at the direction of a licensed operator. No other manipulations are allowed except as directed in step 3.2.7.2.b.

R 10. The Shift Technical Advisor responsibilities during an emergency operating condition are: (Reference 2.4.3)

   a. Upon notification, being able to be present in the Main Control Room within 10 minutes during an emergency situation.

   b. During a Reactor Trip/SI, the STA will monitor the Critical Safety Function Status Trees and provide input to the Unit SCO on any yellow, orange or red end paths. The items monitored are as follows:

      - Subcriticality
      - Core Cooling
      - Heat Sink
      - Integrity
      - Containment
      - Inventory

   c. Providing additional information to the Unit SCO, by monitoring the EOP Path Guides.

   d. Independently assessing the situation and providing recommendations to the Unit SCO.

   e. Using ERFIS to get data related to events, and if ERFIS is unavailable, manually calculating subcooling margin.

   f. Acting as the Accident Assessment Team until activation of the Technical Support Center (TSC).

   g. Serving as a member of the Accident Assessment Team, when required, during plant emergencies requiring activation of the Technical Support Center.

3.2.6 Control Operator (continued)

R 3. An individual designated Control Operator shall have two years of power plant experience, of which a minimum of one year shall be nuclear plant experience. Each Control Operator must hold a Senior Reactor Operator or Reactor Operator License for Shearon Harris Nuclear Power Plant. (Reference 2.3.1 and 2.4.1)

3.2.7. Shift Technical Advisor

1. The Shift Technical Advisor (STA) is responsible to the S-SO while assigned to a shift for providing operating support during normal operations and accident assessment technical advice during emergency operating conditions. While off shift the STA is responsible to the S-OS.

R 2. The Shift Technical Advisor responsibilities during normal operating conditions are: (Reference 2.4.3)

R a. Contributing to maintaining and upgrading safe plant operations by independently monitoring operations related activities, including forced outages, and proposing corrective actions to enhance or prevent degradation of plant safety. (Reference 2.3.14)

b. **Providing on-shift coverage during plant operations above 200°F to provide accident assessment capability in case of plant emergency situations. To help with oversight, the STA may be stationed in lower modes. He can periodically help the test team in these instances as allowed by his license.**

c. Being aware of current plant activities, equipment status, and planned evolutions that could lead to off-normal operation or complicate recovery operations following an accident.

R d. Complementing shift functions by providing aid in the interpretation of Tech Specs. Providing technical assistance as needed to recommend corrective actions to the Unit SCO or other plant supervision. (Reference 2.2.7)

e. Providing an independent assessment of notifications required by AP-617.

f. Performing post-trip reviews before a plant restart to assure understanding for the trip and assure no associated unresolved safety questions exist.

g. Performing assessment of safety consequences of events resulting in the filing of Licensee Event Reports (LERs) per 10CFR50.73(b)(3).

69. G2.2.1 001/BANK/HIGHER/3/3/2/2.2.1/RO/

Given the following conditions:

- A reactor startup is being performed 90 hours after a plant trip.
- Critical boron concentration is determined to be 80 ppm.
- The estimated critical rod position is Control Bank D at 100 steps.

Which of the following identifies the - 500 PCM and + 500 PCM rod positions for these conditions?

	- 500 PCM	+ 500 PCM
A.	Bank D @ 37 Steps	Bank D @ 175 Steps
B.	Bank D @ 47 Steps	Bank D @ 180 Steps
C✓	Bank D @ 57 Steps	Bank D @ 182 Steps
D.	Bank D @ 62 Steps	Bank D @ 190 Steps

Using the correct graph from the graphs supplied, C is correct. All the other answers could be correct if the wrong curve is used
Common 69

Tier 3 Group 2
K/A Importance Rating - RO 3.7

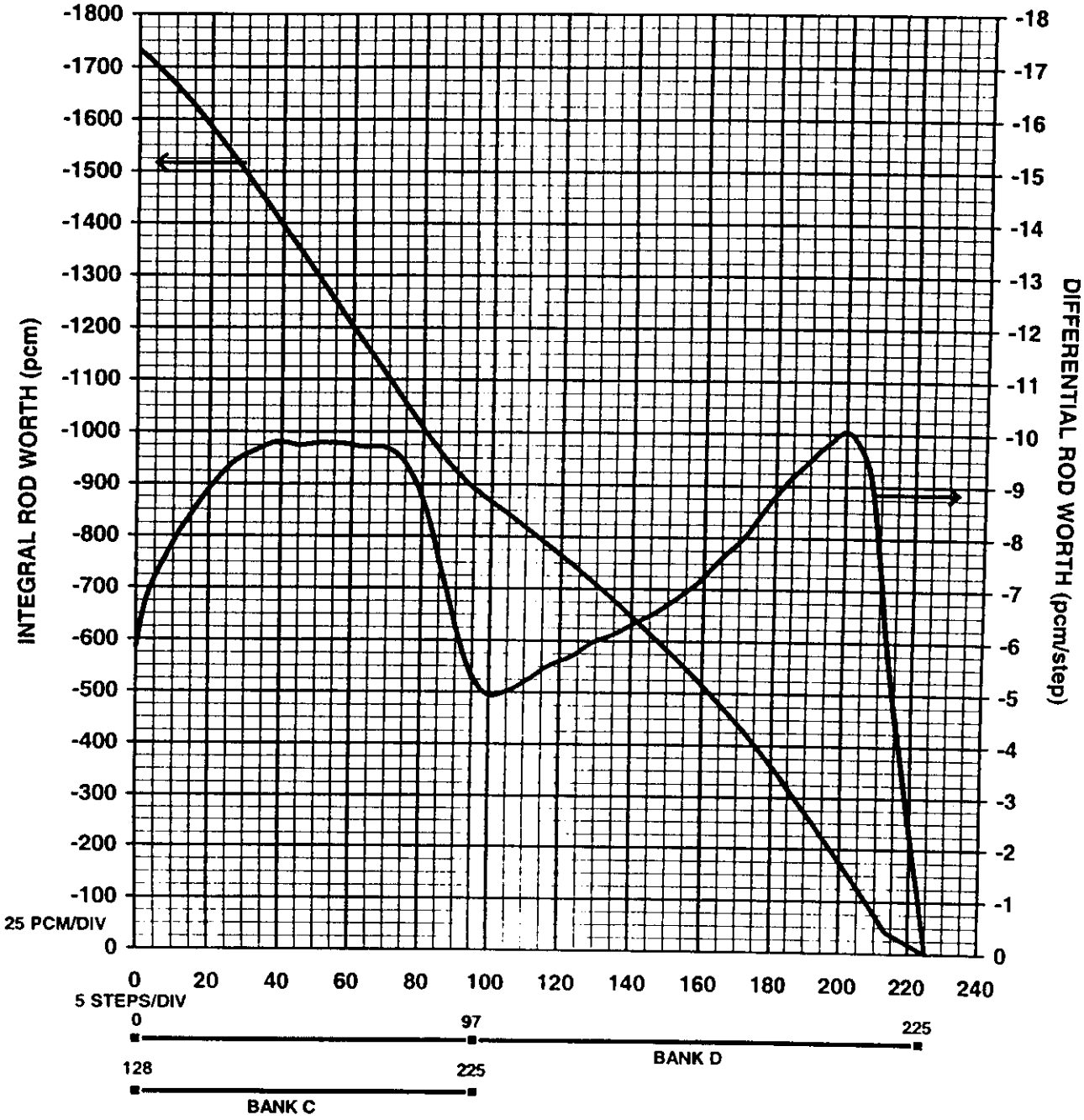
Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity.

Reference(s) - Curve Book
Proposed References to be provided to applicants during examination - Curves A12-6 through 11
Learning Objective - LP GP3-4 OBJ 5
Question Source - Bank
Question History - 2004 Audit RO 04 001
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).6
Comments -

G 2.2.1

HARRIS UNIT 1 CYCLE 13
DIFFERENTIAL AND INTEGRAL
ROD WORTH CONTROL BANKS D and C
MOVING WITH 97 STEP OVERLAP

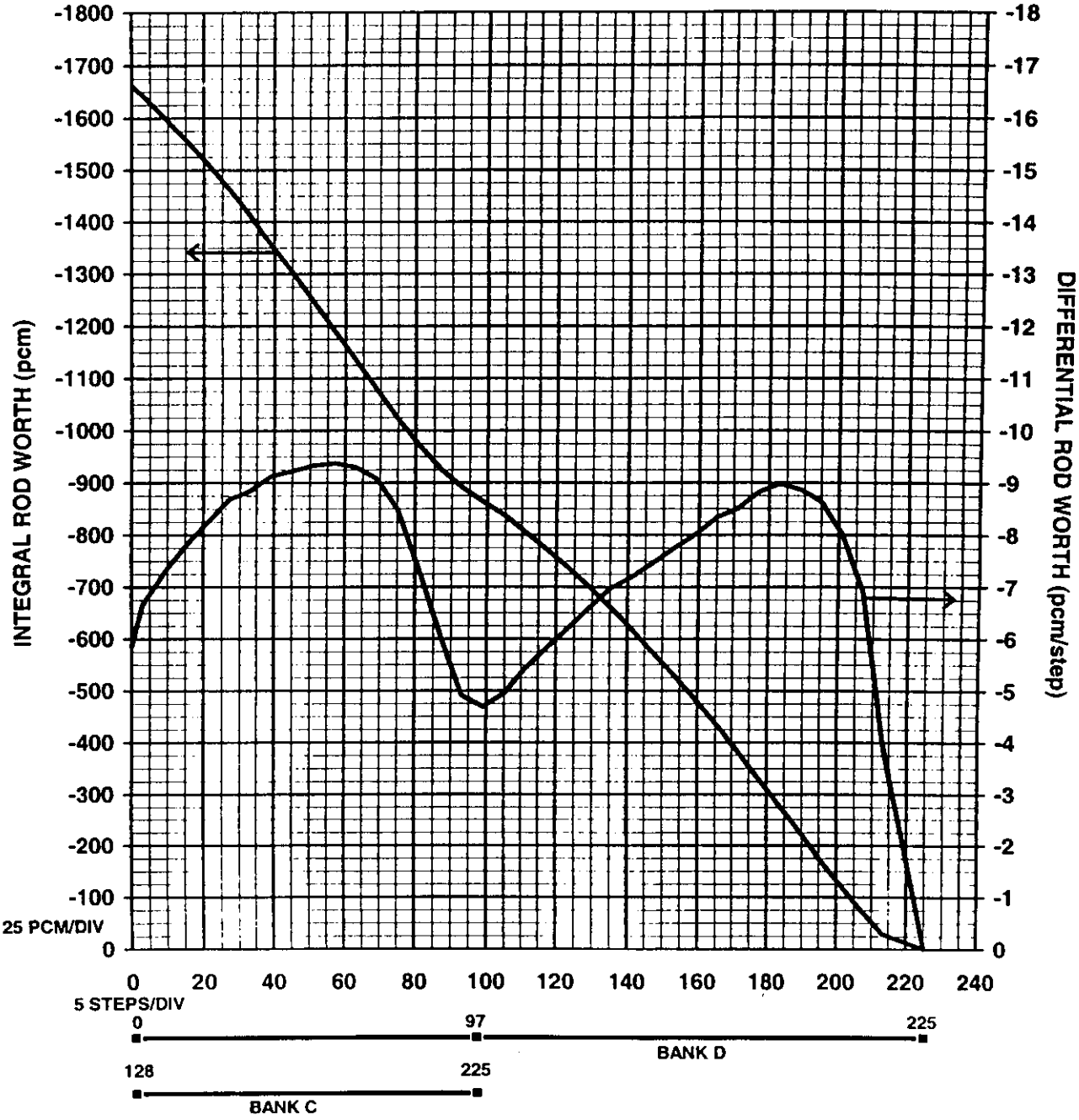
BOL (0 ≤ EFPD ≤ 161), HZP, WITH NO XENON



CURVE NO.	A-13-6	REV NO.	0
ORIGINATOR	Charles Hopkins	DATE	10/24/04
SUPERVISOR	R. Michael Hall	DATE	10/23/04
SUPERINTENDENT - SHIFT OPERATIONS	C R Smith	DATE	10/24/04

