Calvert Cliffs Post Exam Comments

In accordance with the guidance provided in NUREG 1021, "Operating Licensing Examination Standards for Power Reactors" (Revision 9 Supp 1), ES-403 "Grading Initial Site-Specific Written Examinations" justification for modification to the original examination answer key to accept two responses or to eliminate the question is provided in the following attachments. The following changes are requested based on post examination grading and reviews conducted by the Operations Training Staff.

The requested changes are:

Exam Question Number	Change to Answer Key
RO 5	Accept A and B
RO 13	Accept A and B
RO 25	Delete question
RO 28	Accept A and B
RO 31	Accept B and D
RO 40	Accept B and C
RO 54	Delete question
RO 60	Accept A and D
RO 61	Accept A and B
RO 68	Delete question
SRO 10	Accept B and D
SRO 15	Accept B and C
SRO 24	Delete question

Inadequate technical reviews and examination validations are the cause of the errors identified with the questions listed above. Calvert Cliffs is revising the examination development procedure to ensure more stringent reviews and validations are performed and personnel assigned to these tasks are provided proper oversight. This issue has been captured in the site corrective action program under Condition Report IRE-032-618.

Additionally, a Root Cause Analysis Team composed of Calvert Cliffs, Constellation Fleet, and personnel from other nuclear utilities is investigating examination quality issues. The Licensed Operator Initial Training unit will be adopting the team's corrective actions and recommendations. The technical justification for each requested change is attached.

Examination questions were copied as they appeared on the tests. No spelling or typographical errors were corrected.

Supervisor-Initial Training: _Mike Wasem_____/ _____
Printed Name and Signature Date

Facility Representative: _Nick Lavato_____/_____
Printed Name and Signature Date

RO Written Examination Question #5 (ID: Q50610)

Unit-1 in mode 5 on SDC with the RCS capable of being pressurized. The following conditions exist:

- RCS Temperature is 180°F
- RCS Pressure is 180 psia
- 11 & 12 SGFP are secured and tagged out
- Main & Auxiliary Feedwater is tagged out to 11 S/G for maintenance

A loss of both LPSI pumps occurs. Due to a malfunction, no charging pumps are available. Which of the following is the next course of actions for these conditions?

A. Feed and bleed the RCS using the HPSI pumps and pressurizer PORVs.

B. Align condensate to 12 S/G and bleed steam from 12 steam generator.

C. Align a containment spray pump to provide flow through the shutdown cooling heat exchanger.

D. Feed and bleed the RCS using the CS pumps and pressurizer PORVs.

The original answer accepted was B

Original Answer Explanation

In this condition, with a loss of both LPSI pumps the preferred order would be to align a Containment spray pump, followed by steaming using available S/Gs, and then followed by once through core cooling. However RCS pressure needs to be reduced to less than 170 PSIA to use the CS pumps. Since without Auxiliary Spray (No charging pumps) this is not possible, other means must be used.

A. Feed and bleed the RCS using the HPSI pumps and pressurizer PORVs. **Is incorrect** since the RCS is capable of being pressurized. This would be the last course of action of the available choices. A candidate might think that the other methods are not available since both S/Gs are not available and main feedwater is not available. A candidate might think that you need both S/Gs available for H/R.
B. Align condensate to 12 S/G and bleed steam from the 12 steam generator. **Is correct** since you have one S/G available for heat removal, and RCS pressure is too high for Containment spray pumps, and without a charging pump auxiliary spray is not available this is the next course of action.
C. Align a containment spray pump to provide flow through the shutdown cooling heat exchanger. **Is incorrect** since RCS pressure is greater than 170 PSIA, and auxiliary spray is not available to lower pressure (No charging pumps); this course of action is not correct for the conditions given. A candidate might not realize that RCS pressure is too high to use the CS pumps.

D. Feed and Bleed the RCS using the CS Pumps and pressurizer PORVs is incorrect since the RCS is capable of being pressurized. This would be the last course of action of the available choices. A candidate might think that the other methods are not available since both S/Gs are not available and main feedwater is not available, and may believe that since a CS Pump is the first alternative to a LPSI Pump, that the CS Pumps should be used first for OTCC.

Original Reference

The reference used to develop the test question was AOP-3B, Abnormal Shutdown Cooling Conditions, Section IV pages 22-25, and section VI pages 42-57.

Licensee's Justification for Change

The 3rd bulleted condition contained in the question "11 & 12 SGFPs are secured and tagged out" was confusing. It is not clear what the tagging boundaries for the feedpumps were. Two candidates concluded the SGFP bypass valve was part of the tagging boundary, making the condensate system unavailable to feed S/Gs. The feed and condensate systems are normally secured per OP-5 Section 6.3 when RCS temperature is approximately 220 degrees. For the 2008 outage, three tagouts were written which included shutting SGFP Bypass Valve, 1-FW-108, eliminating this flowpath.

The next course of action would be to feed 12 Steam Generator with Auxiliary Feedwater. This was not one of the available answer choices. With that answer not provided, the two candidates chose (answer A) the third option of cooling listed in the AOP, HPSI injection and flow through the PORVs. The remainder of the candidates stated they would depressurize the RCS using reactor vessel head vents, or by opening PORVs and then use the containment spray pumps. These actions are not supported by the AOP.

AOP-3B, Abnormal Shutdown Cooling Conditions, section VI. H page 52 (IF RCS TEMPERATURE CONTROL IS NOT ESTABLISHED, THEN ESTABLISH LONG TERM COOLING

The question was originally intended to direct the student to select the actions contained in AOP-3B section IV. D Prepare a Steam Generator for Heat Removal.

Question #5 (ID:50610)

VI. COMPLETE LOSS OF SDC WITH PRESSURIZATION OF THE RCS POSSIBLE

ACTIONS	ALTERNATE ACTIONS
D. PREPARE A SG FOR RCS HEAT REMOVAL.	
1. **IF** the SGs are already in use for heat removal, **THEN PROCEED** to step E.2, Page 48. (continue)	

This section of AOP-3B would have provided the necessary guidance to align Condensate to 12 S/G.

Question #5 (ID:50610)

VI. COMPLETE LOSS OF SDC WITH PRESSURIZATION OF THE RCS POSSIBLE

ACTIONS	ALTERNATE ACTIONS
D. (continued)	
2. If necessary, inform Outage Management to restore at least one SG to a functional status by the following criteria: • Feedwater flow path is available • Steam flow path is available • SG Level indication is available • SG capable of being pressurized	2.1 **IF** at least one SG can **NOT** be made available, **THEN PROCEED** to Step H, Page 53.
3. **IF** only one SG can be made available, **THEN** isolate the SG which can **NOT** be made available: a. Verify the MSIV is shut: • (11 SG) 1-MS-4043-CV • (12 SG) 1-MS-4048-CV b. Verify the MSIV BYP valve is shut: • (11 SG) 1-MS-4045-MOV • (12 SG) 1-MS-4052-MOV c. Verify the SG FW ISOL valve is shut: • (11 SG) 1-FW-4516-MOV • (12 SG) 1-FW-4517-MOV d. Verify the S/G B/D valves are shut: 11 SG • 1-BD-4010-CV • 1-BD-4011-CV 12 SG • 1-BD-4012-CV • 1-BD-4013-CV (continue)	

Question was intended to send the student to AOP-3B Section VI, Step D.3 to commence maintaining level using 12 Steam Generator as a heat sink.

If the candidate believed that using 12 S/G as a heat sink was not available, then AOP-3B section VI.H would have been the next available option based on the provided choices.

H. **IF** RCS TEMPERATURE CONTROL IS **NOT** ESTABLISHED, **THEN** ESTABLISH LONG TERM COOLING.

1. Ensure **ALL** personnel are evacuated from the Containment.

2. Notify Radiation Safety Supervision of the intention to use Once-Through-Cooling.

(continue)

VI. COMPLETE LOSS OF SDC WITH PR HE RCS POSSIBLE

ACTIONS	ALTERNATE ACTIONS
H. (continued) 9. Check open PORV BLOCK valves: • 1-RC-403-MOV • 1-RC-405-MOV 10. Open both PORVs: a. Place the PORV OVERRIDE handswitches in MANUAL OPEN: • 1-HS-1402 • 1-HS-1404	

Section VI. H. 9 & 10 Directs opening PORVs

15. **IF** a HPSI PP is available, **THEN PROCEED** to the appropriate step as follows: • (13 HPSI PP) Step H.16, Page 57 • (11 HPSI PP) Step H.17, Page 59 • (12 HPSI PP) Step H.18, Page 61	15.1 **IF** a HPSI PP is **NOT** available, **THEN PROCEED** to the appropriate step as follows: • (11 LPSI PP) Step H.19, Page 63 • (12 LPSI PP) Step H.19.1 • (11 CS PP) Step H.20, Page 64 • (12 CS PP) Step H.20.1 • (CHG PP) Step H.21, Page 65

Guidance to start a HPSI Pump

(continue)

From AOP-3B Bases:

9-10. These steps provide the required actions to implement Once-Through-Cooling. Both PORV block valves are checked open and both PORVs are opened. The PORVs are solenoid-operated power relief valves that fail shut. They are in parallel to each other with an associated motor driven block valve, which are normally open. Both the PORV and its associated block valve have to be open for water to flow to the pressurizer quench tank. Both PORVs should be opened to ensure enough flow to allow for heat removal for all decay heat levels. The pressurizer quench tank is relatively small. Its internal capacity is 217 ft^3 (approximately 1623 gallons) with a design pressure of 100 PSIG. Because of the tank's design, when SI flow is initiated the tank's rupture disk will most likely break and the it's contents will discharge to the containment

13-21. The source of the water is based on equipment availability. This step provides the instructions for establishing flow into to the RCS. Since the Unit is most likely in an outage when on shutdown cooling, the availability of equipment will vary. This step gives instruction for the use of any HPSI, LPSI, CS or charging pump. The order of preference is HPSI, LPSI, CS and then the charging pumps. The charging pumps are the least preferable because the charging pumps may not have the capacity necessary to maintain the core cool. If the Unit has been shutdown for greater than 1 days, a charging pump can supply the flow required to maintain the core cool. But if the Unit is shutdown less than 14 days, the charging pumps probably do not have the capacity to cool the core. If the charging pumps are the only pumps available to inject water into the core, then they must be started to increase the time to boiling while restoring another pump (HPSI, LPSI, or CS) to a functional status.

The reactor core decay heat rate decreases logarithmically as fission products decay after the reactor is shutdown. By the end of the first day after shutdown from rated power operation, the decay heat rate is nearly 0.5%. This heat rate continues to decrease and is less than 0.2% by the end of the first month.

Regrade Request
A and B should be accepted as correct responses based on confusion over SGFP tagging boundaries. Selection D "Feed and bleed the RCS using the CS pumps and pressurizer PORVs" should not be considered as a correct response since it is lower in the order of preference per AOP-3B. C is incorrect since RCS pressure is 180 psia and charging is not available to supply auxiliary spray to depressurize the RCS to 170 psia or less.

Question Statistics
Question 5 was missed by 9 of 11 students. Two students selected A, two selected B, six selected C, and one chose D. Candidates who chose C stated they either forgot the 170 PSIA Containment Spray Pump suction piping limit or they would depressurize the RCS using head/pressurizer vents of the PORVs. These actions are not supported by the AOP.

Post Examination Review References
AOP-3B, Abnormal Shutdown Cooling Conditions
AOP-3B, Abnormal Shutdown Cooling Conditions Technical Basis

RO Written Examination Question #13 (ID: Q50256)
Unit one is operating at 100% power when the following indications are noted:
- Pressurizer pressure is 2250 PSIA
- Pressurizer level is rising
- All B/u Htrs are ON
- AFAS Loss of Power Alarm
- Actuation SYS loss of Power alarm
- RAS Actuation Sys tripped alarm
- SIAS Actuation Sys tripped alarm
- CSAS Actuation Sys tripped alarm
- 11, 12, & 13 Charging pumps are operating
- Letdown is at minimum

Based on these indications which of the following is correct?

A. 1Y01 has been lost
B. 1Y02 has been lost
C. 1Y03 has been lost
D. 1Y04 has been lost

The original answer accepted is selection A

Original Answer Explanation
A is correct based on the indications listed in AOP -7J. All others are not consistent with the indications of AOP 7J.

Original References
The reference used to develop the test question was AOP-7J Section V actions for a loss of 1Y01 pages 12-15.

Licensee's Justification for Change
Selection "B" is also correct. The indications listed in the stem are indications in the AOP for both the loss of 1Y01 and 1Y02. Per AOP-7J Unit-1 Rev. 19 pages 12, 13, 25 and 26, AFAS Loss of Power, Actuation SYS loss of Power, RAS Actuation Sys tripped, SIAS Actuation Sys tripped and CSAS Actuation Sys tripped alarms are received during both a loss of 1Y01 or 1Y02.