HARRIS UNIT 1 CYCLE 13
DIFFERENTIAL AND INTEGRAL
ROD WORTH CONTROL BANKS D and C
MOVING WITH 97 STEP OVERLAP

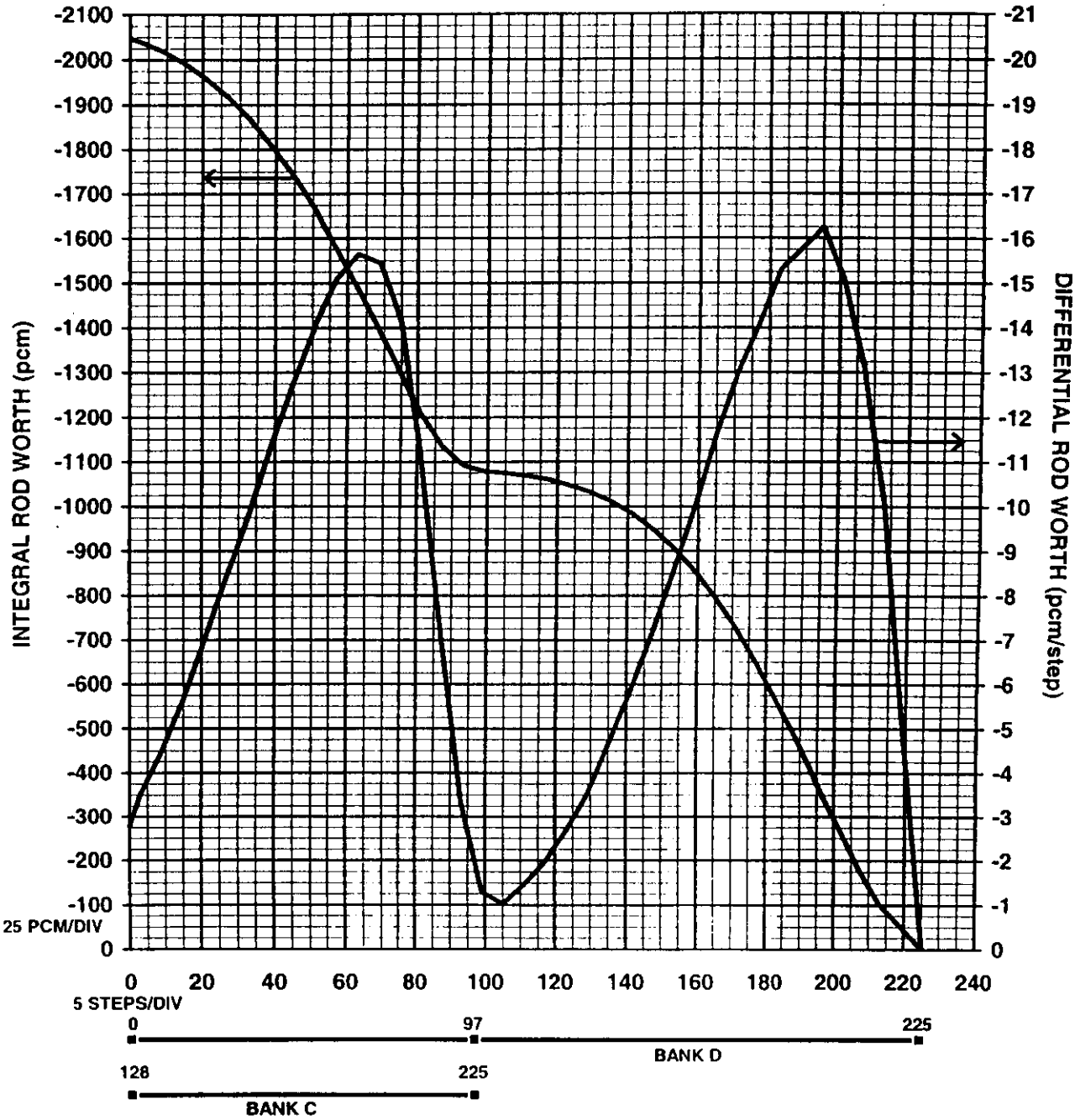
MOL (161 < EFPD ≤ 333), HZP, WITH NO XENON



CURVE NO.	A-13-7	REV NO.	0
ORIGINATOR	[signature]	DATE	10/14/04 10/17/04
SUPERVISOR	[signature]	DATE	10/23/04
SUPERINTENDENT - SHIFT OPERATIONS	CR Smith	DATE	10/24/04

HARRIS UNIT 1 CYCLE 13
DIFFERENTIAL AND INTEGRAL
ROD WORTH CONTROL BANKS D and C
MOVING WITH 97 STEP OVERLAP

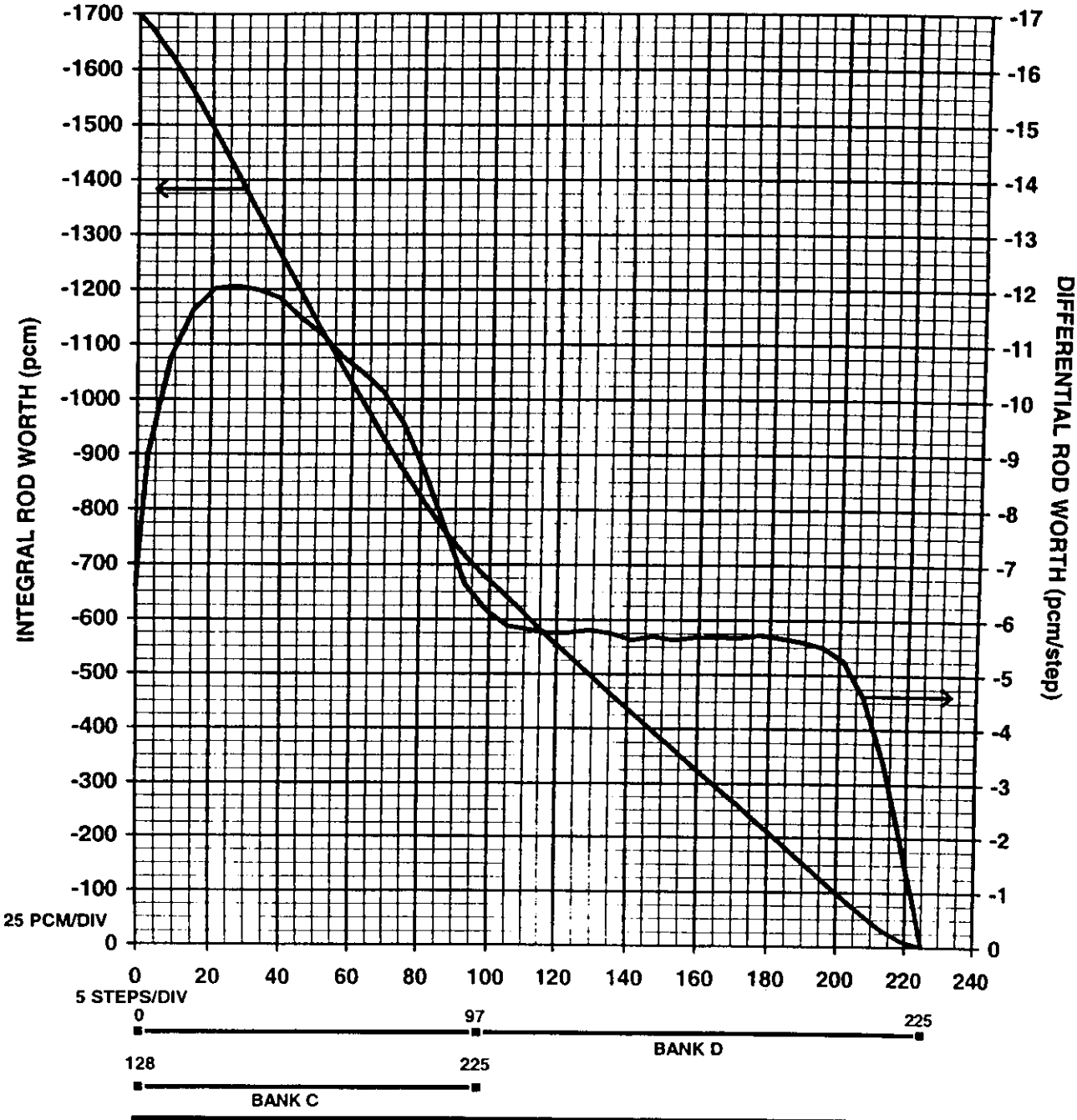
EOL (333 < EFPD ≤ 517), HZP, WITH NO XENON



CURVE NO.	A-13-8	REV NO.	0
ORIGINATOR	Charles J. Griffin	DATE	10/14/04 10/17/04
SUPERVISOR	D. Richard Hill	DATE	10/23/04
SUPERINTENDENT - SHIFT OPERATIONS	C R Smith	DATE	10/24/04

HARRIS UNIT 1 CYCLE 13
DIFFERENTIAL AND INTEGRAL
ROD WORTH CONTROL BANKS D and C
MOVING WITH 97 STEP OVERLAP

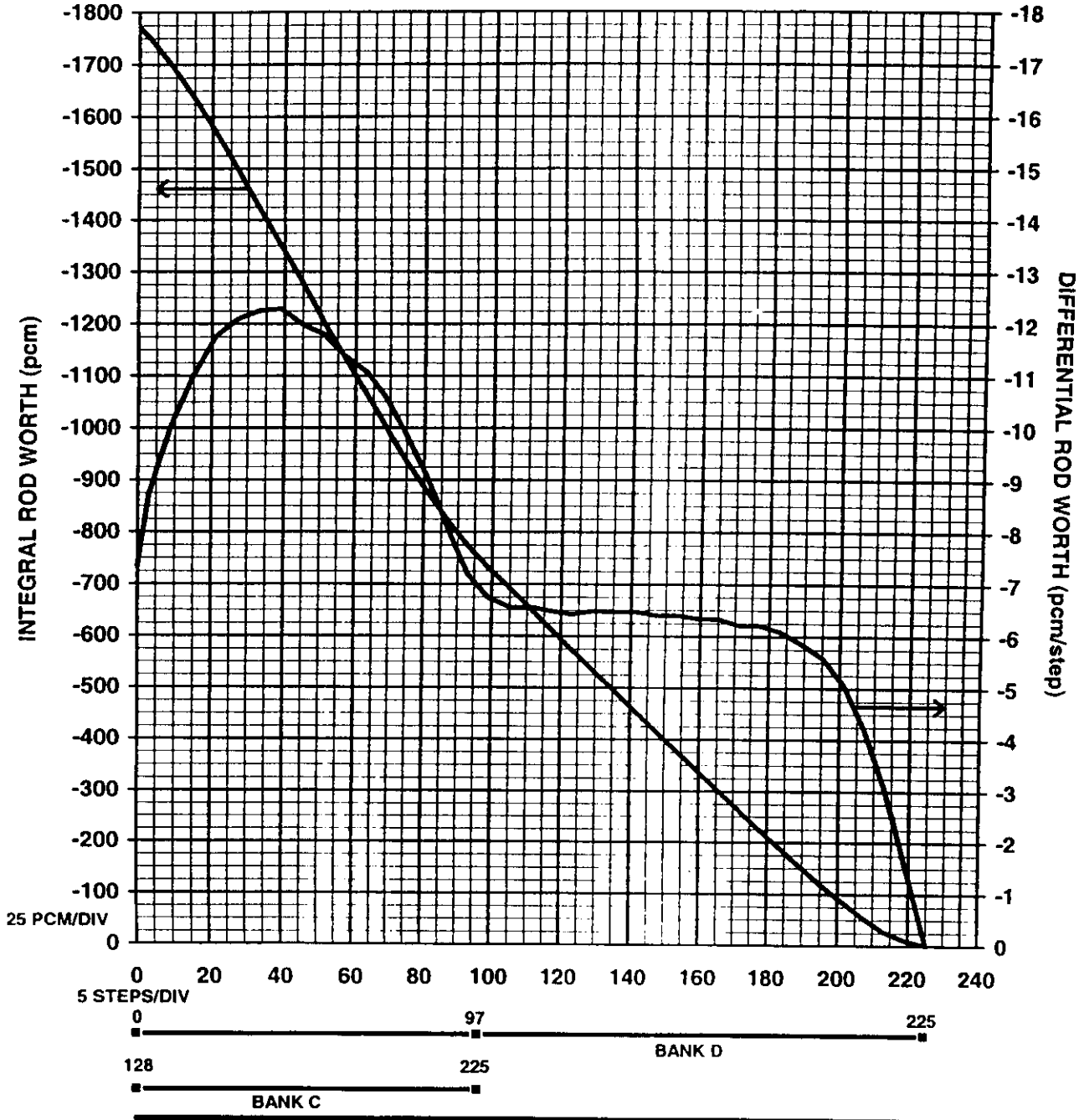
BOL (0 ≤ EFPD ≤ 161), HFP, EQUILIBRIUM XENON



CURVE NO.	A-13-9	REV NO.	0
ORIGINATOR	[signature]	DATE	10/14/04 10/17/04
SUPERVISOR	[signature]	DATE	10/23/04
SUPERINTENDENT - SHIFT OPERATIONS	[signature]	DATE	10/24/04

HARRIS UNIT 1 CYCLE 13
DIFFERENTIAL AND INTEGRAL
ROD WORTH CONTROL BANKS D and C
MOVING WITH 97 STEP OVERLAP

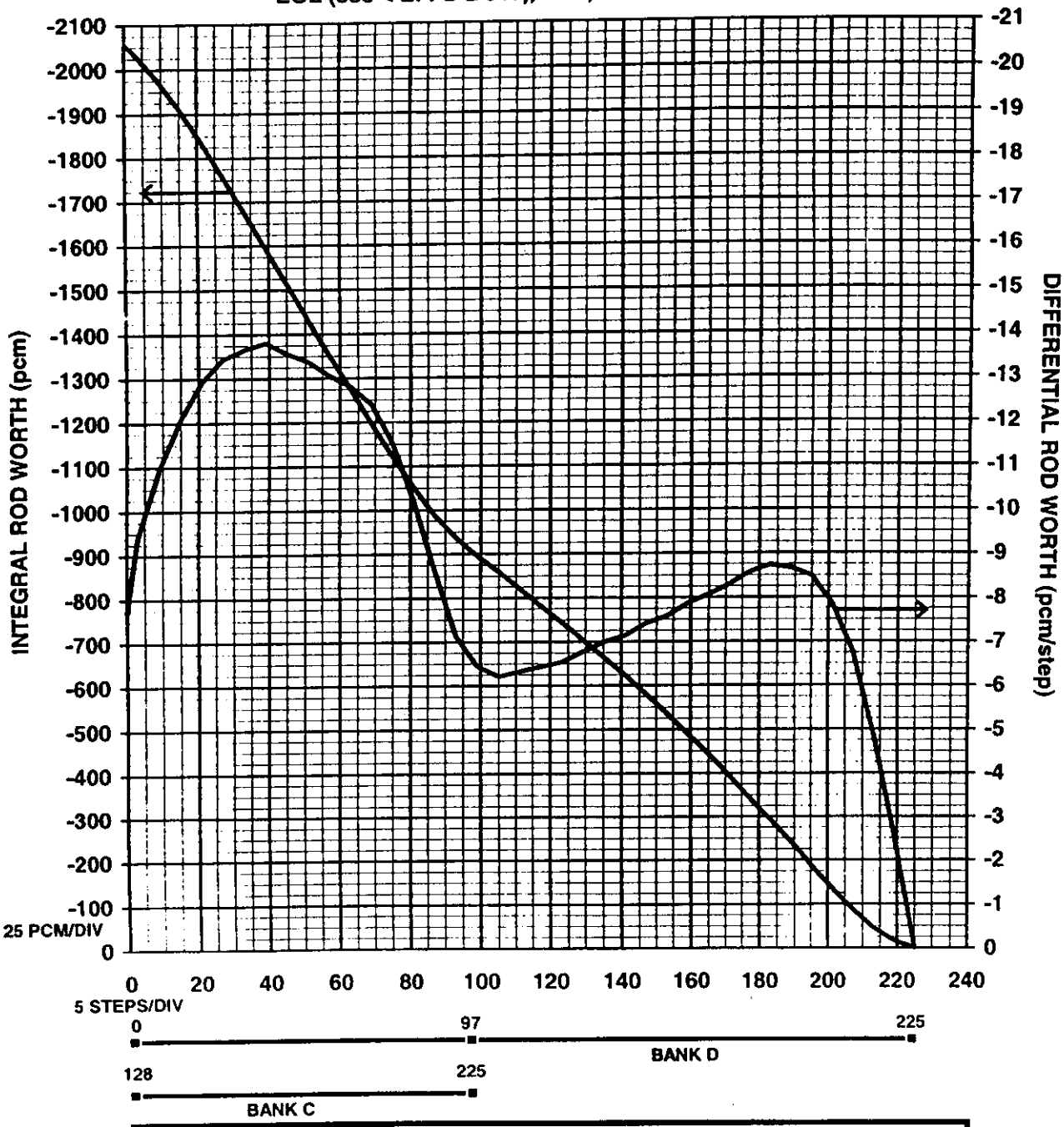
MOL (161 < EFPD ≤ 333), HFP, EQUILIBRIUM XENON



CURVE NO.	A-13-10	REV NO.	0
ORIGINATOR	[signature]	DATE	10/14/04 10/17/04
SUPERVISOR	[signature]	DATE	10/23/04
SUPERINTENDENT - SHIFT OPERATIONS	CR Smith	DATE	10/24/04

HARRIS UNIT 1 CYCLE 13
DIFFERENTIAL AND INTEGRAL
ROD WORTH CONTROL BANKS D and C
MOVING WITH 97 STEP OVERLAP

EOL (333 < EFPD ≤ 517), HFP, EQUILIBRIUM XENON



CURVE NO.	A-13-11	REV NO.	0
ORIGINATOR	Charles K Griffin	DATE	10/14/04 10/22/04
SUPERVISOR	W. Nicholas Ellis	DATE	10/23/04
SUPERINTENDENT - SHIFT OPERATIONS	CR Smith	DATE	10/28/04

70. G2.2.26 002/BANK/LOWER/4/3/2/G2.2.26/RO/

Maintaining the Refueling boron concentration greater than that required by the Core Operating Limit Report (COLR) ensures the reactor remains shutdown by at least ...

A. 1.3%.

B. 2.0%.

C. 2.5%.

D. 5.0%.

Kef <.95 is SD by 5%
Common 70
Tier 3 Group 2
K/A Importance Rating - RO 2.5

Knowledge of refueling administrative requirements.

Reference(s) - TS 3.9.1 basis, PLP-106
Proposed References to be provided to applicants during examination - None
Learning Objective - LP TS2-0 OBJ 5
Question Source - Bank
Question History - 2004 RO Audit 48
Question Cognitive Level -
10 CFR Part 55 Content - 41(b).10, 43(b).2
Comments -

G 2.2.26

3/4.9.1 BORON CONCENTRATION

The limitations on reactivity conditions during REFUELING ensure that: (1) the reactor will remain subcritical during CORE ALTERATIONS, and (2) a uniform boron concentration is maintained for reactivity control in the water volume having direct access to the reactor vessel. These limitations are consistent with the initial conditions assumed for the boron dilution incident in the safety analyses and are specified in the cycle-specific COLR. The boron concentration limit specified in the COLR ensures that a core K_{eff} of ≤ 0.95 is maintained during fuel handling operations. The administrative controls over the required valves during refueling operations precludes the possibility of uncontrolled boron dilution of the filled portion of the RCS. This action prevents flow to the RCS of unborated water by closing flow paths from sources of unborated water.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the Source Range Neutron Flux Monitors and/or Wide Range Neutron Flux Monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core. If the audible indication is lost, then enter LCO Action 3.9.2.b.

3/4.9.3 DECAY TIME - DELETED

3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

The requirements on containment building penetration closure and OPERABILITY ensure that a release of radioactive material within containment will be restricted from leakage to the environment. The OPERABILITY and closure restrictions are sufficient to restrict radioactive material release from a fuel element rupture based upon the lack of containment pressurization potential while in the REFUELING MODE. Penetrations applicable to Technical Specification 3.9.4.b and 3.9.4.c may be opened provided the following administrative controls are in effect:

1. An individual or individuals shall be designated and available at all times, capable of isolating the breached penetration.

2. The breached penetrations shall not be obstructed unless capability for rapid removal of obstructions is provided (such as quick disconnects for hoses).

3. For the Personnel Air Lock, at least one door must be capable of being closed and secured. Additionally, the equipment hatch must be capable of being closed and secured. Equivalent isolation methods may also be used.

The LCO is modified by a Note allowing penetration flow paths providing direct access from the containment atmosphere to the outside atmosphere to be open under administrative controls. Administrative controls ensure that 1) appropriate personnel are aware of the open status of the penetration flow path during CORE ALTERATIONS or movement of irradiated fuel assemblies within containment, and 2) specified individuals are designated and readily available to isolate the flow path in the event of a fuel handling accident.

71. G2.3.10 002/MODIFIED/HIGHER/3/3/3/2.3.10/RO/YES

Given the following conditions:

- An operator is required to complete a valve lineup in an area where the radiation level is 100 mrem/hour.
- The operator's current annual Total Effective Dose Equivalent (TEDE) is 1390 mrem.
- All of the operator's dose has been received while working at Harris Nuclear Plant.

What is the **MAXIMUM** time that the operator may work in this area and still remain within Progress Energy's Annual Administrative Dose Limit?

A. One (1) hour

B. Five (5) hours

C. ✔ Six (6) hours

D. Eight (8) hours

Admin limit is 2000 mr. 1390 + 600 = 1990 mr
Common 72

Tier 3 Group 3
K/A Importance Rating - RO 2.9

Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure.

Reference(s) - NGGM-PM-0002, LP RP-3.5
Proposed References to be provided to applicants during examination - NONE
Learning Objective - RP-3.5-20
Question Source - Modified
Question History - 2002 NRC Exam RO 28
Question Cognitive Level -
10 CFR Part 55 Content - 41(b).12
Comments -

ORIGINAL

G.2.3.10

QUESTION: 28

Given the following conditions:

- An operator is required to complete a valve lineup in an area where the radiation level is 50 mrem/hour.
- The operator's current annual Total Effective Dose Equivalent (TEDE) is 1450 mrem.
- All of the operator's dose has been received while working at Harris Nuclear Plant.

What is the **MAXIMUM** time that the operator may work in this area and still remain within CP&L's Annual Administrative Dose Limit?

a. One (1) hour

b. Eleven (11) hours

c. Fifty-one (51) hours

d. Seventy-one (71) hours

ANSWER:

b. Eleven (11) hours

G 2.3.10

c. Rad

d. Dose equivalent

e. Rem

f. Sievert

g. Quality factor

10. State the quality factor and absorbed dose equal to a unit dose equivalent for gamma, beta, alpha, and neutron radiation

11. Calculate the total dose equivalent for different doses of varying radiation types, using quality factors

12. Define exclusion area and low population zone, and state the criteria used to determine these areas

13. Define the following terms as defined in 10CFR20:

    a. Unrestricted area

    b. Restricted area

    c. Radiation area

    d. High radiation area

    e. Very high radiation area

14. State the 10CFR20 and corporate occupational dose limits for individuals

15. List the requirements for an access point to a high radiation area as stated in 10CFR20

16. List the circumstances under which personnel monitoring devices must be worn

17. Identify the purpose and applications of Appendices B and C in 10CFR20

18. Recognize the events which require immediate notification and the events which require 24-hour notification to the NRC Regional Office as stated in 10CFR20

19. List and state the three basic mechanisms used to control external radiation exposure

20. Calculate total dose based on dose rate and stay time

21. Calculate dose rates at different distances from point sources and line sources

22. Calculate shielding thicknesses required for a given material for attenuating neutron and gamma radiation

Exercise 7:

Calculate the total dose to a person who stays 30 minutes in a field of 5 mR/hr gamma and 2 mrad/hr neutron.

Solution:

$$DE\left(\frac{\text{mrem}}{\text{hr}}\right) = \text{Dose} \times \text{QF}$$

$$= \left(5\,\frac{\text{mR}}{\text{hr}}\right)(1) + \left(2\,\frac{\text{mrad}}{\text{hr}}\right)(10)$$

$$= 25\,\frac{\text{mrem}}{\text{hr}}$$

$$\text{TOTAL DOSE} = \left(25\,\frac{\text{mrem}}{\text{hr}}\right)(.5\ \text{hr})$$

$$= 12.5\ \text{mrem}$$

applicable, should be considered for work involving higher than usual exposures to radiation, difficult to master skills and techniques.

4.5.3 Radiation Control Technicians and their supervisors should review theoretical and practical training. Training or briefing(s) shall also be given to applicable procedures, equipment, and programs. This training shall be performed in accordance with the appropriate training program procedure.

4.5.4 Respiratory Protection training is required for persons who may perform work under the respiratory protection program.

4.6 Exposure Control

4.6.1 Annual Administrative Dose Limits

The Progress Energy goal is that no individual shall exceed the following annual administrative limits for total effective dose equivalent (TEDE):

1. 0.5 rem Progress Energy dose if non-Progress Energy occupational dose for the current year has not been determined (no dose extension permitted).

2. 2 rem Progress Energy dose and 4 rem total dose if non-Progress Energy occupational dose for the current year has been determined.

3. Site Vice President approval is required to exceed the annual administrative dose limits.

4.6.2 Lifetime Administrative Dose Limit

1. Progress Energy personnel cumulative lifetime TEDE in rem shall not exceed the individual's age in years as of the end of the year.

2. Progress Energy personnel annual administrative limit shall be reduced as necessary to avoid exceeding the lifetime dose limit unless an annual dose limit extension is authorized by the Site Vice President or designee.

72. G2.3.2 001/BANK/HIGHER/3/3/3/2.3.2/RO/

A job must be performed under the following conditions:

- Dose rate at job location is 90 mrem/hr.
- Airborne Radioactivity Area from particulates due to weld grinding:
  - Total Internal dose for the job if respirator is worn is 0 mrem.
  - Total Internal dose for the job if no respirator is worn is 82 mrem.
- Time to complete job while wearing a respirator is 3.5 hours.
- Time to complete job without wearing a respirator is 2.75 hours.

Which ONE (1) of the following describes whether a respirator will be worn, and why?

A. No, wearing a respirator will raise total exposure.

B. ✔ Yes, wearing a respirator will lower total exposure.

C. No, wearing a respirator will make no difference to the total exposure.

D. Yes, a respirator must be worn anytime airborne radiation is present.

A. Incorrect. 315 total mr vs. 329.5 mr without respirator
B. Correct. 315 total mr
C. Incorrect. There is a difference if you add the internal dose
D. Incorrect. Not if total dose would be higher by wearing a respirator
Common 71
Tier 3
K/A Importance Rating - RO 2.5

Knowledge of facility ALARA program.