Question #13 (ID Q50256)

V. 11 120 VOLT VITAL AC INSTRUMENT BUS (1Y01)

ACTIONS	ALTERNATE ACTIONS
A. (continued) 11. The following alarms may actuate and indications may be affected upon loss of the bus: 1C03 • 11 and 12 SG Channel A pressure and level indicators fail low • "12 CST LVL LO" alarm 1C04 • "AFAS LOSS OF POWER " alarm	

Question #13 (ID Q50256)

V. 11 120 VOLT VITAL AC INSTRUMENT BUS (1Y01)

ACTIONS	ALTERNATE ACTIONS
A.11 (continued) 1C06 • Loss of Channel X PZR pressure control and indication fails low • Loss of Channel X PZR level control and indication fails low • Channel A Total Core Cooling Flow indication, 1-PDI-101A, fails low • PZR Low Range pressure indicator, 1-PI-103, goes blank • PZR pressure instrument, 1-PI-102A, fails low • TM/LP Trip Setpoint indication, 1-PIA-102A fails low • Loss of PAM CH A FPD, 1-CRT-1C06A 1C08 • "ACTUATION SYS LOSS OF POWER" alarm • "ACTUATION SYS" tripped alarms for SIAS, CIS, CSAS, RAS, SGIS-A, CRS, and CVCS-A • "ACTUATION SYS SENSOR CH ZD TRIP" alarm	

Question #13 (ID Q50256)

VI. 12 120 VOLT VITAL AC INSTRUMENT BUS (1Y02)

ACTIONS	ALTERNATE ACTIONS
A. (continued) **NOTE** Loss of power to 1Y02 causes 12 CC HX SW OUT, 1-SW-5208-CV and 12A/12B SRW HX SW BYPASS VLV, 1-SW-5157-CV valves to close. 8. Restore 12 Saltwater header: a. Verify 11 CC HX is in service. b. Verify 12A/12B SRW HX SW OUT valve handswitches are in OPEN. • 1-SW-5211-CV • 1-SW-5212-CV 9. The following alarms may actuate and indications may be affected upon loss of the bus: 1C03 • 11 and 12 SG Channel B pressure and level indicators fail low 1C04 • "AFAS LOSS OF POWER " alarm	

Question #13 (ID Q50256)

VI. 12 120 VOLT VITAL AC INSTRUMENT BUS (1Y02)

ACTIONS	ALTERNATE ACTIONS
A.9 (continued) 1C05 • Loss of PAM CH B FPD, 1-CRT-1C05B 1C06 • Loss of Channel Y PZR pressure control and indication fails low • Loss of Channel Y PZR level control and indication fails low • Channel B Total Core Cooling Flow indication, 1-PDI-101B, fails low • PZR Low Range pressure indicator, 1-PIC-103-1, fails low • PZR pressure instrument, 1-PI-102B, fails low • TM/LP Trip Setpoint indication, 1-PIA-102B fails low • Loss of PAM CH B FPD, 1-CRT-1C06B 1C08 • "ACTUATION SYS LOSS OF POWER" alarm • "ACTUATION SYS " tripped alarms for SIAS, CIS, CSAS, RAS, SGIS-B, CRS, and CVCS-B • "ACTUATION SYS SENSOR CH ZE TRIP" alarm	

The AOP-7J Bases describes the failure responses for Reactor Coolant System Instrumentation pressurizer pressure, pressurizer level, pressurizer heater control and charging and letdown controls following a loss of 1Y01 or 1Y02. The responses for either channel are identical to the other and the operator is able to distinguish between the two but that information is not contained in the question stem. The stem does not provide information as to which pressurizer level and pressure instrument channels, X or Y is selected. There is no 'normal' lineup for these instruments that is procedurally or operationally directed.
In accordance with AOP-7J Bases SECTION NUMBER: V. 11 120 VOLT VITAL AC INSTRUMENT BUS (1YO1) the following failure responses are expected:

- 1-PlC-100X is de-energized and fails down scale. If pressure control were to remain in Channel X it would be sending a minimum pressure signal calling for the PZR heaters to be on. Channel Y is selected so that a valid PZR pressure signal is used to automatically control pressure. RRS cabinet 1C31, Channel X, is de-energized so Reactor Regulating System is switched to Channel Y.
- 1-LIC-110X is de-energized and fails down scale sending a low level signal to the PZR level control circuit resulting in all charging pumps starting and letdown reducing to minimum. Channel Y is selected so that a valid PZR level signal is used to automatically control level. Pressurizer low level cutoff is normally selected to X/Y. PZR heaters will be interlocked off due to the control channel X until the Y position is selected.

Question #13 (ID Q50256)

SECTION NUMBER: V. 11 120 VOLT VITAL AC INSTRUMENT BUS (1Y01)
BLOCK STEP: V.A. RESPOND TO A LOSS OF 11 120 VAC INSTRUMENT BUS (1Y01).

1. 1-PIC-100X is de-energized and fails down scale. If pressure control were to remain in Channel X it would be sending a minimum pressure signal calling for the PZR heaters to be on. Channel Y is selected so that a valid PZR pressure signal is used to automatically control pressure. **[P0056]**
2. RRS cabinet 1C31, Channel X, is de-energized so Reactor Regulating System is switched to Channel Y. **[P0056]**
3. 1-LIC-110X is de-energized and fails down scale sending a low level signal to the PZR level control circuit resulting in all charging pumps starting and letdown reducing to minimum. Channel Y is selected so that a valid PZR level signal is used to automatically control level. **[P0056]**
4. Pressurizer low level cutoff is normally selected to X/Y. PZR heaters will be interlocked off due to the control channel X until the Y position is selected. **[P0056]**

In accordance with AOP-7J Bases SECTION NUMBER: VI. 12 120 VOLT VITAL AC INSTRUMENT BUS (1Y02) the following failure responses are expected:

- 1-PlC-100Y is de-energized and fails down scale. If pressure control were to remain in Channel Y it would be sending a minimum pressure signal calling for the PZR

heaters to be on. Channel X is selected so that a valid PZR pressure signal is used to automatically control pressure.

- 1-HIC-110 is being given erroneous signals from PZR level program from Reactor Reg and 1-LIC-110Y, which is de-energized. So the controller is placed in manual until PZR level control signal and Reactor Reg are restored in steps 3, 4 & 6.
- RRS cabinet 1 C32, Channel Y, is de-energized so Reactor Regulating System is switched to Channel X. 1-LIC-110Y is de-energized and fails down scale sending a low-level signal to the PZR level control circuit resulting in all charging pumps starting and letdown reducing to minimum. Channel X is selected so that a valid PZR level signal is used to automatically control level.

Pressurizer low level cutoff is normally selected to X/Y. PZR heaters will be interlocked off due to the control Channel Y until the X position is selected.

Question #13 (ID Q50256)

SECTION NUMBER: VI. 12 120 VOLT VITAL AC INSTRUMENT BUS (1Y02)
BLOCK STEP: VI.A. RESPOND TO A LOSS OF 12 120 VAC INSTRUMENT BUS (1Y02).

1. 1-PIC-100Y is de-energized and fails down scale. If pressure control were to remain in Channel Y it would be sending a minimum pressure signal calling for the PZR heaters to be on. Channel X is selected so that a valid PZR pressure signal is used to automatically control pressure. **[P0056]**

2. 1-HIC-110 is being given erroneous signals from PZR level program from Reactor Reg and 1-LIC-110Y, which is de-energized. So the controller is placed in manual until PZR level control signal and Reactor Reg are restored in steps 3, 4 & 6.

3. RRS cabinet 1C32, Channel Y, is de-energized so Reactor Regulating System is switched to Channel X. **[P0056]**

4. 1-LIC-110Y is de-energized and fails down scale sending a low-level signal to the PZR level control circuit resulting in all charging pumps starting and letdown reducing to minimum. Channel X is selected so that a valid PZR level signal is used to automatically control level. **[P0056]**

5. Pressurizer low level cutoff is normally selected to X/Y. PZR heaters will be interlocked off due to the control Channel Y until the X position is selected. **[P0056]**

Regrade Request

Selections “A” and “B” are correct based upon missing information in the stem stating the positions of the pressurizer pressure and pressurizer level control channel selector switches. Without a specific set of handswitch positions identified, either answer is correct.

Question Statistics
Question 13 was missed by 9 of 11 students. Two students selected the original correct answer and nine students selected B.

Post Examination Review References
AOP-7J, Loss of 120 Volt AC or 125 Volt DC Power, Revision 19.
AOP-7J, Loss of 120 Volt AC or 125 Volt DC Power Basis Document U-1, Rev 11.

NOTE: The stem of the question also contains an error. The Pressurizer backup heaters would not be on since a Pressurizer level instrument LIC 110X or 110Y would fail low causing the low level heater cutout. The normal position of the PZR HTR LO LVL CUT-OFF SEL switch is X/Y, therefore, with either 1Y01 or 1Y02 de-energized, backup heaters would be interlocked off. This error is inconsequential to candidates choice of answers.

RO Written Examination Question #25 (ID: Q50475)
A fire in the Unit1 Cable Spreading room has occurred. The SM has determined that a Control Room evacuation is necessary and AOP-9A should be implemented. Which of the following sets of actions are required to be completed within the first 30 minutes of CR Evacuation to prevent damage to plant equipment?

A. Trip the RCPs AND start the 0C Diesel Generator
B. Start the 0C Diesel Generator AND Establish Charging flow
C. Trip the RCPs AND Trip MCC-104 load center
D. Establish AFW flow AND Establish Charging flow

The original answer accepted was A

Original Answer Explanation
1. Trip the RCPs AND start the 0C Diesel Generator - correct per AOP9A basis IV.C and notes III C. 2
2. Start the 0C Diesel Generator AND Establish Charging flow - Not correct, Charging flow not required until 60 minutes
3. Trip the RCPs AND Trip MCC-104 load center - Not correct, trip MCC-104 load center does not have a time limit
4. Establish AFW flow AND Trip MCC-104 load center - Not correct , charging flow not required for 60 minutes

Original References
AOP-9A Basis page 1
AOP-9A page 5

Licensee's Justification for Change
There is no correct answer. The question states: Which of the following sets of actions are required to be completed within the first 30 minutes of Control Room evacuation **to prevent damage to plant equipment.** No set of answers presented are based upon preventing equipment damage. Starting the OC DG within 30 minutes is a time saving step per the AOP-9A Basis document Section IV Step C.

Question #25 (ID Q50475)

III. (continued)

C. **NOTES**

1. Offsite power may be lost at any time during this event. Evolutions are performed to place 0C Diesel Generator on 4KV Bus 24 and 4KV Bus 11 and to secure the remaining 4KV Busses. In the event a loss of offsite power occurs within the first hour, a Station Blackout will be in effect until the 0C Diesel Generator and necessary support equipment are re-aligned.
2. The 0C DG must be started within 30 minutes of a loss of power to 07 4KV Bus to prevent the need for prelubing the 0C DG using the pneumatic prelube pumps.
3. It is important to establish Auxiliary Feedwater flow within 30 minutes and Charging flow within 60 minutes.
4. During the post-fire shutdown, the Reactor Coolant System parameters shall be maintained within those predicted for a loss of offsite power. The fission product boundary integrity shall not be affected. The Reactor Coolant makeup function shall be capable of maintaining level indication in the Pressurizer. No other plant accidents are assumed to occur except as precipitated by the fire.

Question #25 (ID Q50475)

AH. **(OSO)** TAKE LOCAL CONTROL AND START 0C DIESEL GENERATOR

1. **IF** 0C Diesel Generator is **NOT** running
   AND the 07 4KV Bus has been de-energized for 30 minutes or longer,
   THEN initiate pneumatic prelube as follows:
   a. Open 0C1 PNEUMATIC PRELUBE PUMP SUCTION VALVE, 0C1-DLO-2 (at 0C1 pneumatic prelube pump).
   b. Open 0C1 PNEUMATIC PRELUBE PUMP DISCHARGE VALVE, 0C1-DLO-14 (under 0C1 Aux Desk).
   c. Open 0C2 PNEUMATIC PRELUBE PUMP SUCTION VALVE, 0C2-DLO-2 (at 0C2 pneumatic prelube pump).
   d. Open 0C2 PNEUMATIC PRELUBE PUMP DISCHARGE VALVE, 0C2-DLO-14 (under 0C2 Aux Desk).
   e. Open one 0C Pneumatic Prelube Pump Air Bottle outlet valve (35' elevation).
   f. Adjust 0C PNEUMATIC PRELUBE PUMP AIR REGULATOR, 0-DLO-10180-PCV, to a maximum of 110 PSIG on 0C PNEUMATIC PRELUBE PUMP AIR SUPPLY REGULATOR OUTLET PI, 0-PI-10180, to start the Prelube Pump turning.

(continue)

Question #25 (ID Q50475)

AOP-9A
Unit 1
BASES DOCUMENT

IV. ACTIONS

A. This step describes the affected area, defines a severe fire and gives the Shift Manager guidance in determining if the fire is a severe fire.

B. Manual Reactor TRIP is initiated to promptly change plant modes. Manual Reactor TRIP is an allowable action taken per Generic Letter 86-10, "Questions and Answers," Section 3.8.4.

C. Credit is not taken for Control Room initiated trips of the Main Turbine, SGFPs, and shutting the MSIVs (i.e., an exemption was not requested), but are considered prudent actions to minimize the probability of an over-cooling scenario. If the 0C DG can be emergency started here it will save the time of pneumatically prelubing the DG prior to start. If it can't be started here it will be started later in the procedure. Upon loss of component cooling, the RCPs have been evaluated to operate 20 minutes without seal failure. Since the wiring in the Control Room has not been evaluated, the RCPs must be tripped locally within 20 minutes. It is considered a prudent action to trip the RCPs from the Control Room prior to leaving. (Reference: WCAP-16175-P, Model for Failure of RCP Seals Given Loss of Seal Cooling in CE NSSS Plants)

1100

Question #25 (ID Q50475)

AH. The OSO will take local control of and start the 0C DG. The 0C DG will be used to power both the 11 and 24 4KV Buses simultaneously. If the 0C DG was not started prior to leaving the Control Room and the 07 4KV Bus has been de-energized for 30 minutes or longer then the pneumatic prelube must be performed. [B0255]

Question #25 (ID Q50475)

BGE

MEMORANDUM

Auxiliary Systems Engineering Unit
G:\PES\990621-200.DOC

TO: R. J. Martin

FROM: S. J. Loeper

DATE: June 21, 1999

SUBJECT: Prelube time for SACM engines

Due to the required operator actions during plant responses involving the SACM engines, PES requested clarification of the pre-lubrication requirements for the SACM engines. SACM has confirmed that a limited number of engine starts without prelube (up to a maximum of 30 minutes) is acceptable. Therefore, to reduce the time delay for OC DG connection to a 4 KV bus and reduce the required operator actions during a Station Blackout, PES considers it acceptable to start the OC DG without prelube for up to 30 minutes without requiring pneumatic prelube. Starting of the OC DG without prelube for up to 30 minutes should only be utilized for loss of off site power scenarios.

If you have any questions, please contact Steve Loeper at x4734.

Regrade Request

Question #25 should be deleted due to no correct answer. The basis for starting the OC DG within 30 minutes is to save time during a loss of power event.