Reference(s) -
Proposed References to be provided to applicants during examination - None
Learning Objective -
Question Source - BANK
Question History - SONGS 2005 NRC Exam 73
Question Cognitive Level - Comprehension
10 CFR Part 55 Content - 41(b).12
Comments -

3.0 DEFINITIONS (continued)

16. **PERMISSIBLE EXPOSURE LIMIT (PEL)** - the OSHA standard, as listed in 29CFR1910 Air Contaminants, for the concentration of a non-radiological atmospheric contaminant to which an employee may be exposed. Three categories of PELs are specified by OSHA as follows:

    - **Permissible Exposure Limit - Time Weighted Average (PEL-TWA)** is the concentration of an air contaminant to which nearly all persons may be repeatedly exposed without suffering discomfort or known ill effects. The PEL for a given contaminant is expressed as a time-weighted average concentration for a normal 8-hour day and 40-hour workweek.

    - **Permissible Exposure Limit - Short-Term Exposure Limit (PEL-STEL)** is the concentration of an air contaminant to which workers can be exposed continuously for a short period of time without suffering from irritation, chronic tissue damage, or narcosis. Exposures at the PEL-STEL should not be longer than 15 minutes and should not be repeated more than 4 times per day. Certain hazards may require a waiting period between exposures.

    - **Permissible Exposure Limit - Ceiling (PEL-C)** is the concentration of an air contaminant that should not be exceeded even instantaneously.

17. **PERSONNEL QUALIFICATION DATABASE (PQD)** - A computer based data retrieval system which maintains accurate and complete records of site personnel qualifications.

18. **SURVEY** - an evaluation of the conditions associated with the use or presence of hazardous material(s) in the work place. This includes the evaluation of both radiological and non-radiological airborne hazards.

19. **TEST** - an evaluation of the actual respiratory protection equipment's performance under simulated use conditions compared to the manufacturer's standards or other test equipment (for example, ATI TDA-2EN, Q-127).

4.0 GENERAL

1. The primary objective of this procedure is to limit personnel uptake of airborne radioactive and nonradioactive materials. Concentrations of airborne radioactive and nonradioactive materials shall be maintained as low as practicable at all times.

2. Engineering controls (containment or ventilation) are the primary means of minimizing the concentration of airborne radioactive and nonradioactive material.

3. When engineering controls are impractical or unable to keep airborne contaminants below applicable limits, other controls shall be used to limit internal intakes, including access control, limitation of exposure time, and/or respiratory protection.

4. The selection and use of respiratory protection equipment shall be balanced against the potential for causing increased, unnecessary external radiation exposure or other health and safety concerns. The use of respiratory equipment shall be consistent with maintaining the total effective dose equivalent (TEDE) as low as reasonably achievable (ALARA).

5. The policy for wearing prescription glasses and contact lenses with full-face piece respirators is outlined in Sections 5.11.2 and 5.11.3.

5.0 IMPLEMENTATION

5.1 Responsibilities

5.1.1 Vice President - Harris Nuclear Project (HNP)

The Vice President - HNP has the overall responsibility for respiratory protection implementation. As such, the respiratory protection standards described in this program are implemented, maintained, and enforced under the authority of the Vice President - HNP. He ensures that resources are available to properly implement respiratory protection.

73. G2.4.27 002/BANK/LOWER/3/3/4/G2.4.27/RO/

All of the following are Control Room Operator Actions, upon verification of a fire per FPP-002, "Fire Emergency," EXCEPT

A. notify the S-SO

B. ✔ coordinate Fire Brigade efforts to protect potentially affected safety-related equipment.

C. review the appropriate Fire Preplan List.

D. sound the fire alarm and announce the location of the fires.

The Fire Brigade Leader provides the action in B. The RO is responsible for all other actions listed
Common 74

Tier 3 Group 4
K/A Importance Rating - RO 3.0

Knowledge of fire in the plant procedure.

Reference(s) - FPP-002
Proposed References to be provided to applicants during examination - None
Learning Objective -
Question Source - Bank
Question History - PP-2.15-R1 003
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).10
Comments -

G 2.4.27

8.0 PROCEDURE

8.1 Response of the Control Room

NOTE: If spurious valve operations or other component operations occur coincident with a fire alarm or report of a fire, these unexpected component operations should be considered as a result of the fire. This should be considered a CONFIRMATION of a fire.

1. If a confirmed fire is reported to the Control Room, go to Step 8.1.7. _____

2. When a fire alarm is received or the Control Room is notified of a fire emergency, the Unit SCO shall immediately perform the following:

   a. Suspend all Control Room activities not directly involved with the fire emergency. _____

   b. Restrict all Control Room access to personnel not directly involved with the fire emergency. _____

   c. Direct Control Room personnel to increase plant equipment monitoring, especially in the area of the suspected or potential fire. _____

3. If any of the following occurs, dispatch an AO or other Operations personnel to investigate:

   - Fire alarm received for any plant area excluding the Containment. _____
   - Fire alarm received for areas inside the Containment and Containment Integrity is not required. _____

4. If a single fire alarm is received for areas inside the Containment when the Containment is not occupied and Containment Integrity is required, monitor the following to determine if a fire exists: _____

   - Level increase in Containment Sump. (this would indicate a sprinkler head has opened.)
   - Unexplained temperature increase in Containment.
   - Unexplained alarms in the Control Room
   - Fire alarm received in an adjacent fire detection zone.
   - Fire pump start

8.1 Response of the Control Room (continued)

5. If Hot Work caused a fire alarm inside Containment, the assigned fire watch will investigate. Fire brigade response is not required unless the fire spreads and assistance is requested. _____

6. If confirmation is received that no fire exists perform the following:

   a. Prepare a WR, if necessary. _____

   b. Exit this section. _____

NOTE: Notification as required by Plant Emergency Procedures shall be completed within fifteen minutes of the Emergency Action Level (EAL) declaration.

7. When confirmation is received that a fire exists or a second alarm (fire alarm in adjacent zone or a fire pump start) is received in the Control Room, perform the following:

   a. Sound the plant fire alarm. _____

   b. Dispatch the Fire Brigade _____

   c. Announce the following information on the PA System:

      - Location and nature of the fire. _____
      - Any evacuation directions. _____
      - The use of Two Way Radios and the PA System is restricted to emergency communications until further notice. _____
      - Control Room access to non-essential personnel is restricted. _____

   d. Sound the fire alarm again _____

   e. Repeat all PA announcements. _____

   f. Dispatch an Operator to the fire alarm/report area to investigate the cause and determine component(s) affected for any area in the plant excluding Containment, except when Containment Integrity is NOT required. _____

   g. Notify the Superintendent - Shift Operations. _____

8.1 Response of the Control Room (continued)

NOTE: De-energizing a bus or MCC could result in a RPS or ESF actuation. It is appropriate to perform the manual actuation prior to de-energizing the bus or MCC if it is known that a RPS or ESF actuation will occur.

h. De-energize the AFFECTED bus(es), MCC(s), or electrical panel(s) if any of the following occur:

- Spurious valve operations or other component operations occur coincident with a fire alarm or report of fire _____
- An Operator finds an electrical bus, MCC(s) or electrical panel(s) on fire. _____

CAUTION

In the event of a fire in Containment in Modes 1-4, the Containment Hose Header is required to be placed in service prior to the Fire Brigade entering Containment. This action places the plant into Technical Specification LCO 3/4.6.3, Containment Isolation Valves.

---

i. If the fire is in the Containment, Containment Integrity is required, and it has been determined by the Superintendent - Shift Operations that an Emergency Containment Entry is required, perform the following:

(a) Notify Health Physics. _____

(b) Place the Containment Hose Header in service per OP-149. _____

(c) Notify Fire Brigade members Containment entry will be per the Special Instructions listed on Global Radiation Work Permits for Fire Brigade Response in Containment. _____

j. Secure supply ventilation fans to the fire area as necessary. _____

k. Smoke Purge should be considered, if available, at the direction of the Fire Brigade Team Leader and the S-SO. (AR 00031967) _____

NOTE: In any safety-related area, the corresponding fire pre-plan identifies the safety-related equipment which may be affected by the fire.

l. Reference the appropriate fire pre-plan referenced in Attachment 1. _____

m. Refer to AOP-036. _____

8.1 Response of the Control Room (continued)

NOTE: It may be necessary to take actions which deviate from License Conditions or Technical Specifications. These actions require approval per PRO-NGGC-0200.

n. Ensure the plant is in a safe condition commensurate with the existing or potential consequences of the fire on safe plant operation. _____

o. Ensure implementation of PEP-110, Emergency Classification and Protective Action Recommendations. _____

p. If additional assistance is requested by the Fire Brigade Team Leader, contact the Raleigh Central Dispatch per PEP-310, Notifications and Communications, and request assistance from the Apex Volunteer Fire Department and/or the Holly Springs Fire Department. _____

q. When requesting Fire Department assistance, also, request Emergency Medical Services response to support fire fighting efforts. _____

r. Ensure Security Unit is promptly notified of the following:

- Fire location. _____
- Desired response by members of the security force. _____
- E.T.A. and possible number of off-site responders. _____
- Desired deployment of off-site responders. _____

s. Ensure Fire Protection Staff is promptly notified of the emergency (Beeper # 919-420-5922). _____

t. If the fire emergency is of an extended duration and the Diesel-Driven Fire Pump or the Back Up Diesel-Driven fire pump is operating, dispatch an operator to monitor the pump operation. Shut down the Diesel-Driven Fire Pump as soon as it is no longer required to support the fire fighting efforts. _____

u. When the fire is extinguished, direct recovery to normal plant operation giving consideration to the following:

(1) The need for fire watches while fire detection and suppression systems are out of service. _____

8.1 Response of the Control Room (continued)

(2) Restoring fire detection and suppression systems to normal operational alignment per plant Operating Manual (OP-149). _____

(3) Isolating and securing the alternate backup pump and supply. _____

(4) Compliance with Technical Specifications for the following: _____

(a) TS 3/4.7.6 - Control Room Emergency Filtration System

(b) TS 3/4.7.7 - RAB Emergency Exhaust System

(c) TS 3/4.9.12 - FHB Emergency Exhaust system

8.2 Response of the Fire Brigade Team

1. The Fire Brigade Team members shall assemble at the Fire Brigade Staging Area.

NOTE:
- Self Contained Breathing Apparatus can be donned at the fire scene but must be donned prior to entry into an IDLH atmosphere.
- The Fire Brigade Team Leader can approve the removal of SCBAs, if conditions do not require their use.

2. Don fire fighting apparel and obtain self-contained breathing apparatus and proceed to the fire scene.

3. Assess the on-scene conditions and extinguish the fire using the following guidelines:

   a. Use the fire pre-plan appropriate to the room for basic information on the fire hazards, room contents, and fire fighting techniques.

   b. Observe actuation of automatic suppression systems where installed.

   c. Conduct fire fighting as directed by the Fire Brigade Team Leader.

   d. During performance of interior firefighting operations, personnel shall remain in voice or visual communication with each other.

   e. Use teams with a minimum of two members for interior structural firefighting or rescue situations.

   f. With the exception of search/rescue situations, ensure a Rapid Intervention Team (RIT) of at least two Fire Brigade members is established prior to commencing interior structural fire fighting for fires beyond the incipient stage. The Fire Brigade Team Leader may fill one of the RIT positions.

8.3 Response of the Fire Brigade Team Leader

1. Perform an initial size-up of the situation based on information provided from the fire pre-plans or Recon Team report and establish a command post.
2. Direct the fire fighting effort of the Fire Brigade and any Off-Site responding agencies.

NOTE: Off-site assistance would be necessary if the fire appears to be beyond the capability of two fire extinguishers, or if heavy smoke is present and the fire cannot be located in a timely manner.

3. Advise the Unit SCO of the initial fire condition including the need for off-site assistance.
4. Use the appropriate fire pre-plan for information on the fire hazard, room contents, and component layout.
5. Keep the Control Room informed of subsequent status changes.
6. Request necessary support such as radiation monitoring, first aid, and Security force from the Superintendent - Shift Operations.
7. Coordinate and control support by off-site fire companies that are appropriate for the circumstances.
8. Notify Security Unit if the fire is of a suspicious origin.
9. Maintain accountability of fire brigade members at the fire scene.
10. Perform the following when the fire is extinguished:
    a. Notify the Unit SCO.

NOTE: Fire Protection supply valves are identified in the Fire Pre-Plans.

    b. If an Automatic Fire Suppression System is activated, perform the following:
        (1) Close the supply valve(s).
        (2) Posting a Fire Watch on the valve(s) and the area served by the system.
        (3) Establish communication between the Fire Watch stations.
    c. Assign a Fire Watch if there is potential for re-flash or re-ignition after the auto suppression system is restored.
    d. Direct Fire Brigade Team members' activities including restoring fire fighting equipment and systems to service.
    e. Ensure the initiation of the necessary maintenance requests to restore fire suppression systems and housekeeping conditions. For fire suppression systems, these requests should require replacement or recharge, as necessary, fusible links, portable fire extinguishers and Halon systems.

8.3 Response of the Fire Brigade Team Leader (continued)

f. Ensure preservation of evidence and the fire scene for investigation.

g. Ensure that a Fire Report is prepared per FPP-003.

8.4 Response of the Security Unit

1. Grant access to responding off-site emergency units to the protected areas and necessary vital areas per the provisions of the approved SHNPP Security plan and implementing security procedures.
2. Escort the off-site emergency personnel to the scene.
3. Provide transportation of the Fire Response Vehicle to the location determined by the Fire Brigade Team Leader.

8.5 Response of General Plant Personnel to Fire Alarm

1. When a local fire alarm is activated in any plant building, all personnel shall evacuate to the exterior of the building, assemble in a safe location, ensure the Control Room is notified, and follow instructions given through the PA System.
2. Building occupants shall not re-enter the building until an announcement is made on the PA System by the Control Room. Silencing the building alarm does not grant permission to re-enter the building.

8.6 Response of Person discovering a Fire on Site

1. The person discovering the fire, shall immediately proceed to the nearest means of communication and report the fire to the Control Room using extension 5555 or the PA system.
2. Speaking slowly and distinctly, provide the Control Room with the following information, to the extent known:
   a. Your name.
   b. Exact location of the fire.
   c. Type of combustibles involved in the fire (class of fire, if possible).
   d. Nature of the fire (electrical, oil, contaminated material, etc.).
   e. Severity of fire (smoldering, small blaze, room engulfed in flames, amount of smoke, etc.).
   f. Nature of personnel injuries, if any.
3. Unless undue personal risk is apparent or doubt exists in the ability to properly use fire extinguishers, the person discovering the fire may, after reporting the fire, attempt to extinguish the fire using the appropriate class of fire extinguisher.

74. G2.4.34 001/NEW/LOWER/3/3/4/G2.4.34/RO/

During performance of AOP-004, Remote Shutdown, which ONE (1) of the following describes the responsibility of the RO?

A. Monitor and control plant conditions from the Auxiliary Control Panel (ACP)

B. ✓ Align plant equipment at the Auxiliary Transfer Panel (ATP) and Switchgear Rooms to facilitate control of plant equipment from outside the control room

C. Start and control EDGs locally to provide safety-related power

D. Locally operate and control CSIPs for RCS Makeup

B is correct per AOP-004, whether there is a fire or no fire. A is performed by USCO. C is performed by BOP. D is performed by RAB operator
Common 73

Tier 3 Group 4
K/A Importance Rating - RO 3.8

Knowledge of RO tasks performed outside the main control room during emergency operations including system geography and system implications.

Reference(s) - AOP-004
Proposed References to be provided to applicants during examination - None
Learning Objective - LP AOP3-4, OBJ 7
Question Source - New
Question History -
Question Cognitive Level - Lower
10 CFR Part 55 Content - 41(b).10
Comments -

G 2.4.34

3.1 Remote Shutdown Due To Fire

TABLE 2 (continued)

	Valve	Location/ Responsibility	MCC	Location/ Responsibility
☐	1CS-218, CSIP Discharge Header Cross Connect	247' RAB / RAB	1A35-SA-14D	261' RAB / RAB or EXTRA
☐	1CS-219, CSIP Discharge Header Cross Connect	247' RAB / RAB	1A35-SA-14E	261' RAB / RAB or EXTRA
☐	1CS-171, CSIP Suction Header Cross Connect	247' RAB / RAB	1B35-SB-4D	261' RAB / RAB or EXTRA
☐	1CS-220, CSIP Discharge Header Cross Connect	247' RAB / RAB	1B35-SB-9D	261' RAB / RAB or EXTRA
☐	1CS-217, CSIP Discharge Header Cross Connect	247' RAB / RAB	1B35-SB-12C	261' RAB / RAB or EXTRA
☐	1CS-196, Charging/SI Pump Miniflow (See Step 12 CAUTION)	247' RAB / RAB	1B35-SB-4E	261' RAB / RAB or EXTRA
☐	1CS-210, Charging/SI Pump Miniflow (See Step 12 CAUTION)	247' RAB / RAB	1B35-SB-5B	261' RAB / RAB or EXTRA

NOTE

The following alignment may be performed as time permits. Do NOT delay other steps to complete this step. This alignment will be completed in step 22.

Cable Vaults A and B / RO with ATP cabinet key

☐ **13. REFER TO** Attachment 4, Auxiliary Transfer Panel Alignment,
AND INITIATE alignment of auxiliary equipment on Auxiliary Transfer Panels SA and SB.

75. G2.4.43 002/BANK/HIGHER/4/3/4/G2.4.43/RO/

After a loss of power to 60 KVA NNS UPP-1, what method of communication will be used between the MCR and plant personnel?

A. Plant PA

B. Radios

C. Telephones

D. ✔ Sound Powered Phones

Sound Powered phones would be only phones available. Procedure directs their use
Common 75

Tier 3 Group 4
K/A Importance Rating - RO 2.8

Knowledge of emergency communications systems and techniques.

Reference(s) - AOP-024
Proposed References to be provided to applicants during examination - None
Learning Objective - LP AOP3-24, OBJ 3
Question Source - Bank
Question History - Comm
Question Cognitive Level - Higher
10 CFR Part 55 Content - 41(b).7
Comments -

G 2.4.43

INSTRUCTIONS	RESPONSE NOT OBTAINED

3.2 Loss of 60 KVA NNS UPS Bus UPP-1

1. Manually CONTROL the following, as necessary:

- ☐ • DEH
- ☐ • Condensate Booster Pumps
- ☐ • Steam Dumps
- ☐ • PRZ Master Pressure controller
- ☐ • PRZ heaters and sprays

☐**2. PLACE** BOTH Steam Dump Interlock Bypass Switches in OFF/RESET.

☐**3. CHECK** the Turbine-Generator OPERATING.

☐**3. GO TO** Step 5.

✱**4. MONITOR** the following parameters for normal values:

☐**4. Manually CONTROL** systems as required to maintain normal parameters.

- ☐ • Generator temperature
- ☐ • Generator load
- ☐ • Gland Seal pressure

☐**5. CHECK** a Condenser Vacuum Pump OPERATING.

☐**5. GO TO** Step 7.

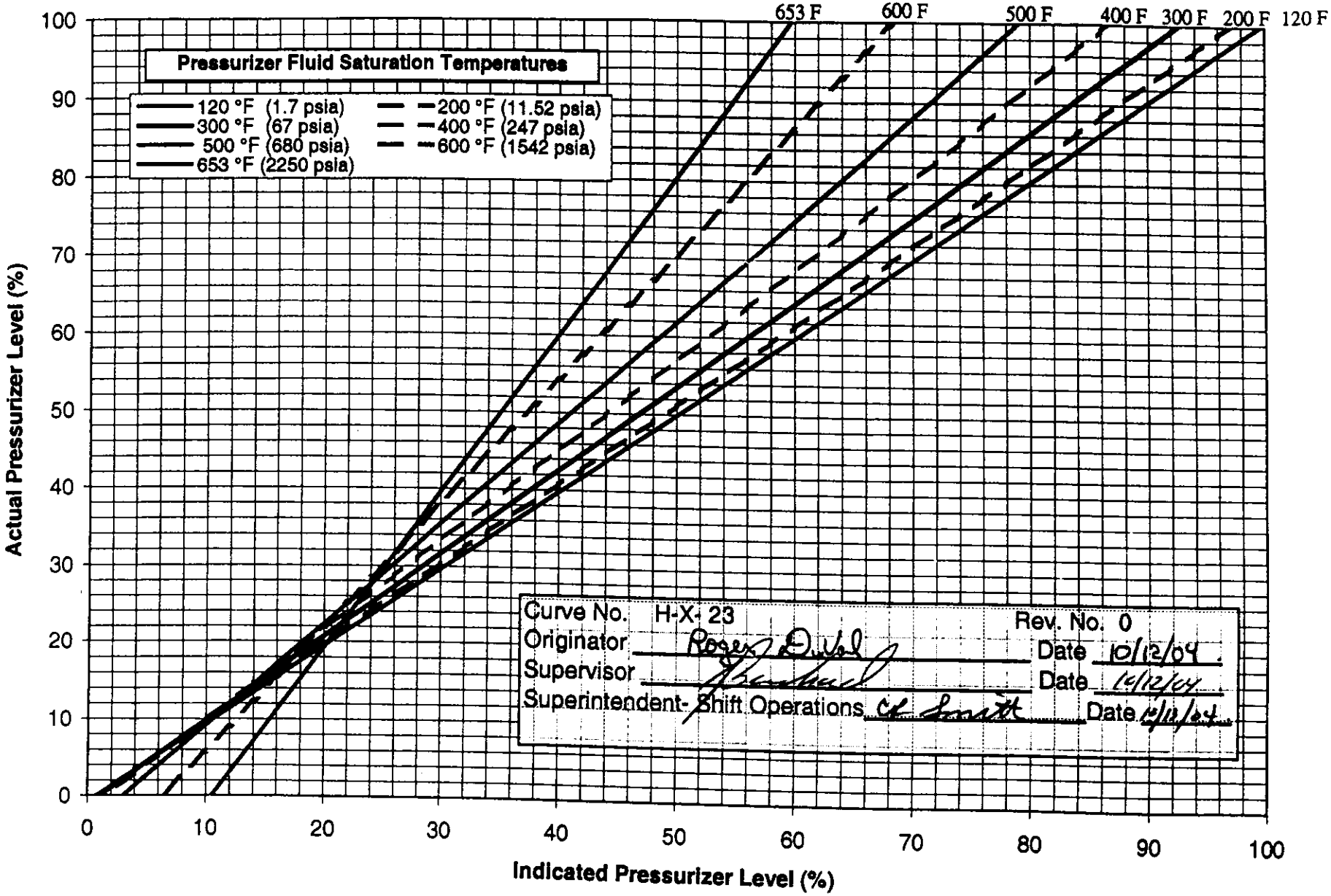
☐**6. START** CVPETS per OP-133, Main Condenser Air Removal System.

☐**7. ESTABLISH** sound powered phone communications with plant personnel as needed.

8. NOTIFY WPB Control Room of the following:

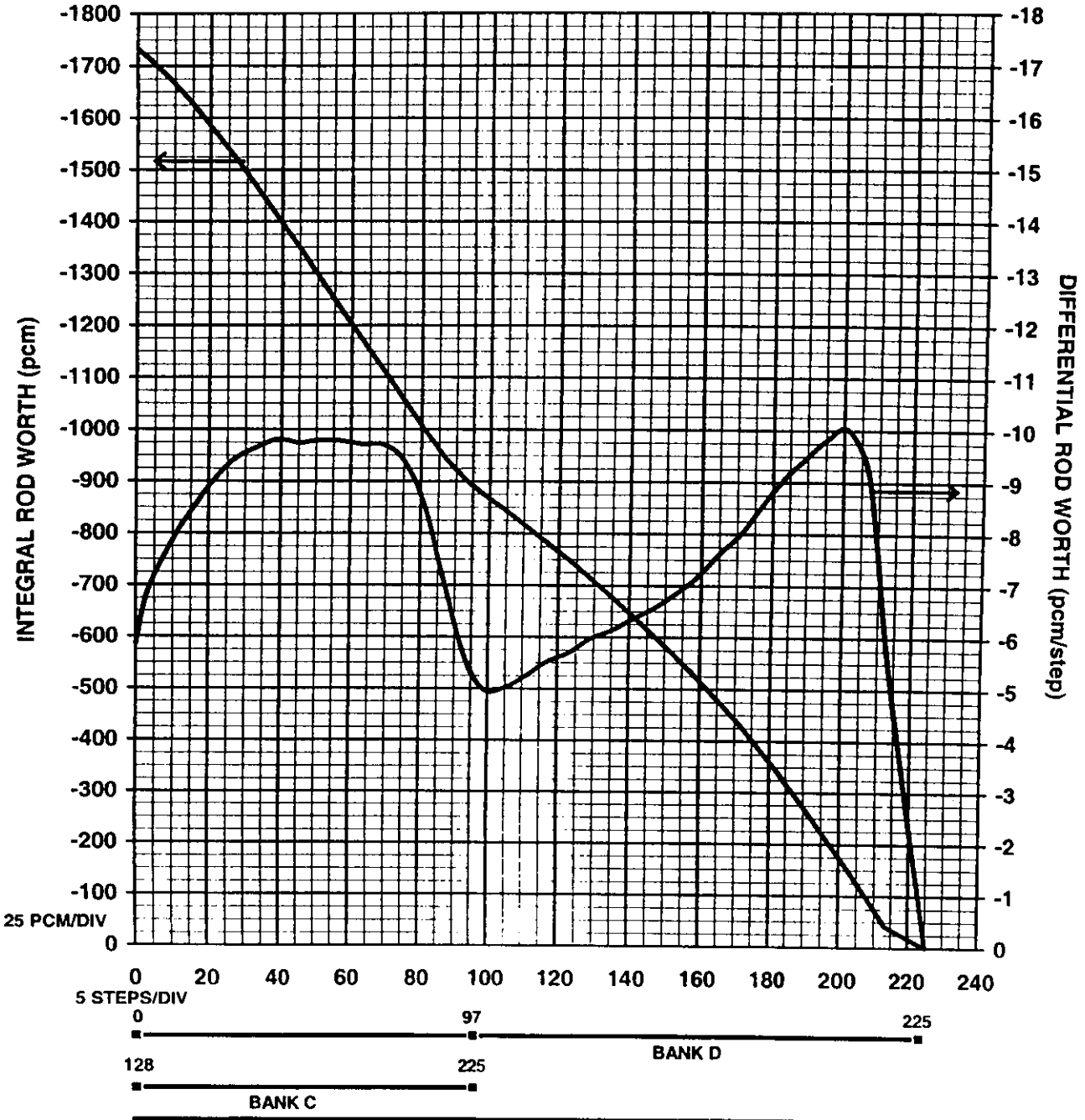
- ☐ • WPB vent stack monitors are inoperable
- ☐ • Verify all gaseous releases have stopped