Question Statistics

Question 25 was missed by 7 of 11 students. Four students selected A, five selected C and two selected D. Candidates stated they knew that tripping RCPs had to be completed within 20 minutes, initiating Auxiliary Feedwater had to be completed within 30 minutes and charging initiated with 60 minutes.

Post Examination Review References

AOP-9A Unit 1, rev. 11
AOP 9A Bases
Memo from Steve Loeper, system engineer to Bob Martin, on shift SRO

RO Written Examination Question #28 (ID: Q50476)

Using the provided Reference and given the following conditions on Unit-2.

- Pressurizer Pressure = 315 PSIA
- RCS Tcold = 140F
- S/G Temperature = 90F
- Pressurizer Level = 160 inches
- 4KV Bus Voltage = 4130KV
- 13.8 KV Bus Voltage = 14.2 KV

Which of the following conditions would prevent starting 21A RCP per plant operating procedures.

A. A pressurizer level control malfunction causes pressurizer level to rise to 172 inches and stabilizes
B. A heat up causes RCS Temperature to rise to 155F and stabilizes
C. A voltage regulator perturbation causes 4KV bus voltage to lower to 4110 KV
D. An electrical perturbation causes 13 KV bus voltage to rise to 14.8 KV and stabilizes.

Original answer accepted was A

Original Answer Explanation

Per OI-1A Section 6.1.B starting requirements for an RCP, S/G temperature no more that 60F below RCS temperature, pressurizer level less than 170 inches, RCS pressure and temperature within the limits of figure 17, 4KV bus voltage greater than 4100 volts and 13.8KV bus voltage less than or equal to 14.8 KV.

A. A pressurizer level control malfunction causes pressurizer level to rise to 172 inches and stabilizes is correct since pressurizer level has to be less than 170 inches.
B. A heat up causes RCS temperature to rise to 155F and stabilizes is incorrect since RCS temperature has to be less that 60F above S/G temperature 90+ 60 =150. 155F is 55F less than RCS temperature and still within limits. **[Error 155-90=65, > limit]**
C. A voltage regulator perturbation causes 4KV bus voltage to lower to 4110 volts and stabilizes is incorrect since bus voltage is greater than 4100 volts.
D. An electrical perturbation causes 13KV bus voltage to rise to 14.8 KV and stabilizes is incorrect since the limit is less than or equal to 14.8 KV.

Original References
OI-1A, Reactor Coolant System, pages 5-13
OI-1A, Reactor Coolant System figure 17

Licensee's Justification for Change
The following is justification why selection B is also correct based upon the initial provided data and plant condition change. Selection B states the following: A heat up causes RCS temperature to rise to 155F and stabilizes.
OI-1A stipulates that the first RCP shall not be started with one or more Unit 2 cold leg temperatures less than 301F unless:

- The pressurizer water level is less than 170 inches
- For Unit 2, Steam Generator temperature limits are as follows
    - S/G temperature greater than 30F above RCS temperature
    - Steam Generator temperature is no more than 60F below RCS temperature
- Unit 2 pressurizer pressure is between 250 and 320 PSIA as indicated on PZR LO RANGE PRESS 2-PI-103 or 2-PI-103-1

5.0 PRECAUTIONS (Continued)

H. The first RCP shall **NOT** be started with one **OR** more Unit 1 RCS cold leg

5.0.H PRECAUTIONS (Continued)

NOTE

- If SDC is secured, RCS temperature shall be determined using RCS T_{AVG} (the average of RCS T_{HOT} and T_{COLD}) from the loop with the largest delta T
  - (11(21) loop) 1(2)-TI-112H, 1(2)-TI-112C
  - (12(22) loop) 1(2)-TI-122H, 1(2)-TI-122C
- If SDC is in operation, RCS temperature shall be determined using the SDC Temperature Recorder, 1(2)-TR-351, **OR** computer points as follows:
  - If **NO** LPSI flow rate changes have been made in the previous 30 minutes, using the average SDC Temperature (the average of FROM RCS(red pen) and TO RCS(blue pen) **OR** computer points T351X and T351Y
- **IF** SDC is in operation, **AND** RCS temperature can **NOT** be obtained by averaging, **THEN** RCS temperature shall be determined using the SDC Temperature Recorder, 1(2)-TR-351, **OR** computer points as follows:
  - S/G 30° F above RCS temperature: RCS temperature shall be determined using TO RCS(blue pen) **OR** computer point T351X
  - S/G below RCS temperature: RCS temperature shall be determined using FROM RCS(red pen) **OR** computer point T351Y
- Steam Generator temperature is obtained locally using a hand-held surface instrument on the Steam Generator shell between the Steam Generator Tube Sheet and water level covering the tubes

- For Unit 1, Steam Generator temperature limits are as follows:
  - S/G temperature is no greater than 30° F above RCS temperature **[B0064]**
  - **IF** RCS temperature is 146° F or less, **THEN** S/G temperature is no more than 50° F below RCS temperature **[B0410]**
  - **IF** RCS temperature is greater than 146° F, **THEN** S/G temperature is no more than 60° F below RCS temperature **[B0410]**
- For Unit 2, Steam Generator temperature limits are as follows:
  - S/G temperature is no greater than 30° F above RCS temperature **[B0064]**
  - S/G temperature is no more than 60° F below RCS temperature **[B0410]**

The initial steam generator temperature was 90°F and a heat up caused RCS temperature to rise to 155°F. The difference between 155°F and 90°F (155-90= 65) equals 65°F which exceeds the RCP start limit of S/G temperature of no more than 60°F below RCS temperature.

Regrade Request
Response B is also correct. A math error on the original answer justification incorrectly eliminated B as a correct choice. Accept A and B.

Question Statistics
Question 28 was missed by 9 of 11 students. Two candidates selected A, two selected B, three candidates chose C and four selected D.

Post Examination Review References
OI-1A, Reactor Coolant System

RO Written Examination Question #31 (ID: Q50290) ***See PPT file on reference CD also***

Which of the following is the most likely reason for this condition?
"SI PPS RECIRC MOV 659 CLOSED RAS BLOCKED" Alarm is ON

A. MINI FLOW RETURN TO RWT ISOL, 1- SI-659 MOV, is shut with an inadvertent RAS present

B. MINI FLOW RETURN TO RWT ISOL MOV, 1- SI-659 MOV is shut with no RAS present

C. SI PP RECIR LOCKOUT handswitch, 1-HS-3659A, is ON and RAS present

D. MINI FLOW RETURN TO RWT ISOL, 1-SI-659-MOV shut and SI PP RECIR LOCKOUT handswitch, 1-HS-3659A in ON

Original answer accepted was B

Original Answer Explanation
Per Alarm Manual for 1C09 window H-55 Different sets of conditions will give the alarm.

B. MINI FLOW RETURN TO RWT ISOL MOV, 1- SI-659 MOV is shut with no RAS present will give this alarm

A, C, D have conditions that do not fully satisfy any of the three requirements to get the alarm

Original References
Alarm manual 1C09 window H-55 page 86.

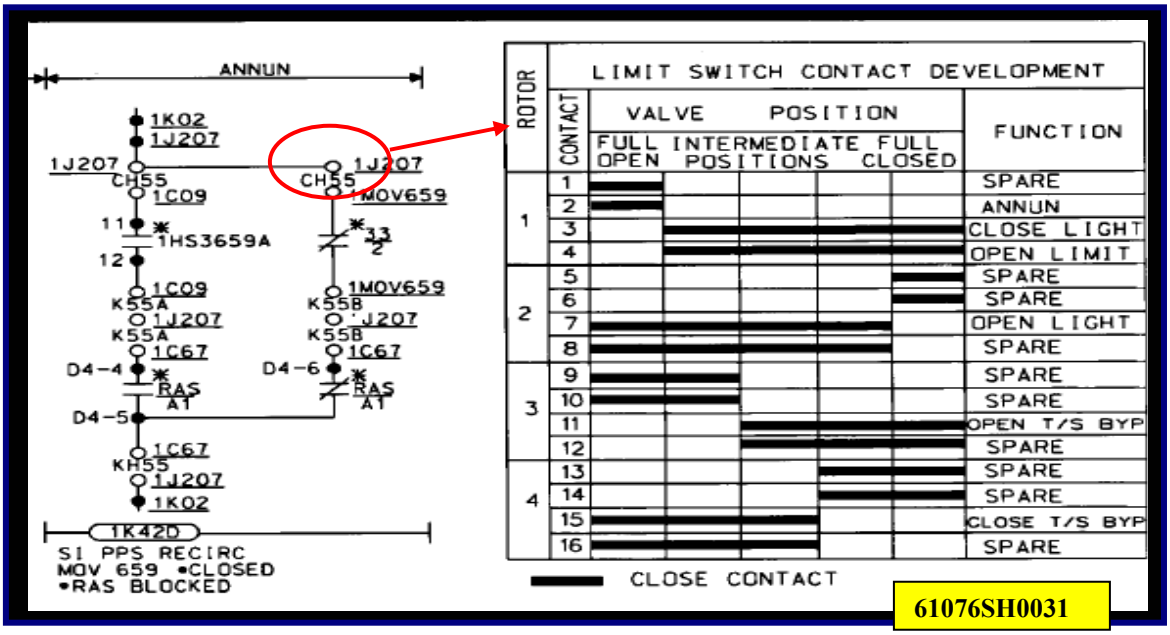
Licensee's Justification for Change
The following is the justification for changing the answer key to include selection D as a correct response in addition to selection B. Selection D states MINI FLOW RETURN TO RWT ISOL, 1-SI-659-MOV shut and SI PP RECIRC LOCKOUT handswitch, 1-HS-3659A in ON.
Selection "D" will also cause the "SI PPS RECIRC MOV 659 CLOSED RAS BLOCKED" alarm to actuate with MOV-659 shut and 1-HS-3659A in ON. The alarm circuitry logic seeks a combination of MOV 659 position, RAS actuation and 1-HS-3659A position.

DEVICE	SETPOINT	WINDOW	H-55
1-SI-659-MOV 1-HS-3659A RAS relay	N/A	SI PPS RECIRC MOV 659 • CLOSED • RAS BLOCKED	

POSSIBLE CAUSES

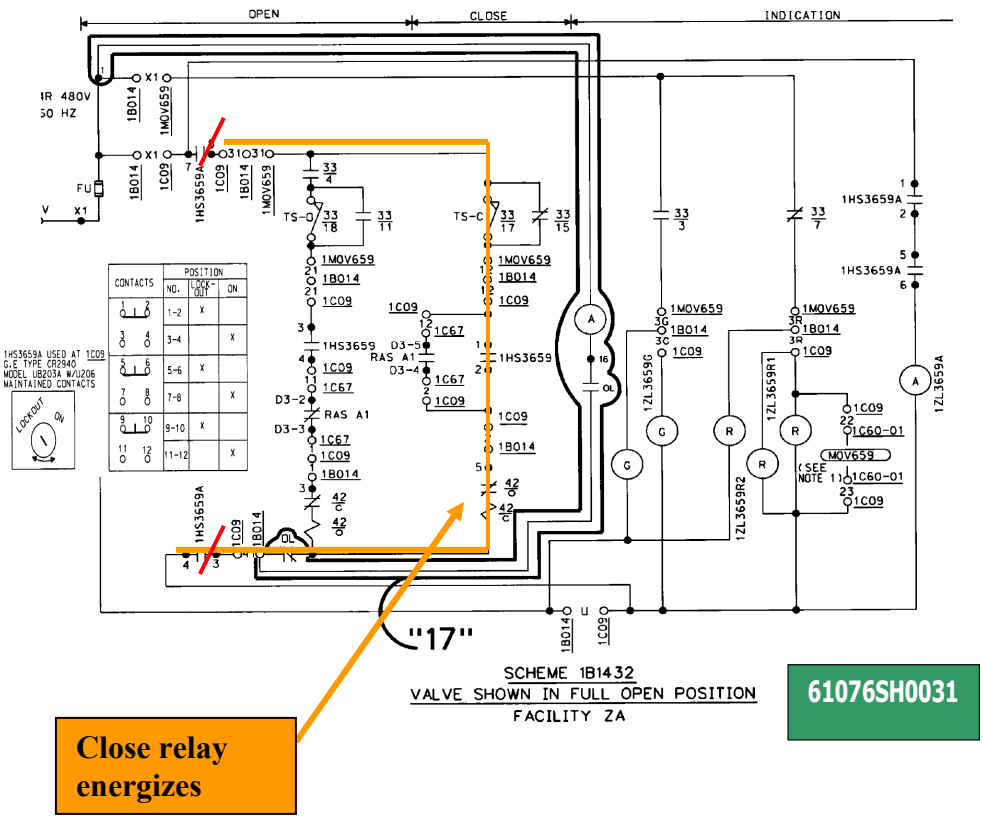
- SI PP RECIRC LOCKOUT handswitch, 1-HS-3659A, in LOCKOUT with a RAS signal present
- MINI FLOW RETURN TO RWT ISOL MOV 659, 1-SI-659-MOV, shut without RAS signal present
- MINI FLOW RETURN TO RWT ISOL MOV 659, 1-SI-659-MOV, shut **AND** SI PP RECIRC LOCKOUT handswitch, 1-HS-3659A, in LOCKOUT with or without an RAS signal present

Referencing electrical print 61076SH0031 (REACTOR SAFEGAURDS C.S. & S.I. PUMPS RECIRC VALVE 1MOV659) when 1MOV659 is shut without a corresponding RAS, contact 33/2 will open and interrupt power to the alarm circuitry and actuate the alarm.



Under normal configuration, 1HS3659A is in the lockout position which prevents aligning power to reposition 1MOV659. When handswitch 1HS3659A is placed in the ON position, power is aligned to 1MOV659 and the MOV is able to be repositioned by an operator. If 1HS3659A is in the ON position and an operator shuts 1MOV659 without a RAS present, contact 33/2 will open and the "SI PPS RECIRC MOV 659 CLOSED RAS BLOCKED" alarm will actuate. The electrical print shows that if 1HS3659A is placed in the ON position, contact 7 and 8 will shut and align power to 1MOV659 open/close circuitry and allow repositioning.