Pressurizer Level Cold Calibrated Channel (LI-462)
Indicated Level versus Actual Water Level at Various Saturation Temperatures



HARRIS UNIT 1 CYCLE 13
DIFFERENTIAL AND INTEGRAL
ROD WORTH CONTROL BANKS D and C
MOVING WITH 97 STEP OVERLAP

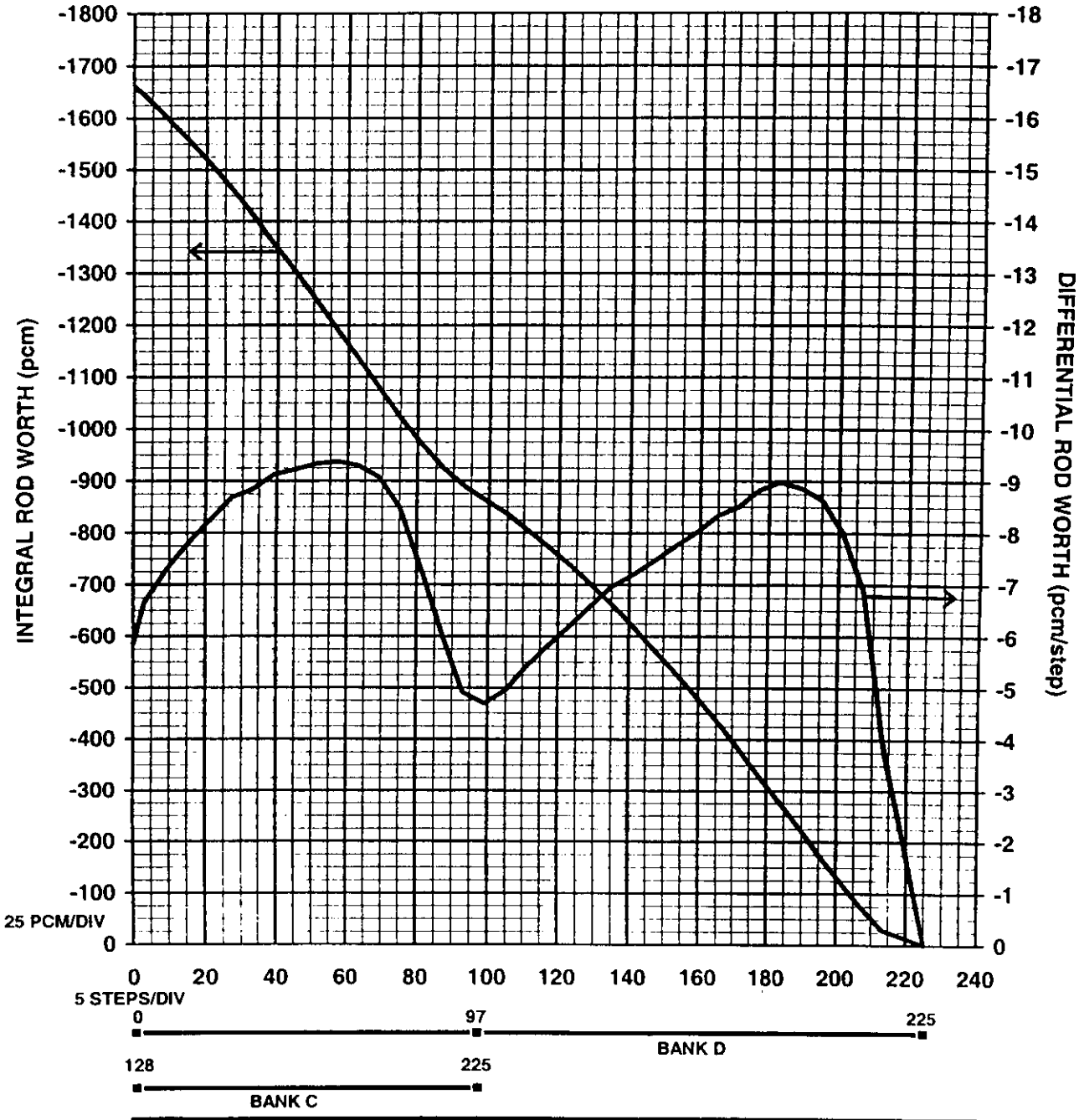
BOL (0 ≤ EFPD ≤ 161), HZP, WITH NO XENON



CURVE NO.	A-13-6	REV NO.	0
ORIGINATOR	Charles [illegible]	DATE	10/14/04 10/12/04
SUPERVISOR	[illegible]	DATE	10/23/04
SUPERINTENDENT - SHIFT OPERATIONS	CR Smith	DATE	10/24/04

HARRIS UNIT 1 CYCLE 13
DIFFERENTIAL AND INTEGRAL
ROD WORTH CONTROL BANKS D and C
MOVING WITH 97 STEP OVERLAP

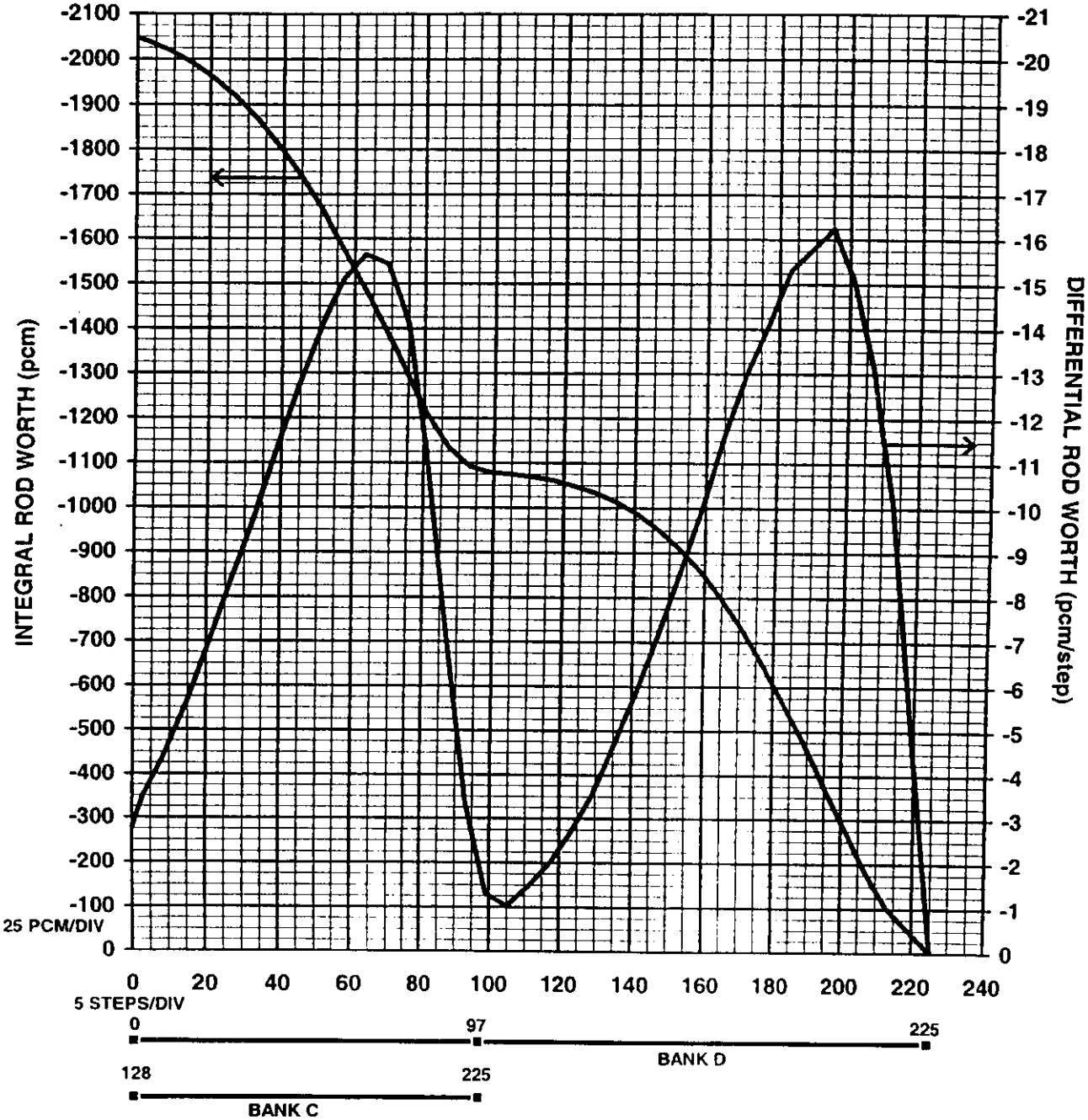
MOL (161 < EFPD ≤ 333), HZP, WITH NO XENON



CURVE NO.	A-13-7	REV NO.	0
ORIGINATOR	Charles S. Griffin	DATE	10/14/04 10/7/04
SUPERVISOR	[signature]	DATE	10/23/04
SUPERINTENDENT - SHIFT OPERATIONS	CR Smith	DATE	10/24/04

HARRIS UNIT 1 CYCLE 13
DIFFERENTIAL AND INTEGRAL
ROD WORTH CONTROL BANKS D and C
MOVING WITH 97 STEP OVERLAP

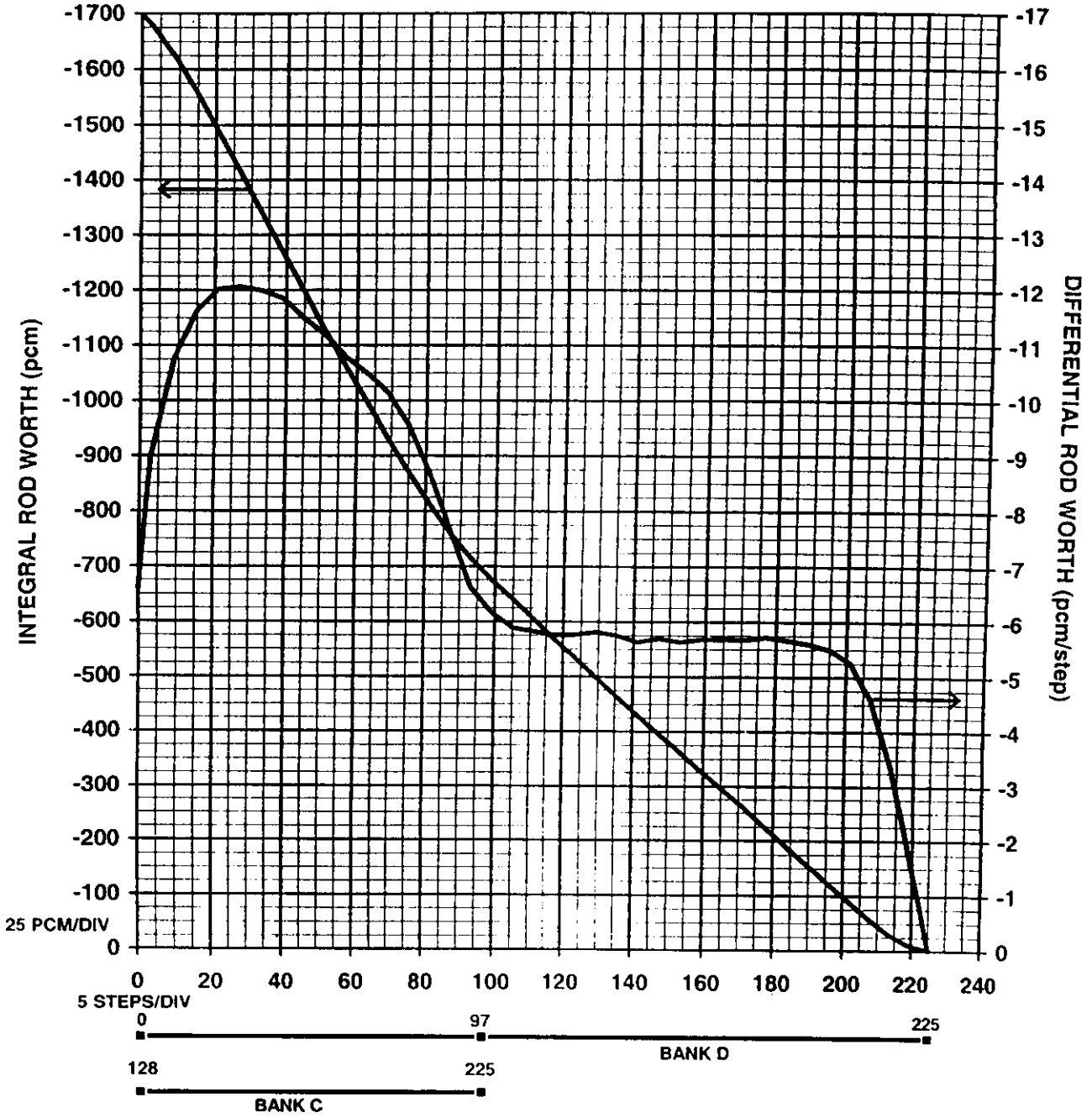
EOL (333 < EFPD ≤ 517), HZP, WITH NO XENON



CURVE NO.	A-13-8	REV NO.	0
ORIGINATOR	Charles Hopkins	DATE	10/14/04 10/17/04
SUPERVISOR	R. Michael Hall	DATE	10/23/04
SUPERINTENDENT - SHIFT OPERATIONS	CR Smith	DATE	10/24/04

HARRIS UNIT 1 CYCLE 13
DIFFERENTIAL AND INTEGRAL
ROD WORTH CONTROL BANKS D and C
MOVING WITH 97 STEP OVERLAP

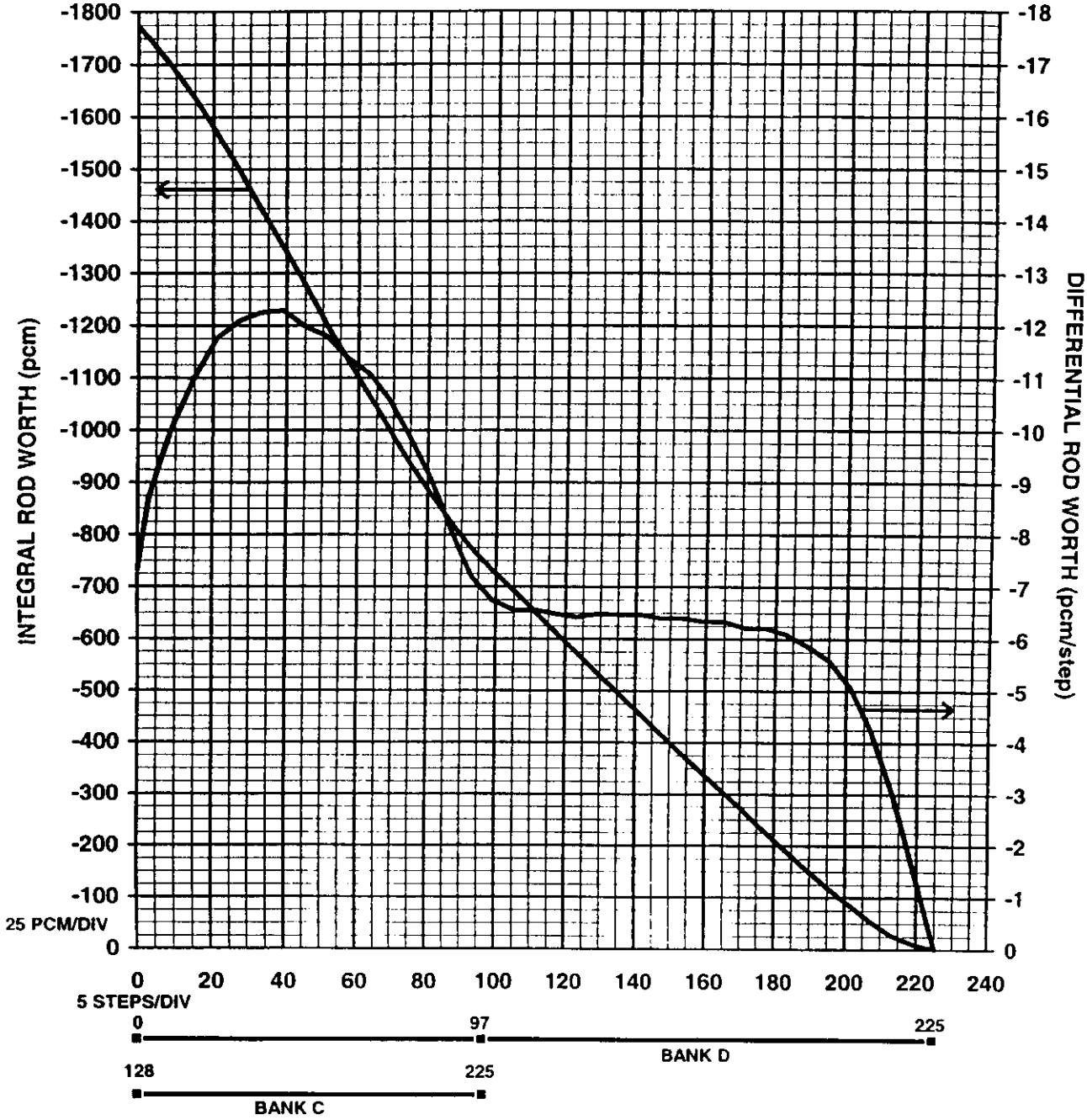
BOL (0 ≤ EFPD ≤ 161), HFP, EQUILIBRIUM XENON



CURVE NO.	A-13-9	REV NO.	0
ORIGINATOR	[signature]	DATE	10/24/04 10/27/04
SUPERVISOR	[signature]	DATE	10/23/04
SUPERINTENDENT - SHIFT OPERATIONS	CR Smith	DATE	10/24/04

HARRIS UNIT 1 CYCLE 13
DIFFERENTIAL AND INTEGRAL
ROD WORTH CONTROL BANKS D and C
MOVING WITH 97 STEP OVERLAP

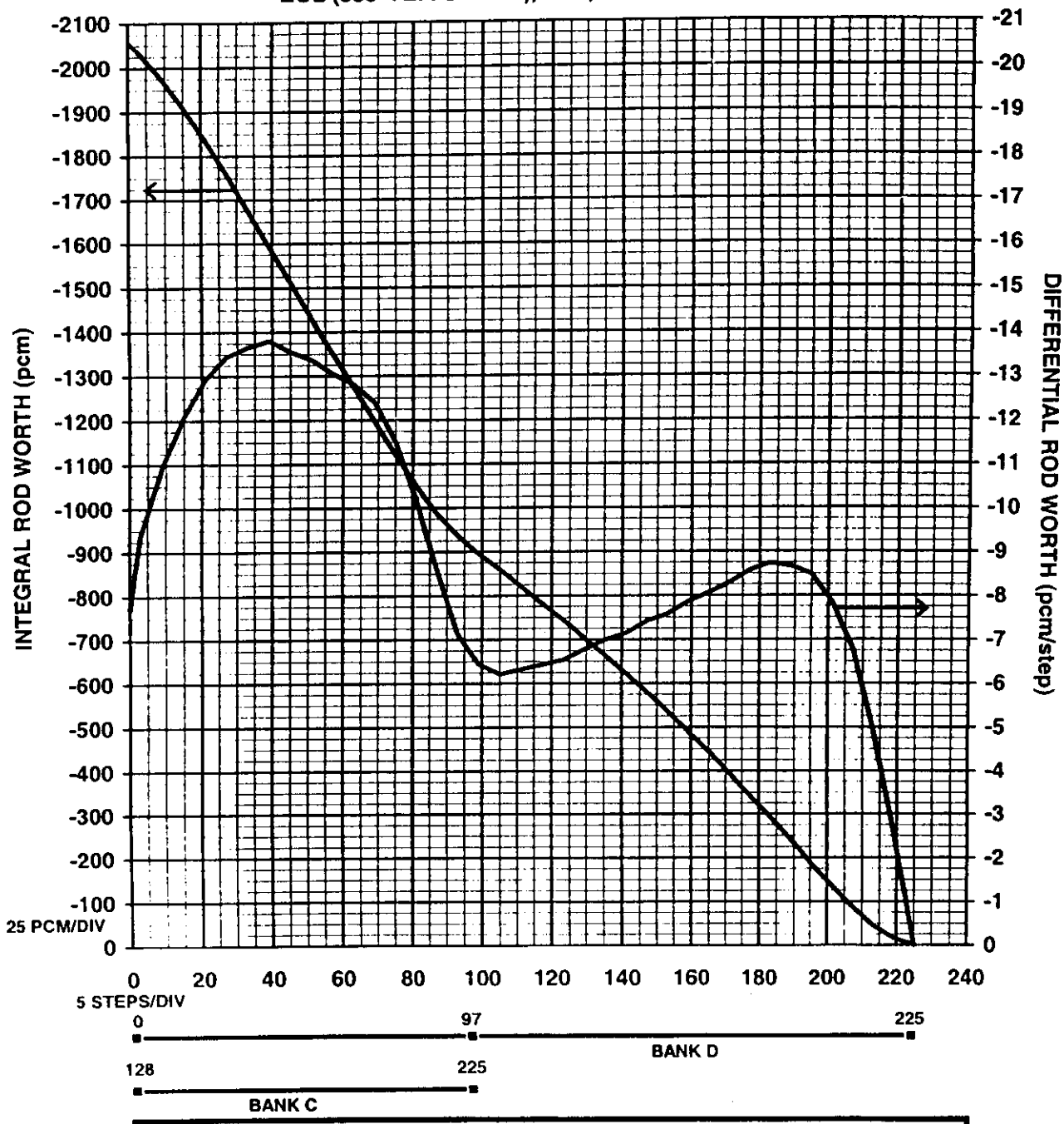
MOL (161 < EFPD ≤ 333), HFP, EQUILIBRIUM XENON



CURVE NO.	A-13-10	REV NO.	0
ORIGINATOR	[signature]	DATE	10/14/04 10/17/04
SUPERVISOR	[signature]	DATE	10/23/04
SUPERINTENDENT - SHIFT OPERATIONS	CR Smith	DATE	10/24/04

HARRIS UNIT 1 CYCLE 13
DIFFERENTIAL AND INTEGRAL
ROD WORTH CONTROL BANKS D and C
MOVING WITH 97 STEP OVERLAP

EOL (333 < EFPD ≤ 517), HFP, EQUILIBRIUM XENON



CURVE NO.	A-13-11	REV NO.	0
ORIGINATOR	Charles Bishir	DATE	10/14/04 10/17/04
SUPERVISOR	M. Nichols	DATE	10/23/04
SUPERINTENDENT - SHIFT OPERATIONS	CR Smith	DATE	10/20/04

Attachment 1
Sheet 1 of 6

Primary-To-Secondary Leak

INSTRUCTIONS	RESPONSE NOT OBTAINED

1. **NOTIFY** Chemistry to implement CRC-804, Primary-To-Secondary Leak Rate Monitoring, to accomplish the following: **[A.2]**

☐ • quantify leak rate

☐ • quantify leak rate trend

☐ • determine leaking SG

NOTE

Condenser Vacuum Pump radiation monitor indication is sensitive to high temperature and may read higher than actual when the monitor cooler is not in service. The cooling water alignment is located in OP-139, Service Water System.

☐2. **ESTIMATE** Primary-To-Secondary leak rate every 15 minutes based on ONE of the following (no preferred method): **[C.5, 7]**

	Method
(1)	• Condenser Vacuum Pump Rad Monitor, REM-01TV-3534 (Grid 2) • Curve H-X-15a, H-X-15b or H-X-15c (depending on the status of motivating air)
(2)	OSI PI plot (Chemistry tab) for Curve H-X-15a, H-X-15b or H-X-15c
(3)	Condenser Vacuum Pump Rad Monitor, REM-01TV-3534 (Grid 2) and conversion factor (Attachment 20), after Chemistry sampling has commenced

Attachment 1
Sheet 2 of 6

Primary-To-Secondary Leak

INSTRUCTIONS	RESPONSE NOT OBTAINED

☐ **3.** **IF** measured leak rate becomes stable for one hour (less than or equal to 10% change in 1-hour), **THEN REDUCE** monitoring frequency to once every 2-hours or more frequently, as directed by the Unit SCO.