Based upon electrical print 61076SH0031, 1MOV659 can be shut with 1HS3659A in the ON position and satisfy the circuitry to actuate the "SI PPS RECIRC MOV 659 CLOSED RAS BLOCKED" alarm. The function of 1-HS-3659A is to supply power for positioning 1MOV-659 such as in EOP-5 when preparing for RAS actuation.


OPEN
CLOSE
INDICATION
"17"
SCHEME 1B1432
VALVE SHOWN IN FULL OPEN POSITION
FACILITY ZA
61076SH0031
Close relay energizes

Regrade Request
There are two correct answers. B and D should be accepted as correct responses for this question based on the electrical prints and logic diagrams.

Question Statistics
Question 31 was missed by 8 of 11 students. Three candidates selected B, four candidates selected C and four candidates selected D.

Post Examination Review References
61076SH0031, RECIRC VALVE 1MOV659
Alarm Manual 1C09 Window H-55

RO Written Examination Question # 40 (ID: Q50342) ***See PPT file on reference CD also***

A SIAS has occurred on Unit 1. Which of the following is a correct statement for CAC operation?
A. The CACs can be started in Fast Speed at 1C09 AND at the load contactor panel.
B. The CACs can be shifted to Fast Speed at the load contactor panel ONLY
C. The CACs can be stopped from the load contactor panel ONLY
D. The CACs can be stopped at 1C09 and at the load contactor panel.

Original answer accepted was B

Original Answer Explanation
The CACs can be shifted to Fast Speed at the load contactor panel ONLY.
A is incorrect, with a SIAS present CACs can not be started in fast speed from the control room per LD 76 sheet 1.
B is correct since CACs can be shifted to Fast Speed at the load contactor panel ONLY.
C is incorrect, SIAS seals in per LD 76 sheet 11.
D is incorrect SIAS signal seals in per LD 76 sheet 11.

All of the answers require the candidate to be familiar with the logic sheets and/or control drawings for the CACs. If a candidate does not know the logic he could have the misconception that the CACs can be shifted to fast or stopped with a SIAS present since the H/S at 1C09 have a pull to lock feature to start them in slow. He could confuse this with the ability to pull to lock and stop the CACs. Some pumps (CCW, SW, SRW) can be pulled to lock and will not start on SIAS. This is not true for the CAC. CACs are manually started in fast speed from 1C09 when containment environment is degraded.

Original References
LD-76 Sheet 11
AOP-9A page 53

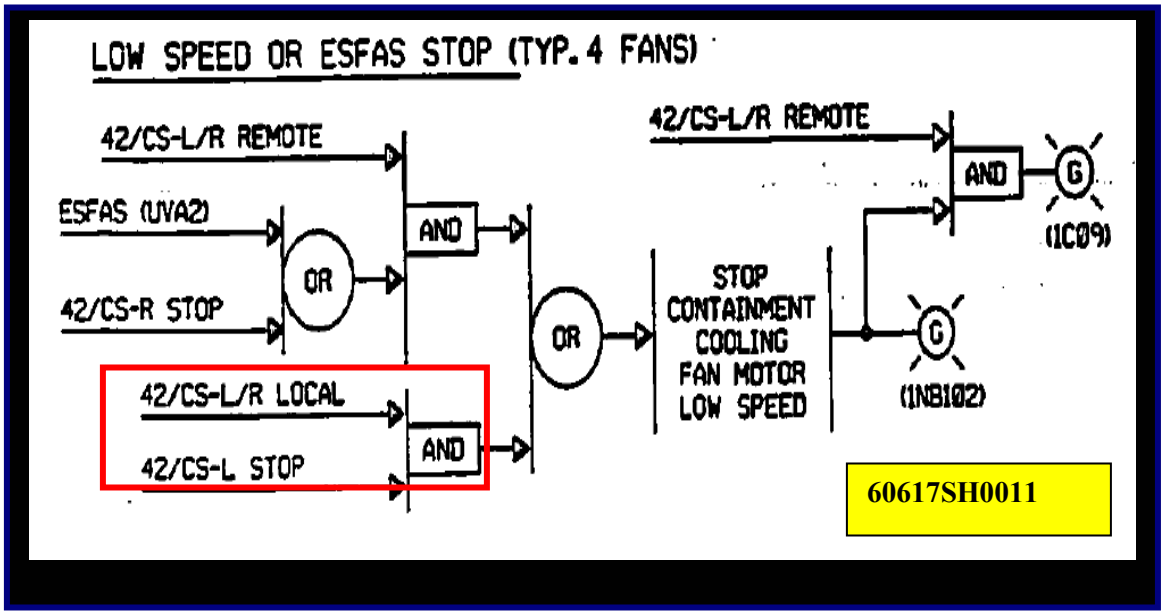
Licensee's Justification for Change

Selection C is also a correct response. The following is the justification for changing the examination answer key to include selection C as a correct response in addition to selection B. Question #40 states the following: A SIAS has occurred on Unit 1. Which of the following is a correct statement for Containment Air Cooler (CAC) operation?

Selection C states the following: The CACs can be stopped from the load contactor panel ONLY. If the CAC local remote handswitch is positioned to the LOCAL position and the CAC local control handswitch is selected to STOP, the CAC will stop regardless of the SIAS actuation signal.

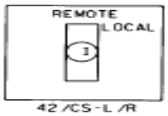
The CAC logic diagram shows that the SIAS signal is not sealed in, preventing securing the CAC, if the remote/local handswitch is in the REMOTE position.

If the remote/local selector switch is in LOCAL and the local control handswitch is selected to STOP, the CAC will stop.



Electrical schematic 61076SH0011D shows that a CAC can be stopped from its local load contactor if its local/remote switch is placed in LOCAL and its local control switch is placed in STOP then spring returned to NORMAL. In this configuration the CAC can be shifted to Fast or Slow Speed locally in addition to being secured during an active SIAS.

1HS5300A1



42/CS-L/R

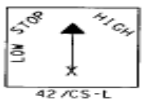
MAINTAINED CONTACTS.
KEY OPERATED.
KEY REMOVABLE IN
REMOTE POSITION

DECK	CONTACTS	POSITION	
		REMOTE	LOCAL
1	1 – 2	X	
	3		X
	5 – 6	X	
	7		X

ONE DECK SHOWN
TYPICAL FOR TEN DECKS.
EXCEPT FOR TERMINAL NUMBERS

TERMINAL NUMBER = 1 1
DECK NO. ——▲
CONTACT NO. ——▲

1HS5300A

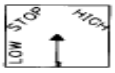


42/CS-L

SPRING RETURN TO NORMAL
FROM STOP & HIGH.
PULL TO LOCK AT LOW.
PISTOL-GRIP HANDLE

CONTACTS	POSITION			
	LOW	STOP	NORM	HIGH
1 – 2				X
3 – 4			X	X
5 – 6	X			
7 – 8	X			

1HS5300



42/CS-R

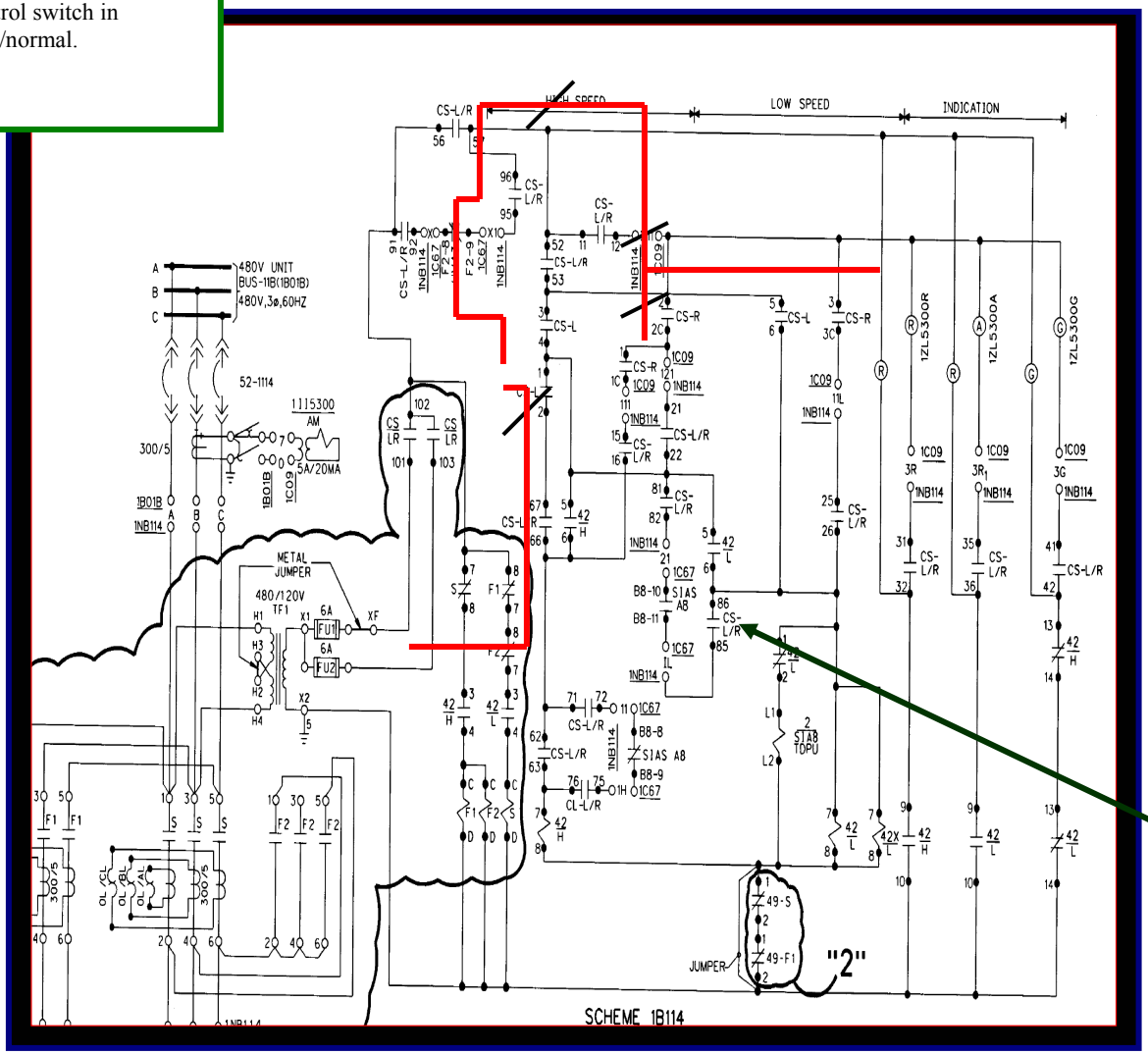
USED AT 1C09

CONTACTS HANDLE	END	NO.	HIGH	NORMAL	STOP	LOW
1 – 1C	2C – 2	1	X	X		
		2	X	X		
3 – 3C	4C – 4	3				X
		4				X

SPRING RETURN TO NORMAL FROM
STOP & HIGH, PULL TO LOCK AT LOW

61076SH0011D

The trace with the red lines display the control circuit's contact alignment with the local/remote switch in local and the local control switch in stop/normal.



In this control circuit configuration, power is not supplied to the SIAS A8 contact if shut.

Regrade Request
C and B should be accepted as correct answers.
A CAC can be stopped or shifted to fast speed from its local load contactor panel with a SIAS signal present.

Question Statistics
Question 40 was missed by 9 of 11 students. Two candidates selected B, five candidates selected C and four selected D.

Post Examination Review References
60617SH0011
61076SH0011D

RO Written Examination Question #54 (ID: Q50364) ***See PPT file on reference CD also***

Unit -1 is operating at 100% power when Instrument Air System pressure decreases to 96 psig.

Which of the following is correct?

A. Loss of Power to an IA dryer has occurred.

B. Standby Air Compressor has picked up

C. Plant Air to I/A X-Conn, 1-IA-2061-CV has opened

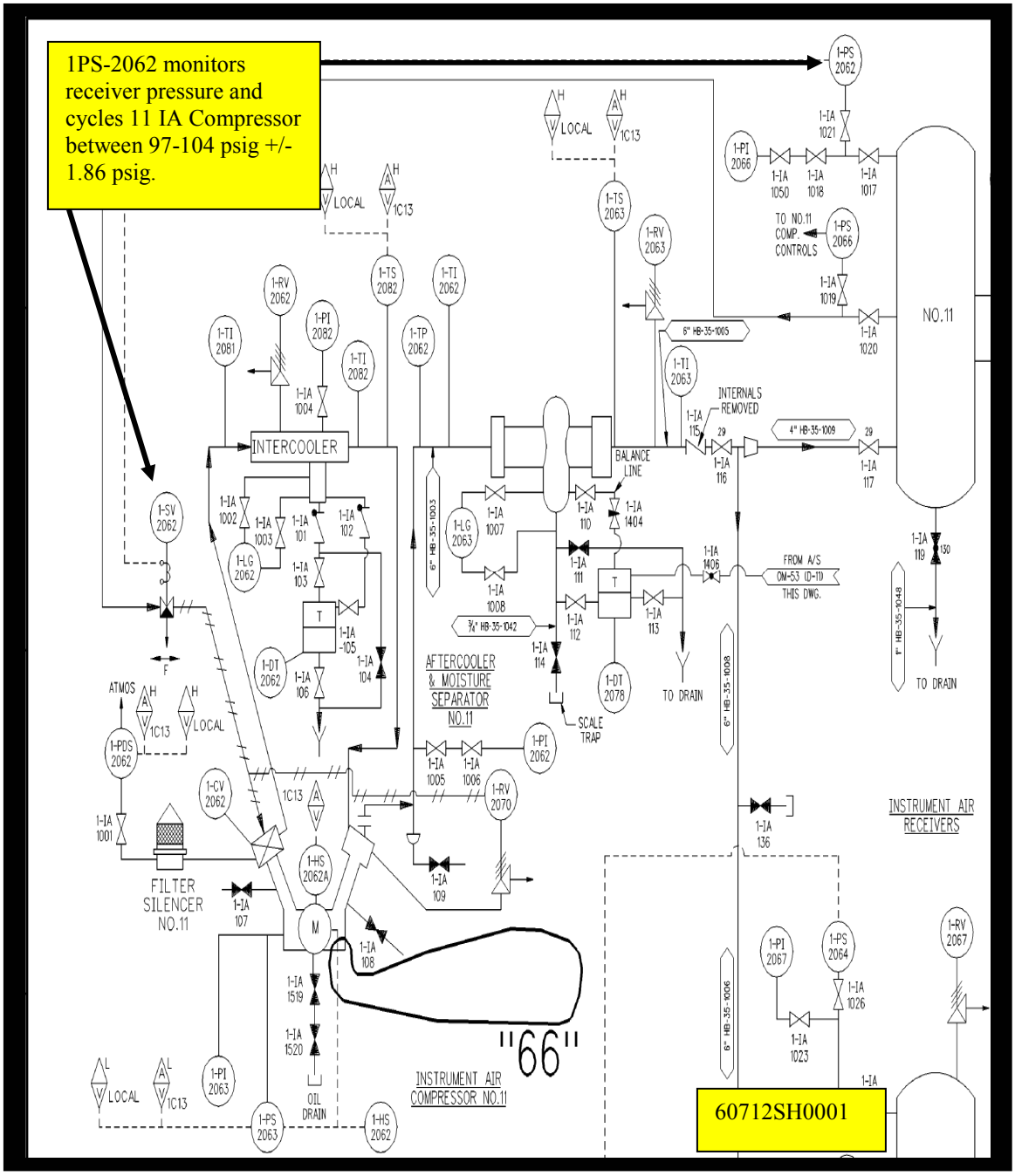
D. Both dryers are in service due to low IA pressure

Original answer accepted was A

Answer Explanation
A. Correct per Alarm Manual for Window K-26
B. Incorrect, STBY compressor starts @ 93 PSIG per AOP7D section III.C notes
C. Incorrect, This CV opens @ 88 psig per AOP 7B section III C. notes
D. Incorrect, Pressure is 96 not 93 psig

Original References
Alarm Manual 1C13 pages 48-50
Compressed Air Lesson Plan – LOI-019-1-2 slides 62, 63

Licensee's Justification for Change
There is no correct answer. A candidate cannot determine if an instrument air system event has occurred solely upon 96 psig system pressure. This can be an expected condition since the instrument air compressors can cycle between 95 psig and 106 psig. Per the set point file (Attachment 1) for the Compressed Air System, pressure switches 1-PS-2062 and 1-PS-2064 cycle 11 and 12 Instrument Air Compressors between 97 and 104 psig +/- 1.86 psig to regulate instrument air system pressure.
The drawing below shows that 1-PS-2062 monitors 11 Instrument Air Receiver pressure and cycles 11 Instrument Air Compressor between the set points.



The alarm referenced in the answer explanation (INSTR AIR SYS MALFUNCTION) does not support the answer if instrument air pressure is the only parameter provided to the candidates. Indications that a loss of power to an Instrument Air Dryer cannot be based only on 96 psig instrument air system pressure. The question should have included additional data to support the correct answer.

DEVICE	SETPOINT
1-PS-2079	90 PSIG (89.2 to 90.8 PSIG)
1CR/11 Dryer malfunction	
2CR/12 Dryer malfunction	

WINDOW K-26

INSTR AIR SYS MALFUNCTION

POSSIBLE CAUSES

- Air Compressor failure
- Instrument Air Header break
- Instrument Air Dryers:
  - High humidity detected in bed
  - Valve switching failure (Repress, Inlet, Exhaust)
  - AMLOC probe/signal failure
  - Loss of Power to an IA dryer 5300
  - IA Pressure lowers to 93 ± 1 PSIG. 5300

AUTOMATIC ACTIONS

Attachment 1

NEQR440 — Setpoints By System and Instrument Number — Page 3

Setpoint File For System 019 Unit 1 — 01/11

Eqp Number / Setpt No.	SP Alias / Setpoint	Units	Direction	Action / Setpoint	Tolerance	Descr / Reset	Reset Tolerance		Panel	Wi
1PS2008				OPENS CONTACT					1PNL1C13	K-
1 Des	93	PSIG	DEC	+1	-1					See R
Eqv										
Offset N/A	Remarks	1) Initiates 12 IA Dryer auto purge isolation								
1PS2025				OPEN CONTACTS						
1 Des	75	PSIG	DEC	+4	-4					
Eqv		- -								
Offset N/A	Remarks	Isolates Plant Air to Containment, Places Emergency Air Bottles on Service								
1PS2057	1XIC2054			CLOSE CONTACTS		SHUTDOWN ALARM			1PNL1C13	K-
1 Des	6	PSIG	DEC	+1	-1					
Eqv										
Offset N/A	Remarks	1) PAC S/D. Local 1XIC2054 alarm, causes common CR alarm. Factory Set								
1PS2059										
1 Des	85	PSIG	DEC	+.85	-.85					
Eqv		- -								
Offset N/A	Remarks									
1PS2060									1PNL1C13	K-
1 Des	90	PSIG	DEC	+.8	-.8					
Eqv		- -								
Offset N/A	Remarks									
1PS2061										
1 Des	88	PSIG	DEC	+.85	-.85					
Eqv		- -								
Offset N/A	Remarks									
1PS2062										
1 Des	97	PSIG	DEC	+1.86	-1.86	104	+1.86	-1.86		
Eqv		- -								
Offset N/A	Remarks									
1PS2063									1PNL1C13	K-
1 Des	16.21	PSIG	DEC	+.3	-.3					
Eqv		- -								
Offset -1.21	Remarks									

Regrade Request
Question #54 should be deleted due to no correct answer. It is normal for instrument air system pressure to cycle between 95 psig and 106 psig and an Instrument Air Dryer failure cannot be properly diagnosed when the only indication given is that system pressure is 96 psig.

Question Statistics
Question 54 was missed by 4 of 11 students. Seven candidates selected A, two selected B, and two selected D.

Post Examination Review References
Set point File for System 019 – Compressed Air System
1C13 Alarm Manual – Window K-26
Compressed Air System – 60712SH0001

RO Written Exam Question #60 (ID Q: 50371)

Each Containment Iodine Removal Unit (IRU) is _____ capacity with each unit being _____ efficient for removing Iodine. As humidity level approaches 99%, filter efficiency is _____.

A. 50%, 90%, ~ 50%
B. 100%, 99%, ~ 90%
C. 100%, 90%, ~ 50%
D. 50%, 99%, ~ 90%

Original answer accepted was D

Original Answer Explanation:

D. Correct - (1) Each IRU is 50% capacity, with each unit being 99% efficient for removing Iodine, (2) as humidity level approaches 99%, filter efficiency is ~ 90% - Correct per EOP-5 basis

A. Incorrect, wrong efficiency @ 99% humidity

B. Incorrect, Wrong capacity

C. Incorrect, Wrong capacity and wrong efficiency

Licensee's Justification for Change

Answer options A and D are correct responses based on design filter capacity and efficiency. Per EOP-5 bases, efficiency ranges from 90 to 99%. Technical Specification 3.6.8 bases states that the IRUs are 50% capacity. The third part of the question is trivial information, found only in the EOP-5 basis document. There are no learning objectives or training materials that support this part of the question. No operator action is based on containment humidity changes and there is no direction to the operators in the EOP other than to start the IRUs. It is sufficient to know the capacity and efficiency of the Iodine Removal Units with the knowledge that under any conditions, two IRUs are sufficient for iodine removal.

B 3.6 CONTAINMENT SYSTEMS

B 3.6.8 Iodine Removal System (IRS)

BASES

BACKGROUND

The IRS is provided per Reference 1, Appendix 1C, Criteria 62, 63, and 64, to reduce the concentration of fission products released to the containment atmosphere following a postulated accident. The IRS would function together with the Containment Spray and Cooling Systems following a DBA to reduce the potential release of radioactive material, principally iodine, from the Containment Structure to the environment.

The IRS consists of three 50% capacity separate, independent (except for power), and redundant trains. Each train includes a moisture separator, a high efficiency particulate air filter, an activated charcoal adsorber section for removal of radioiodines, a fan, and instrumentation. The moisture separators function to reduce the moisture content of the air stream. The system initiates filtered recirculation of the containment atmosphere following receipt of a SIAS. The system design is described in Reference 1, Section 6.7.

Step: IV.W. IF THE LEAK IS INSIDE CONTAINMENT,
THEN RESTORE THE CONTAINMENT ENVIRONMENT.

This block step provides steps in restoring containment environment to allow resetting of ESFAS actuation equipment. This step is consistent throughout the procedures whenever containment environment is challenged.

The EPG contains a step to provide containment radiation levels to the TSC, to evaluate the impact of potential environmental release and if containment radiation levels are high, to consider operating the Iodine Removal System. The EOP does not contain a step to provide containment radiation levels to the TSC, and contains a step to verify the Iodine Filter fans are running when addressing restoration of containment environment without requiring high containment radiation levels. Containment radiation level assessment is performed via the Emergency Response Plan.

1. The containment iodine removal system is designed to collect within the containment the iodine released following a loss of coolant accident. Following a loss of coolant accident, a SIAS automatically starts three 50 percent capacity recirculation filter units, each with 20,000 cfm capacity. These units consist of activated charcoal filters preceded by high efficiency particulate air filters. A moisture separator is provided upstream of the particulate air filters to remove water droplets. An electric driven induced draft fan located at the end of the banks of filters pulls the containment atmosphere through these components and discharges vertically back into the containment. The operators should verify these fans have started and are operating to reduce containment iodine levels. The three containment charcoal filter units contain a total of 7300 lbs. of Barnebey-Cheney #727 coconut shell charcoal impregnated with 5 WT. % iodine compounds. Test conducted by the ORNL on Barnebey-Cheney #727 charcoal demonstrate that the installed charcoal absorbers will perform satisfactorily in removing both elemental and organic iodides for design conditions of flow, temperature and relative humidity. In these tests iodine removal efficiencies ranging between 90 to 99 percent were obtained. Filter efficiency fell toward the lower level as relative humidity approached 99 percent.

Regrade Request
Accept responses A and D. Knowledge of the capacity and efficiency of the Iodine Removal Units is sufficient. The degree of efficiency changes with respect to humidity is trivial.

Question Statistics
Question 60 was missed by 10 candidates. Three candidates selected A, two selected B, 1 selected C, 5 selected D.

Post Examination Review References
EOP-5 bases for step W.
Technical Specification Bases B3.6.8

Question # 61 (ID: Q50373) ***See also reference CD***
Unit-1 is in EOP-1 with feedwater controls in automatic mode (feedwater regulating bypass valves are controlling level) when RCP feeder breaker, 252-1201, trips. Assume no other operator action is taken. Which of the following secondary plant parameters observed ~ 25 minutes after the RCP trips indicate a loss of RCS flow is occurring?

A. Lowering steam flow and feed flow with rising S/G pressures

B. Rising steam flow and feed flow with lowering S/G pressures

C. Rising steam flow and feed flow with rising S/G pressures

D. Lowering steam flow and feed flow with lowering S/G pressures

Original answer accepted was C

Original Answer Explanation:
Rising steam flow and feed flow with rising S/G pressures--is correct, Tave will increase, causing ADVs to open. This will cause steam flow and feed flow to rise. S/G pressures will rise as Thot increases.
Distracters are possible combinations of secondary plant parameters.

Licensee's Justification for Change

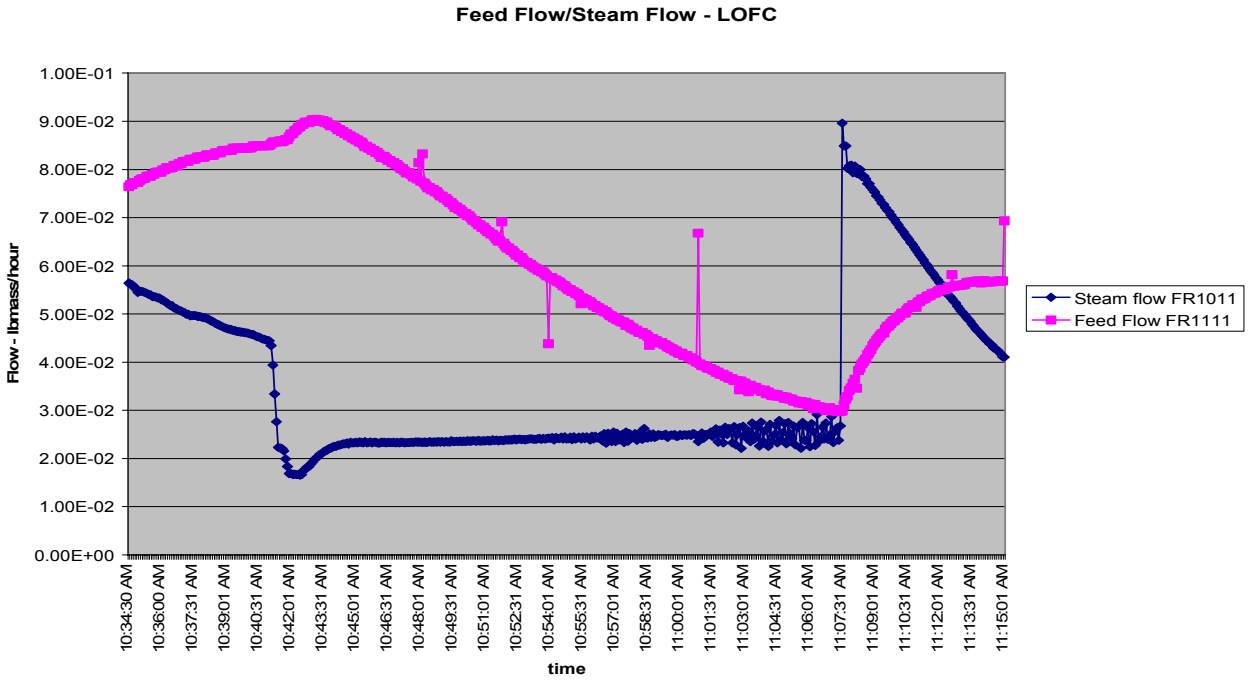
The stem of the question is confusing. Some candidates thought the question was asking for the indications of loss of forced flow, others thought the question asked for the indications of loss of natural circulation flow (based on "a loss of RCS flow is occurring" in the stem).