4. **DETERMINE** leaking SG(s) using the following information:

☐ • Individual SGBD samples

☐ • Main steam line radiation monitor levels

☐ • Local surveys of SGBD lines

Attachment 1
Sheet 3 of 6

Primary-To-Secondary Leak

INSTRUCTIONS	RESPONSE NOT OBTAINED
✸ 5. **CHECK** the following radiation monitor readings indicating NOT IN ALARM:	5. **PERFORM** the following:
☐ • RM-01MS-3591 SB, Main Steam Line A	a. **NOTIFY** Health Physics to survey the following outside the RCA:
☐ • RM-01MS-3592 SB, Main Steam Line B	☐ • SG Blowdown piping ☐ • Vicinity of Main Steam piping
☐ • RM-01MS-3593 SB, Main Steam Line C	b. **IF** ANY monitor is in HIGH ALARM, **THEN PERFORM** the following:
☐ • REM-01TV-3534, Condenser Vacuum Pump Effluent (Group 16 RM-11)	☐ (1) **SOUND** the local evacuation alarm.
☐ • REM-1BD-3527, Steam Generator Blowdown (Group 16 RM-11)	☐ (2) **ANNOUNCE** evacuation of the following areas: • Steam Tunnel • SG PORVs/SG Safety valves area • Turbine Building 314' elevation
☐ • RM-1TV-3536-1, Turbine Building Vent Stack Effluent (Group 16 RM-11)	☐ (3) **REPEAT** sounding the local evacuation alarm AND the announcement.
	☐ (4) **IF** ANY Main Steam Line Monitor is in HIGH ALARM, **THEN PERFORM** an Offsite Dose Calculation (refer to PEP-340, Dose Assessment).

Attachment 1
Sheet 4 of 6

Primary-To-Secondary Leak

INSTRUCTIONS	RESPONSE NOT OBTAINED
✸ **6. CHECK** BOTH of the following: ☐ • Turbine Building vent stack radiation monitor reading below the high alarm setpoint ☐ • SG tube leakage is less than Tech Spec limits.	☐ **6. START** CVPETS (refer to OP-133, Main Condenser Air Removal System).
✸ **7. CHECK** the following radiation monitor reading indicating NOT IN ALARM: ☐ • REM-21AC-3525, Aux Steam Condensate Tank (Group 4, RM-11) ☐ • REM-21AC-3543A, WPB Aux Stm Condensate (Group 19, RM-11) ☐ • REM-21AC-3543B, WPB Aux Stm Condensate (Group 19, RM-11)	**7. NOTIFY** Radwaste to perform the following: **a. VERIFY** the following valves are SHUT: ☐ • 1AC-151, AS Condensate Return to Condenser MOV ☐ • 1AC-371, Aux Condensate Return to Aux Boiler MOV **b. VERIFY** the following pumps are STOPPED: ☐ • WPB Auxiliary Condensate Pump 1-4A (216' elev. WPB) ☐ • WPB Auxiliary Condensate Pump 1-4B (216' elev. WPB) ☐ • RAB Auxiliary Condensate Pump 1-2A (216' elev. RAB, access to FHB south) ☐ • RAB Auxiliary Condensate Pump 1-2B (216' elev. RAB, access to FHB south)

Attachment 1
Sheet 5 of 6

Primary-To-Secondary Leak

INSTRUCTIONS	RESPONSE NOT OBTAINED

☐**8.** **NOTIFY** Chemistry to sample the Auxiliary Steam System for activity.

☐**9.** **IF** Chemistry reports activity, **THEN ISOLATE** the Auxiliary Steam System to minimize contamination (refer to OP-130.01, Auxiliary Steam and Condensate System).

Attachment 1
Sheet 6 of 6

Primary-To-Secondary Leak

INSTRUCTIONS	RESPONSE NOT OBTAINED

NOTE

For initial leakage reports, where no previous leakage existed, leakage should be assumed to have changed from zero to the current value in the last hour.

✱ **10. MONITOR** BOTH of the following:

☐ • Primary-to-Secondary leak rate

☐ • Rate of increase reports from Chemistry

AND PERFORM the required actions based on the following: **[C.5, 7]**

Leak Rate (gpd) in any SG	+	Rate of Increase (gpd/hr) in any SG	=	Required Action
Increased Monitoring				
5 to less than 30	+	N/A	=	• Perform Attachment 9
Action Level 1				
30 to less than 75	+	N/A	=	• Perform Attachment 10
Action Level 2				
Greater than or equal to 75 sustained for 1 hour	+	Less than 30	=	• Perform Attachment 11 • Be in Mode 3 within 24 hours
Action Level 3				
Greater than or equal to 75	+	Greater than or equal to 30	=	• Perform Attachment 11 • Reduce power to 50% within 1 hour • Be in Mode 3 within the next 2 hours (3 hours total time)
Greater than or equal to 75 **AND** LOSS of REM-01TV-3534, Condenser Vacuum Pump Rad Monitor (Grid 2)	+	N/A	=	• Perform Attachment 11 • Be in Mode 3 in less than 6 hours
Greater than or equal to 150	+	Less than 30	=	• Perform Attachment 11 • Be in Mode 3 in less than 6 hours • Be in Mode 5 within the next 30 hours (36 hours total)

-- END OF ATTACHMENT 1 --

3/4.3.3 MONITORING INSTRUMENTATION

RADIATION MONITORING FOR PLANT OPERATIONS

LIMITING CONDITION FOR OPERATION

3.3.3.1 The radiation monitoring instrumentation channels for plant operations shown in Table 3.3-6 shall be OPERABLE with their Alarm/Trip Setpoints within the specified limits.

APPLICABILITY: As shown in Table 3.3-6.

ACTION:

a. With a radiation monitoring channel Alarm/Trip Setpoint for plant operations exceeding the value shown in Table 3.3-6, adjust the Setpoint to within the limit within 4 hours or declare the channel inoperable.

b. With one or more radiation monitoring channels for plant operations inoperable, take the ACTION shown in Table 3.3-6.

c. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.3.3.1 Each radiation monitoring instrumentation channel for plant operations shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL CALIBRATION and DIGITAL CHANNEL OPERATIONAL TEST for the MODES and at the frequencies shown in Table 4.3-3.

TABLE 3.3-6

RADIATION MONITORING INSTRUMENTATION FOR PLANT OPERATIONS

INSTRUMENT	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ALARM/TRIP SETPOINT	ACTION
1. Containment Radioactivity--					
a. Containment Ventilation Isolation Signal Area Monitors	2	3	1, 2, 3, 4, 6	#	27
b. Airborne Particulate Radioactivity					
1) RCS Leakage Detection	1	1	1, 2, 3, 4	$\leq 1.0 \times 10^{-3}$ μCi/ml	26, 27
2) Pre-entry Purge	1	1	##	$\leq 2.0 \times 10^{-3}$ μCi/ml	30
c. Airborne Particulate Radioactivity					
1) RCS Leakage Detection	1	1	1, 2, 3, 4	$\leq 4.8 \times 10^{-8}$ μCi/ml	26, 27
2) Pre-entry Purge	1	1	##	$\leq 1.5 \times 10^{-8}$ μCi/ml	30
2. Spent Fuel Pool Area-- Fuel Handling Building Emergency Exhaust Actuation					
a. Fuel Handling Building Operating Floor--South Network	1 train***	1/train 2 trains	**	≤ 150 mR/hr	28
b. Fuel Handling Building Operating Floor--North Network	1 train***	1/train 2 trains	*	≤ 100 mR/hr	28
3. Control Room Outside Air Intakes--					
a. Normal Outside Air Intake Isolation	1	2	1,2,3,4,5,6 and during movement of irradiated fuel assemblies and movement of loads over spent fuel pools	≤ 4.9 x [illegible] μCi/ml	29

TABLE 3.3-6 (Continued)

RADIATION MONITORING INSTRUMENTATION FOR PLANT OPERATIONS

INSTRUMENT	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ALARM/TRIP SETPOINT	ACTION
7. Control Room Outside Air Intakes - Continued					
a. Emergency Outside Air Intake Isolation - South Intake	1	1	1,2,3,4,5,6 and during movement of irradiated fuel assemblies and movement of loads over spent fuel pool	$\leq 4 \times 10^{-6}$ μCi/ml	25
b. Emergency Outside Air Intake Isolation - North Intake	1	1	1,2,3,4,5,6 and during movement of irradiated fuel assemblies and movement of loads over spent fuel pool	$\leq 4 \times 10^{-6}$ μCi/ml	25

TABLE 3.3-6 (Continued)

TABLE NOTATIONS

* With irradiated fuel in the Northend Spent Fuel Pool or transfer of irradiated fuel from or to a spent fuel shipping cask.

** With irradiated fuel in the Southend Spent Fuel Pool or New Fuel Pool.

*** Each channel consists of 3 detectors with 1 of 3 logic. A channel is OPERABLE when 1 or more of the detectors are OPERABLE.

\# For MODES 1, 2, 3 and 4, the setpoint shall be less than or equal to three times detector background at RATED THERMAL POWER. During fuel movement the setpoint shall be less than or equal to 150 mR/hr.

\#\# Required OPERABLE whenever pre-entry purge system is to be used.

ACTION STATEMENTS

ACTION 26 - Must satisfy the ACTION requirement for Specification 3.4.6.1.

ACTION 27 - With less than the Minimum Channels OPERABLE requirement, operation may continue provided the containment purge makeup and exhaust isolation valves are maintained closed.

ACTION 28 - With less than the Minimum Channels OPERABLE requirement, declare the associated train of Fuel Handling Building Emergency Exhaust inoperable and perform the requirements of Specification 3.9.12.

ACTION 29 - With the number of OPERABLE channels one less than the Minimum Channels OPERABLE requirement, within 1 hour initiate isolation of the respective air intake. With no outside air intakes available, maintain operation of the Control Room Emergency Filtration System in the Recirculation Mode of Operation.

ACTION 30 - With less than the Minimum Channels OPERABLE requirement, pre-entry purge operations shall be suspended and the containment pre-entry purge makeup and exhaust valves shall be maintained closed.

REFUELING OPERATIONS

3/4.9.12 FUEL HANDLING BUILDING EMERGENCY EXHAUST SYSTEM

LIMITING CONDITION FOR OPERATION

3.9.12 Two independent Fuel Handling Building Emergency Exhaust System Trains shall be OPERABLE.*

APPLICABILITY: Whenever irradiated fuel is in a storage pool.

ACTION:

a. With one Fuel Handling Building Emergency Exhaust System Train inoperable, fuel movement within the storage pool or crane operation with loads over the storage pool may proceed provided the OPERABLE Fuel Handling Building Emergency Exhaust System Train is capable of being powered from an OPERABLE emergency power source and is in operation and discharging through at least one train of HEPA filters and charcoal adsorber.

b. With no Fuel Handling Building Emergency Exhaust System Trains OPERABLE, suspend all operations involving movement of fuel within the storage pool or crane operation with loads over the storage pool until at least one Fuel Handling Building Emergency Exhaust System Train is restored to OPERABLE status.

c. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.12 The above required Fuel Handling Building Emergency Exhaust System trains shall be demonstrated OPERABLE:

a. At least once per 31 days on a STAGGERED TEST BASIS by initiating, from the control room, flow through the HEPA filters and charcoal adsorbers and verifying that the system operates for at least 10 continuous hours with the heaters operating;

b. At least once per 18 months or (1) after any structural maintenance on the HEPA filter or charcoal adsorber housings, or (2) following significant painting, fire, or chemical release in any ventilation zone communicating with the system by:

1. Verifying that the cleanup system satisfies the in-place penetration and bypass leakage testing acceptance criteria of less than 0.05% and uses the test procedure guidance in Regulatory Positions C.5.a, C.5.c, and C.5.d of Regulatory Guide 1.52, Revision 2, March 1978, and the unit flow rate is 6600 cfm ± 10% during system operation when tested in accordance with ANSI N510-1980.

* The Fuel Handling Building Emergency Exhaust System boundary may be opened intermittently under administrative controls.

SURVEILLANCE REQUIREMENTS (Continued)

4.9.12 (Continued)

2. Verifying, within 31 days after removal, that a laboratory analysis of a representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, has a methyl iodide penetration of ≤ 2.5% when tested at a temperature of 30°C and at a relative humidity of 70% in accordance with ASTM D3803-1989.

c. After every 720 hours of charcoal adsorber operation by verifying, within 31 days after removal, that a laboratory analysis of a representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, has a methyl iodide penetration of ≤ 2.5% when tested at a temperature of 30°C and at a relative humidity of 70% in accordance with ASTM D3803-1989.

d. At least once per 18 months by:

1. Verifying that the pressure drop across the combined HEPA filters and charcoal adsorber bank is not greater than 4.1 inches water gauge while operating the unit at a flow rate of 6600 cfm ± 10%.

2. Verifying that, on a High Radiation test signal, the system automatically starts and directs its exhaust flow through the HEPA filters and charcoal adsorber banks.

3. Verifying that the system maintains the spent fuel storage pool area at a negative pressure of greater than or equal to 1/8 inch water gauge, relative to the outside atmosphere, during system operation at a flow rate of 6600 cfm ± 10%, and

4. Deleted

5. Verifying that the heaters dissipate 40 ± 4 kW when tested in accordance with ANSI N510-1980.

e. After each complete or partial replacement of a HEPA filter bank, by verifying that the unit satisfies the in-place penetration leakage testing acceptance criteria of less than 0.05% in accordance with ANSI N510-1980 for a DOP test aerosol while operating the unit at a flow rate of 6600 cfm ± 10%.