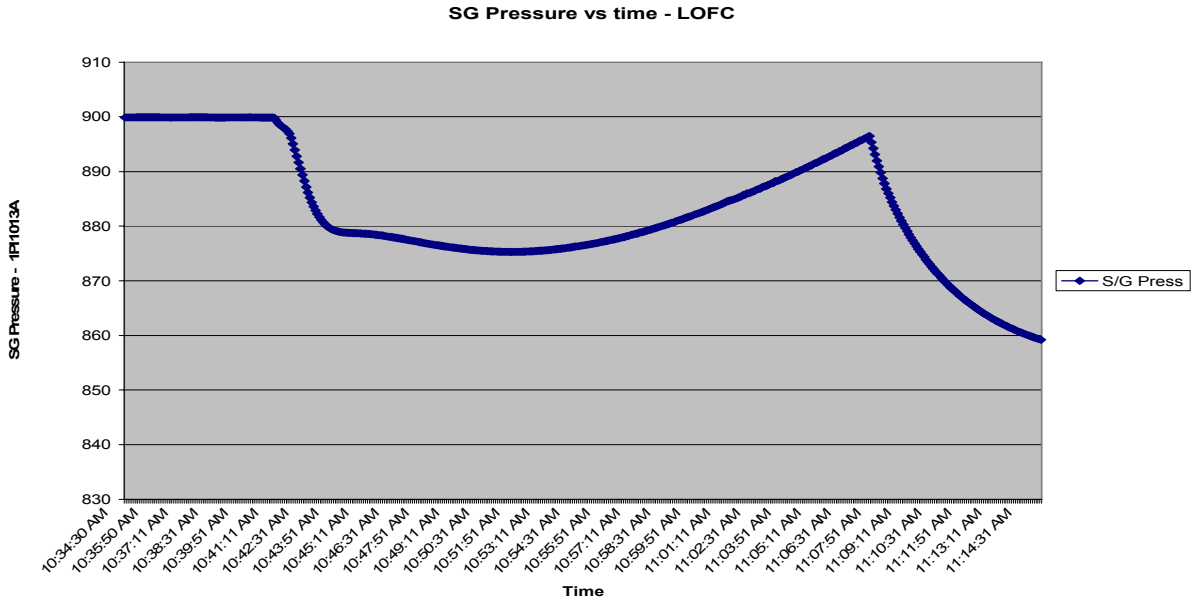
- Indications of a loss of forced flow after about 25 minutes are, the ADVs open, S/G pressure starts to lower as feed and steam flow rise (response B) until after the ADVs shut again.
- A loss of natural circulation flow would be indicated by S/G pressure rising while feed and steam flow lowered (response A, see simulator trends prior to ADVs opening. RCS flow would eventually stagnate, leaving a hot S/G at a higher pressure with feed and steam flow matched at a lower rate).

.
The original answer accepted, C, is incorrect. Steam flow and feed flow lower while S/G pressure is rising until the ADVs open. Once the ADVs open, S/G pressure lowers and feed and steam flows rise until the ADVs reshut.
D is incorrect for the time period stated. From the simulator data, feed flow would not be lowering until S/G level was greater that 0", greater than 1 hour after loss of forced flow.

No references were supplied to support the original answer explanation. See the simulator data. Initially, steam flow is dropping as decay heat is being reduced after the trip. Feed flow is rising during this time to return S/G level to 0".

Simulator data traces:
Feedwater is in AUTO, RCP feeder breaker trips at approximately 10:40:01 causing a loss of forced flow. Steam flow initially drops rapidly due to less heat input from the RCPs. Feed flow spikes due to shrink and then begins to drop to match steam flow. ADVs open at approximately 11:07:31 (27 1/2 minutes), steam flow spikes when ADVs open, and then starts to lower. Feed flow rises during this time. S/G pressure rises until the ADVs open. 'A' is also the most correct answer prior to the ADVs opening, which occurs "about 25 minutes" after loss of forced flow. The candidates were forced to make an assumption about the position of the Atmospheric Dump Valves. Answers A and B should be accepted.


Feed Flow/Steam Flow - LOFC
Flow - lbmass/hour
1.00E-01
9.00E-02
8.00E-02
7.00E-02
6.00E-02
5.00E-02
4.00E-02
3.00E-02
2.00E-02
1.00E-02
0.00E+00
10:34:30 AM
10:36:00 AM
10:37:31 AM
10:39:01 AM
10:40:31 AM
10:42:01 AM
10:43:31 AM
10:45:01 AM
10:46:31 AM
10:48:01 AM
10:49:31 AM
10:51:01 AM
10:52:31 AM
10:54:01 AM
10:55:31 AM
10:57:01 AM
10:58:31 AM
11:00:01 AM
11:01:31 AM
11:03:01 AM
11:04:31 AM
11:06:01 AM
11:07:31 AM
11:09:01 AM
11:10:31 AM
11:12:01 AM
11:13:31 AM
11:15:01 AM
time
Steam flow FR1011
Feed Flow FR1111


SG Pressure vs time - LOFC
SG Pressure - 1P11013A
910
900
890
880
870
860
850
840
830
10:34:30 AM
10:35:50 AM
10:37:11 AM
10:38:31 AM
10:39:51 AM
10:41:11 AM
10:42:31 AM
10:43:51 AM
10:45:11 AM
10:46:31 AM
10:47:51 AM
10:49:11 AM
10:50:31 AM
10:51:51 AM
10:53:11 AM
10:54:31 AM
10:55:51 AM
10:57:11 AM
10:58:31 AM
10:59:51 AM
11:01:11 AM
11:02:31 AM
11:03:51 AM
11:05:11 AM
11:06:31 AM
11:07:51 AM
11:09:11 AM
11:10:31 AM
11:11:51 AM
11:13:11 AM
11:14:31 AM
Time
S/G Press

Regrade Request
Accept responses A and B, do not accept C as a correct response.

Question Statistics
Question 61 was missed by 10 of 11 students. Five candidates selected A, two selected B, one selected C, and three selected D.

Post Examination Review References
Simulator plots of feed flow, steam flow and S/G pressure. There were no references cited for the original answer selection.

RO Written Examination Question # 68 (ID: Q50385R)

Unit 2 has just completed a refueling outage and is conducting PSTP3," Escalation to Power Test Procedure", to test at the power plateau of 85% power. At 80% it was determined that Frt is greater than the full power value of T.S 3.2.3. While reviewing the data a transient occurs and power rises to 90% and is stabilized. Which of the following is required?

A. Reduce Thermal Power to less than or equal to 85% within 1hour
B. Reduce Thermal Power to less than or equal to 85% within 15 minutes
C. Reduce Thermal Power to less than or equal to 80% within 1 hour
D. Reduce Thermal Power to less than or equal to 80% within 15 minutes

Original answer accepted was B

Original Answer Explanation

A. Incorrect, the power level is correct but the time to reduce is wrong
B. Reduce Thermal Power to less than or equal to 85% within 15 Mins - Correct per T.S. 3.1.8
C. Incorrect, the time to reduce power and the power level are wrong
D. Incorrect, the power level to reduce to is incorrect

Original References

Technical Specification 3.1.8, Special Test Exception (STE) – Modes 1 and 2
PSTP-3, Escalation to Power Test Procedure

Licensee's Justification for Change

Candidates were not provided with enough information to properly test their ability to implement the special test exception of Technical Specification 3.1.8. The question states at 80% it was determined that F_r^T is greater than the full power value of T.S. 3.2.3 and a transient occurred which raised power to 90% and stabilized.

The question did not state that Special Test Exception 3.1.8 was invoked. Since no Technical Specifications were being violated, there is no reason to assume the Special Test Exception, 3.1.8 applied. At 80% power, F_r^T can exceed the 100% power limit and not exceed the limit for 80 or 90% (See figure 3.2.3). The intent of the question was to test candidate knowledge of test exception of T.S. 3.1.8. The PSTP-3 procedure does not specifically direct invoking the special test exception of T.S. 3.1.8. Where 3.1.8 is invoked, procedures have a step to ensure the requirements are met.
See PSTP-2 attachment 3 as an example. No similar document exists in PSTP-3. The stem of the question should have stated that the special test exception had been invoked.

Since the special test exception was not applicable, maintaining power stable at 90% would be the correct response. There would be no reason to subject the plant to an additional transient.

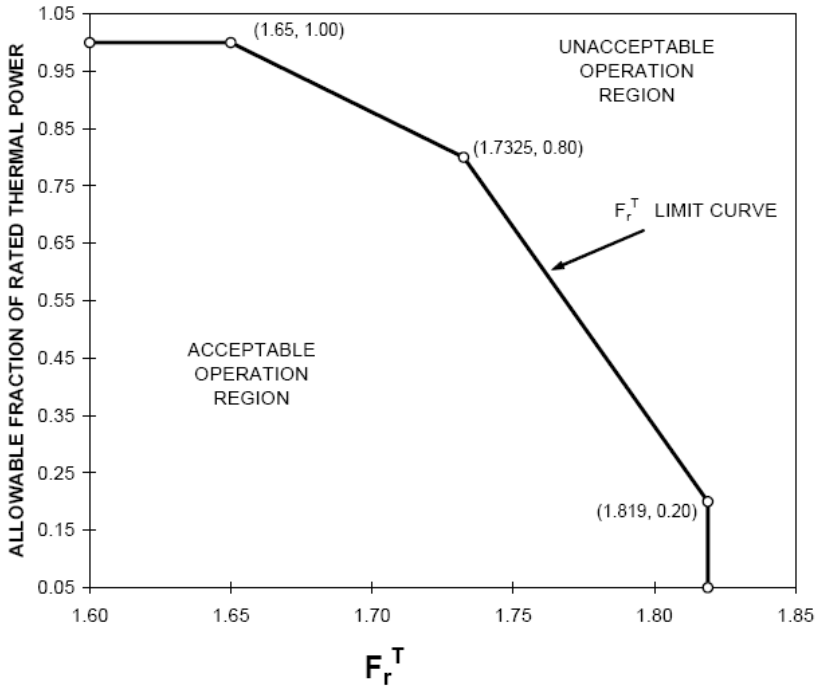


Figure 3.2.3

Total Integrated Radial Peaking Factor (F_r^T) vs.
Allowable Fraction of Rated Thermal Power

While operating with F_r^T greater than 1.65, withdraw CEAs to or above the Long Term Steady State Insertion Limits (Figure 3.1.6)

ATTACHMENT 3
SPECIAL TEST EXCEPTION VERIFICATION

Seq #_____

Technical Specification SR 3.1.8.1 requires that power level be checked once per hour to verify that the highest reading WRLC is less than 1% power. An independent reviewer is required to initial in the "VER." column.

DATE	TIME	POWER LEVEL IN RANGE?	INIT.	VER.

DATE	TIME	POWER LEVEL IN RANGE?	INIT.	VER.

3.1 REACTIVITY CONTROL SYSTEMS

3.1.8 Special Test Exception (STE)-MODES 1 and 2

LCO 3.1.8 During the performance of PHYSICS TESTS, the requirements of

LCO 3.1.3, "Moderator Temperature Coefficient (MTC);"
LCO 3.1.4, "Control Element Assembly (CEA) Alignment;"
LCO 3.1.5, "Shutdown Control Element Assembly (CEA) Insertion Limits;"
LCO 3.1.6, "Regulating Control Element Assembly (CEA) Insertion Limits;"
LCO 3.2.2, "Total Planar Radial Peaking Factor (F_{xy}^T);"
LCO 3.2.3, "Total Integrated Radial Peaking Factor (F_r^T);" and
LCO 3.2.4, "AZIMUTHAL POWER TILT (T_q)"

may be suspended, provided THERMAL POWER is restricted to the test power plateau, which shall not exceed 85% RTP.

APPLICABILITY: MODES 1 and 2 during PHYSICS TESTS.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Test power plateau exceeded.	A.1 Reduce THERMAL POWER to less than or equal to test power plateau.	15 minutes

The original reference used to develop the question was PSTP-3, Escalation to Power Test Procedure applicability/scope statement 2.6. This is a boiler-plate statement in all the PSTPs. In practice, 3.1.8 is not entered during the performance of PSTP-3. Step 6.7 also has a “90% limiting” parenthetical clause which indicates that, at least for this section of the procedure, 3.1.8 cannot apply.
Applicability/scope statement 2.6 states PSTP-3 shall be considered as physics testing but does not direct invoking the special test exception of Technical Specification 3.1.8. The statement only mentions that the special test exception may apply under specific conditions.

2.6 This procedure shall be considered PHYSICS TESTS and certain SPECIAL TEST EXCEPTIONS of Technical Specification 3.1.8 may apply as follows:

- If measured MODERATOR TEMPERATURE COEFFICIENT (MTC) and/or the Peaking Factors F_r^T and F_{xy}^T do not meet the limits of Technical Specifications 3.1.3, 3.2.2 and 3.2.3 early in cycle life, SPECIAL TEST EXCEPTION 3.1.8 may be invoked below 85% Rated Thermal Power (RTP).
- Thermal Power shall be restricted to less than 85% Rated Thermal Power per Technical Specification Surveillance Applicability 3.1.8. **[B-14]**
- Technical Specification Surveillance Requirement 3.1.8.1 is satisfied by recording Thermal Power at least once per hour, ensuring that power remains less than or equal to the test power plateau.

In accordance with PSTP-3 F_r^T is evaluated for technical specification compliance at step 6.7, Power increase to 85% RTP. PSTP -3 section 6.7 does not direct invoking the special test exception, nor is it referred to at any step in the procedure.

6.7 Power increase to 85% RTP (85% RTP NOMINAL, 90% RTP LIMITING)

A. **COMMENCE** power increase to 85% RTP observing limits of PRECAUTION 5.2 **AND CONTINUE** to monitor the power increase by recording values on Attachment PSTP-3-5 hourly and Attachment PSTP-3-4 **PER** Step 6.2.B.

B. **PRIOR** to exceeding 70% RTP, **VERIFY** that the corrected predicted HFP MTC is less than the most positive value allowed at 100% RTP per Technical Specification 3.1.3 and T.S. Figure 3.1.3-1 **OR ESTABLISH** a maximum boron concentration to ensure compliance **AND RECORD** reference below. **MARK** the MAXIUMUM BORON CONCENTRATION "N/A", **IF** such a restriction is not required.

MAXIMUM BORON CONCENTRATION (if required): _____ ppm

Reference:_____

_____
SE

C. **PRIOR** to exceeding 70% RTP, **VERIFY** F_r^T, F_{xy}^T, and T_q are within their Technical Specification limits. **[B-25]**

At 85% reactor power F_r^T is evaluated again for Technical Specification 3.2.3 compliance per Appendix B.

6.8 After reaching steady-state operating conditions at 85% RTP (85% RTP NOMINAL, 90% RTP LIMITING)

A. **DIRECT** Operations to perform OI-30 calibration.

_____
SE

B. **PERFORM** a power distribution measurement in accordance with Appendix B, step 6.3.

_____
SE

C. **VERIFY** per the Operator's Log Sheets that **DELTA T POT SETTINGS** are satisfactory for operation above 90% RTP.

_____
SE

6.8 85% RTP (Continued)

D. **PRIOR** TO EXCEEDING 85% RTP, **ENSURE** all Review Criteria have been met **OR** reviewed by PORC and approved by the Plant General Manager. **[B-23]**

PORC Meeting Number (if applicable): _____

_____
SE

PSTP-3 Appendix B 6.3 log measured F_r^T value and compares its value against the technical specification limit. If the current value of F_r^T is larger than the full power limit the procedure directs notifying the Principal Engineer- Fuel Services Unit. PSTP-3 does not direct invoking Technical Specification 3.1.8 Special Test Exception if the F_r^T limits are exceeded.

Appendix B, CECOR Library Qualification and Power Distribution Measurement
Page 8 of 12

6.3 85% Power Plateau

A. **BLOCK** the periodic CECOR execution by performing the following steps from the System level on the plant computer:

1. From the Main Menu, **SELECT** "System Tasks."
2. **SELECT** "Point Editor."
3. **SELECT** "Edit a Point."
4. **ENTER** Point ID CEPERIOD.
5. **SET** the value of CEPERIOD to 1 (one).

_____
SE

NOTE
Step 6.3.B may be repeated as necessary.

B. **OBTAIN** a corefollow CECOR, option 1.

CECOR Printout Date/Time _____/_____

_____
SE

C. **PERFORM** a power distribution comparison per APPENDIX F.

_____
SE

NOTE
Step 6.3.D through 6.3.F may be performed concurrently.

D. **COMPARE** F_r^T, F_{xy}^T, and T_q from step 6.3.B with the following acceptance criteria **AND DOCUMENT** on Attachment A-1 and below.

	MEASURED	ACCEPTANCE CRITERIA (TS Value - current pwr level)
F_{xy}^T	_____	≤ _____ (TS 3.2.2)
F_r^T	_____	≤ _____ (TS 3.2.3)
T_q Upper	_____	≤ 0.030 (TS 3.2.4)
T_q Lower	_____	≤ 0.030 (TS 3.2.4)

_____
SE

G. **IF** the current value of either F_r^T or F_{xy}^T is larger than the full power limit, **THEN NOTIFY** the PE-FOSU. **[B-91]**

_____
SE

Regrade Request
Question # 68 be should be deleted. As written, there is no correct answer. The question stem did not specifically state the special test exception had been invoked. The candidate could not assume that the requirements of T.S. 3.1.8 applied.

Question Statistics
Question 68 was missed by 11 of 11 candidates. One candidate selected A, 5 candidates selected C, 5 selected D.

Post Examination Review References
Technical Specification 3.1.8 - Special Test Exception – Modes 1 and 2
Technical Specification 3.2.3 – Total Integrated Radial Peaking Factor
PSTP-3 – Escalation to Power Test Procedure

SRO Written Examination Question # 10 (ID: Q50404)

A large break LOCA has occurred on Unit-2 and all RCPs have been tripped. The RO is attempting to verify subcooled natural circulation and reports the following:

Pressurizer Pressure is 150 PSIA being maintained by HPSI & LPSI flow
RCS Subcooling based on CETs is 5°F

Which one of the following set of conditions is the **minimum** needed to ensure adequate core cooling?

A. HPSI and LPSI flow appropriate for current RCS pressure AND Thot ~ 425°F

B. HPSI and LPSI flow appropriate for current RCS pressure AND Thot ~ 405°F

C. HPSI and LPSI flow appropriate for current RCS pressure AND Thot ~ 388°F

D. HPSI and LPSI flow appropriate for current RCS pressure AND Thot ~ 360°F

Original answer accepted was B

Original Answer Explanation

Need to recognize that with CETs at 5°F subcooling, subcooled natural circulation is not being met. Per EOP-5 Block Step IV. N 2, for verifying subcooled natural circulation , if natural circulation subcooling is not being met, then need to ensure no more than 50° superheat to ensure adequate core cooling.

Since RCS pressure is 150 PSIA the **minimum** conditions for providing at less than 50°F superheat
A. 425°F would not provide < 50°F

B. HPSI and LPSI flow appropriate for current RCS pressure AND Thot ~ 405°F - Correct would give < 50°F superheat (Sat temp for 150 PSIA = 358.4°F)

C. 388°F would provide < 50°F but the question asked the minimum conditions to give < 50° superheat

D. 360°F would provide < 50°F but the question asked the minimum conditions to give < 50° superheat

Licensee's Justification for Change
The stem of the question is confusing. Candidates were confused about the meaning of "Which one of the following set of conditions is the **minimum**". EOP-5 basis states that flow out the break is the heat removal process for a large break LOCA. EOP Attachment 10 has a chart that indicates adequate HPSI/LPSI flow for heat removal after a LOCA.

Candidates reasoned that core cooling was met by HPSI and LPSI flow and heat removal is adequate if subcooling exists.

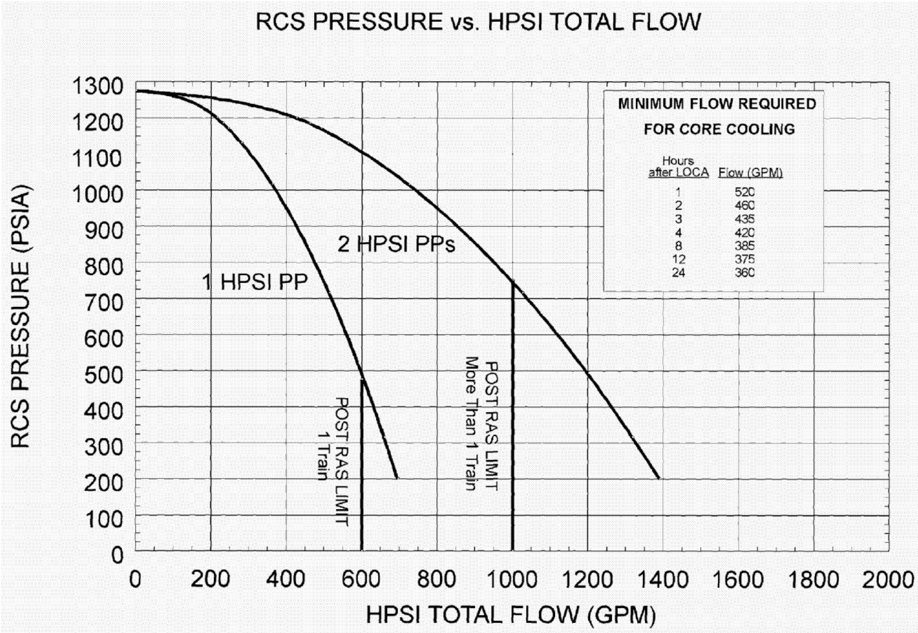
The data contained in the question informs the candidate that CET subcooling is 5°F. The intent of the question was to evaluate the candidates' ability to recall the alternate actions for EOP-5 section IV.N.

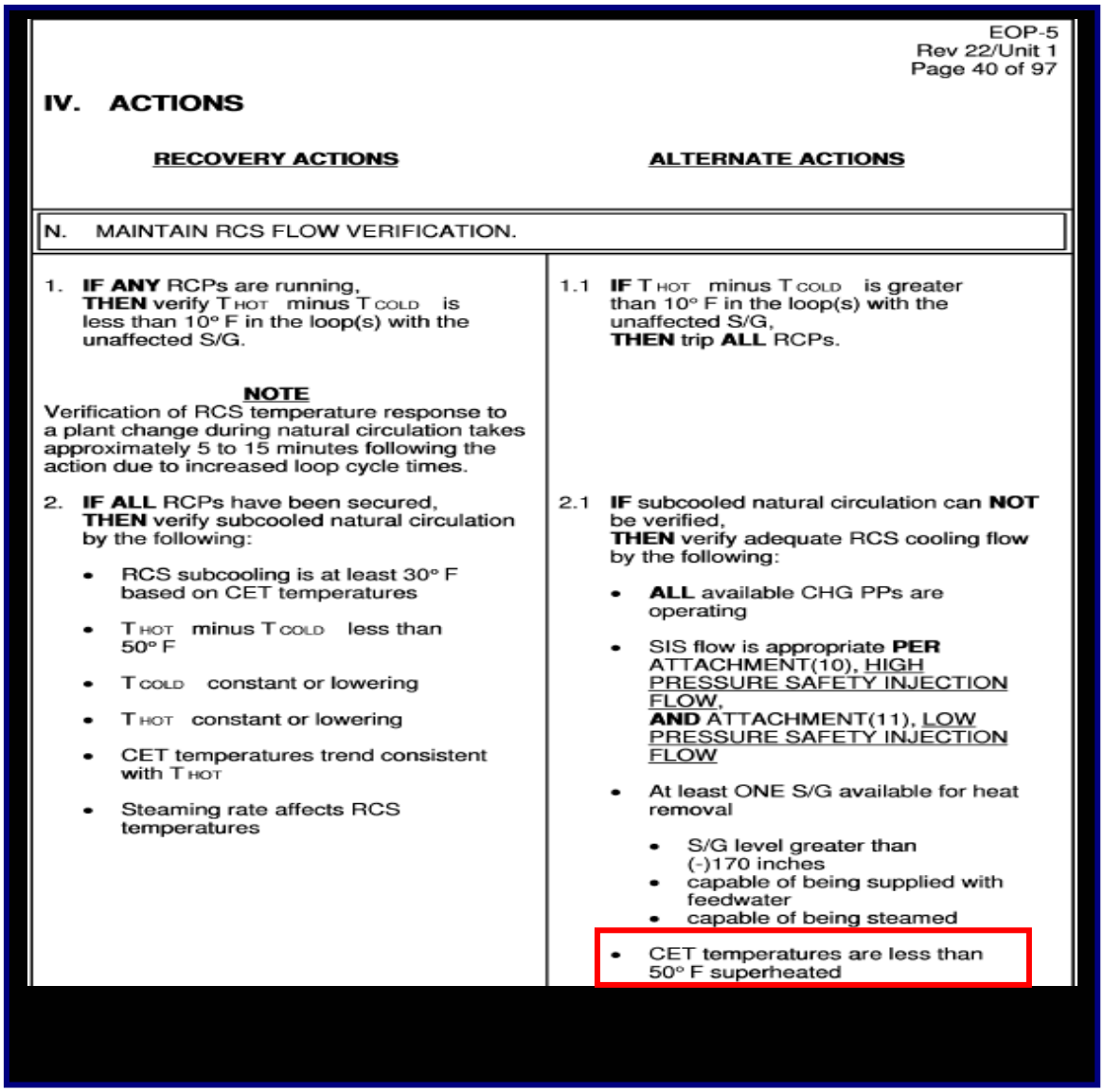
The question asks the SRO candidates to determine which set of conditions is the **minimum** needed to ensure adequate cooling. Each possible selection informs the candidates that HPSI and LPSI flow were appropriate, which satisfies one component of adequate core cooling. In addition to the HPSI and LPSI flow information, each possible selection gave various T_{hot} values. Six of the seven SRO candidates interpreted the meaning of "minimum conditions" in the question stem other than what was intended.

Their understanding of "minimum conditions" guided their thought process to select the lowest superheated temperature. Six SRO candidates selected D as the correct response since T_{hot} at 360°F is only 1.57°F above the saturation temperature for 150 psia. The RCS saturation temperature for 150 psia is 358.43°F. This value was interpreted as the **minimum** RCS condition needed to ensure adequate RCS core cooling. The intent of the question was for the candidates to interpret "minimum condition" as the maximum degree of superheat without exceeding the 50°F limit. One SRO candidate interpreted the question as intended and selected B as the correct response.

From EOP-5 bases-

> Small and large break LOCAs differ in their effect on the post-LOCA RCS heat removal process. For a large break, the only path necessary for RCS heat removal in both the short and long term is the break flow with core boiloff. For small breaks, heat removal via the flow out the break is not sufficient to provide cooling and, therefore, steam generator heat removal is required. The procedure takes this into account with the decisions that must be made. Although distinct small and large break LOCA information is contained in the basis section of this procedure, the action steps to be used during the actual emergency do not require the operator to distinguish between break sizes.


RCS PRESSURE vs. HPSI TOTAL FLOW
RCS PRESSURE (PSIA)
HPSI TOTAL FLOW (GPM)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
0
200
400
600
800
1000
1200
1400
1600
1800
2000
1 HPSI PP
2 HPSI PPs
POST RAS LIMIT
1 Train
POST RAS LIMIT
More Than 1 Train
MINIMUM FLOW REQUIRED
FOR CORE COOLING
Hours after LOCA
Flow (GPM)
1 520
2 460
3 435
4 420
8 385
12 375
24 360



EOP-5
Rev 22/Unit 1
Page 40 of 97

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N. MAINTAIN RCS FLOW VERIFICATION.	
1. **IF ANY** RCPs are running, **THEN** verify T_{HOT} minus T_{COLD} is less than 10° F in the loop(s) with the unaffected S/G.	1.1 **IF** T_{HOT} minus T_{COLD} is greater than 10° F in the loop(s) with the unaffected S/G, **THEN** trip **ALL** RCPs.
NOTE Verification of RCS temperature response to a plant change during natural circulation takes approximately 5 to 15 minutes following the action due to increased loop cycle times.	

2. **IF ALL** RCPs have been secured, **THEN** verify subcooled natural circulation by the following:
• RCS subcooling is at least 30° F based on CET temperatures
• T_{HOT} minus T_{COLD} less than 50° F
• T_{COLD} constant or lowering
• T_{HOT} constant or lowering
• CET temperatures trend consistent with T_{HOT}
• Steaming rate affects RCS temperatures
	2.1 **IF** subcooled natural circulation can **NOT** be verified, **THEN** verify adequate RCS cooling flow by the following:
	• **ALL** available CHG PPs are operating
	• SIS flow is appropriate **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW, **AND** ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW
	• At least ONE S/G available for heat removal
	  • S/G level greater than (-)170 inches
	  • capable of being supplied with feedwater
	  • capable of being steamed
	• CET temperatures are less than 50° F superheated

Regrade Request

Due to unclear wording of the question stem, selections B and D should be accepted as correct responses.

Question Statistics

Question SRO 10 was missed by 6 of 7 SRO candidates. One candidate selected B, six candidates selected D.

Justification References

EOP-5 – Loss of Coolant Accident
EOP-5 – Loss of Coolant Accident Technical basis
EOP Attachments
Steam Tables Properties of Saturated and Superheated Steam – Table 2

SRO Written Examination Question #15 (ID: Q50456)

Using provided reference:
Unit 1 was operating at 100% power when a large Loss of Coolant Accident (LOCA) occurred. EOP-5 has been implemented. Hydrogen concentration rose to .5% and the Hydrogen Recombiners were started. CNTMT TEMP prior to the event was 90°F. Two hours have passed since the Hydrogen Recombiners were started and now the following conditions exist:

H2 concentrations is now .8% and rising
11 Recombiner power setting is 50 KW
12 Recombiner is OFF
Containment Pressure is 4.5 PSIG

Which of the following is the correct action?

A. Set 11 Hydrogen Recombiner power setting to 57 KW

B. Set 11 Hydrogen Recombiner power setting to 60 KW

C. Set 11 Hydrogen Recombiner power setting to 63 KW

D. Set 11 Hydrogen Recombiner power setting to 65 KW

Original answer accepted was B

Original Answer Explanation:
Per the graph of OI-41A with a Cntmt Press at the CSAS set point of 4.25 psig which gives a KW of 60.5 KW. Per the EOP-5 basis document within 1 hour of starting the recombiner it should be functioning, and one recombiner is designed to reduce H2 concentration faster than can be produced from a design basis accident, so if set properly then the H2 concentration should be lowering 2 hours after the recombiner was started. The fact that H2 concentration has risen should indicate that the recombiner is not functioning properly.

A. Set 11 Hydrogen Recombiner power setting to 57 KW-- Is Incorrect for the conditions given this setting is to low.

B. Set 11 Hydrogen Recombiner power setting to 60 KW - Is correct. for the conditions given.

C. Set 11 Hydrogen Recombiner power setting to 63 KW-- Is incorrect for the conditions given, this setting is too high.

D. Set 11 Hydrogen Recombiner power setting to 65 KW-- IS incorrect for the conditions given this setting is to high

Licensee's Justification for Change
This question required the applicants to determine the correct power setting for the recombiner based on initial containment temperature and current containment pressure. The correct answer per the Key was "B" which corresponds to 60 KW. Looking at the reference provided (Figure 10 from OI-41), to obtain the answer the applicants had to extrapolate a power setting based on a given containment pressure of 4.5 psig. The line chosen indicates a power of ~ 61 KW.

1. The H2 recombiner would be started per step G.9 of EOP-5 which directs starting per OI-41A
2. Per OI-41A, pg 6 (attached) the candidate would set the recombiner power to the level determined by adjusting the potentiometer and observing the power meter.
3. Neither answer is directly at the power setting indicated on the graph.
4. The power meter increments are 2 KW. It is difficult to read increments of 1 KW on these meters, (attached photo), an acceptable setting for these conditions could be 60-63 based on acceptable tolerances for reading the meter increments.
5. Additionally, the Hydrogen recombiner technical manual, section 4.5.1.7 (attached), states the power setting should be set to maintain a temperature of 1200° F $\pm$ 25°F. It also states that power adjustment required are approximately 4 KW per 75°F temperature change.
6. Using the data from # 5 above, the range of power settings associated with a $\pm$ 25°F tolerance from the ~61 KW setting would be approximately (4KW/75°F = .0533 X 25 = 1.33 KW). This gives an approximate range of 59.67 – 62.33 KW.
7. 61 was not a selection, it is reasonable that a candidate would choose 60 KW, or the more conservative value of 63 KW, and still be in compliance with the technical manual for the operation of the recombiner, and acceptable for operation.

From Technical Manual

4.5.1.2 Startup - Energize the power supply by closing Breaker No. (this number to be supplied by Customer).

4.5.1.3 The "PWR in Avail" light will be actuated on the control panel.

4.5.1.4 Set the "PWR Out SW" on the control panel to the "ON" position. The light on the switch will be activated.

4.5.1.5 Gradually turn the control potentiometer labeled "PWR ADJ" until 48 KW is indicated on the power meter which is labeled "PWR OUT". (Note there is a lag in the meter reading so turn the potentiometer knob slowly.)

4.5.1.6 Hold power at 48 KW for 5 hours and then read recombiner temperature.

4.5.1.7 If temperature is not 1200 ± 25°F adjust power to bring temperature into this range. Power adjustment required is approximately 4 KW per 75°F temperature change. Allow recombiner to stabilize for two hours after each power adjustment.

4.5.1.8 When recombiner temperature fo 1200 ± 25°F has been obtained, record recombiner power from readout of the power meter and record containment temperature and containment pressure from plant instruments.

4.5.1.9 Determine calibration factor (cc) from the Recombiner Power Correction Factor vs. Calibration Temperature Curve (see Page 22).

JAN 2 8 1985

6.0 PERFORMANCE

6.1 HYDROGEN RECOMBINER STARTUP (11, 12, 21, 22)

A. Initial Conditions

1. It is desired to place hydrogen recombiners in service for testing **OR** post accident conditions. 1002

B. Procedure

1. **ENSURE** the desired hydrogen recombiner heater control potentiometer is set at 000: 1002
   - 11 H_2 RECOMBINER, 1-HS-7501
   - 12 H_2 RECOMBINER, 1-HS-7506
   - 21 H_2 RECOMBINER, 2-HS-7501
   - 22 H_2 RECOMBINER, 2-HS-7506
2. **IF** starting the hydrogen recombiner due to an accident, **THEN PERFORM** the following:
   a. **OBTAIN** pre-accident Containment temperature from shift log readings.
   b. **OBTAIN** current Containment pressure reading.
   c. Using Figure 1, **DETERMINE** the required power (KW).
   d. **PLACE** the desired hydrogen recombiner(s) ON/OFF handswitch(es) in ON: 1002
      - 11 H_2 RECOMBINER, 1-HS-7502
      - 12 H_2 RECOMBINER, 1-HS-7507
      - 21 H_2 RECOMBINER, 2-HS-7502
      - 22 H_2 RECOMBINER, 2-HS-7507

6.1.B.2 Procedure (Continued)

CAUTION
Maximum power to a hydrogen recombiner is limited to 75 KW. 1002

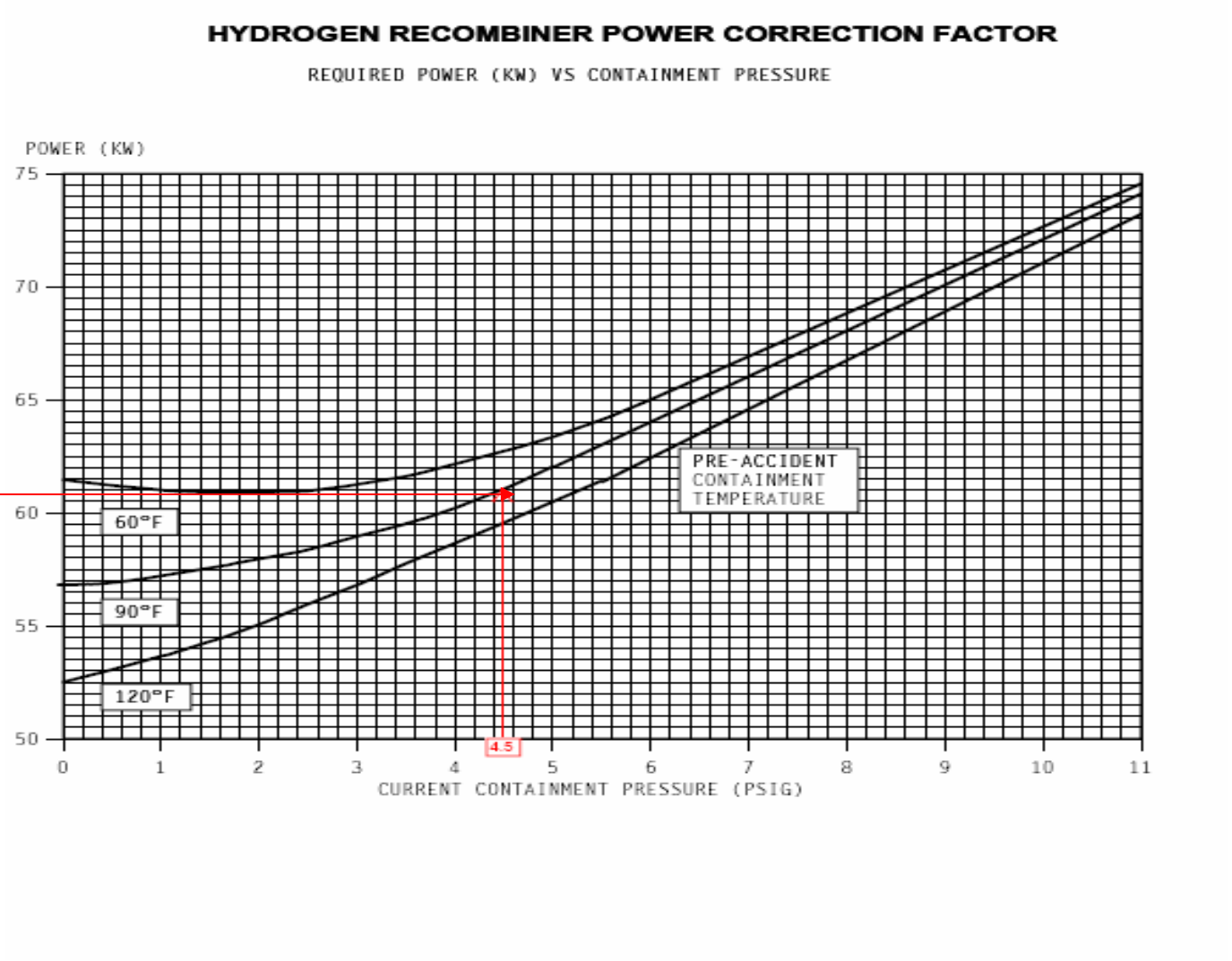
e. **RAISE** the applicable hydrogen recombiner power to the level determined in Step 2.c, by adjusting its Heater Control Potentiometer: 1002

- 11 H_2 RECOMBINER, 1-HS-7501
- 12 H_2 RECOMBINER, 1-HS-7506
- 21 H_2 RECOMBINER, 2-HS-7501
- 22 H_2 RECOMBINER, 2-HS-7506

f. **MONITOR** the hydrogen recombiner(s) placed in service for proper operation by checking each applicable power meter (wattmeter) indicates the value determined in Step 2.c:

- 11 H_2 RECOMBINER, 1-XI-7501
- 12 H_2 RECOMBINER, 1-XI-7506
- 21 H_2 RECOMBINER, 2-XI-7501
- 22 H_2 RECOMBINER, 2-XI-7506

61 KW


HYDROGEN RECOMBINER POWER CORRECTION FACTOR
REQUIRED POWER (KW) VS CONTAINMENT PRESSURE
POWER (KW)
75
70
65
60
55
50
60°F
90°F
120°F
PRE-ACCIDENT
CONTAINMENT
TEMPERATURE
4.5
0
1
2
3
4
5
6
7
8
9
10
11
CURRENT CONTAINMENT PRESSURE (PSIG)


11 H2 RECOMBINER
12
WATTS
TEMP
HTR CONTR
T/C SEL

Regrade Request
The range of power settings associated with a $\pm$ 25°F tolerance from the ~61 KW setting would be approximately (4KW/75°F = .0533 X 25 = 1.333 KW). This gives an approximate range of 59.67 – 62.33 KW. B and C should be accepted for question #15 on the SRO exam.

Question Statistics
Question SRO 15 was missed by 4 of 7 candidates. Three candidates selected B, four selected C.

Justification References
OI-41A
Hydrogen Recombiner technical manual

SRO Written Examination Question # 24 (ID: Q20602)

Unit 2 is in Mode 6 with refueling in progress and Normal Containment Purge in service. The Equipment hatch is installed and the Personnel Airlock (PAL) is open. A momentary loss of power causes the operating Main Exhaust Fan to trip.
(a) What is the effect on containment parameters, (b) What is the correct action?

A. (a) Containment refueling pool level decreases, (b) Continue refueling operations.

B. (a) Containment pressure rises 1 to 2 PSIG, (b) Initiate additional containment cooling

C. (a) Containment area radiation monitors (RE-5316-A through -D) indicate higher, (b) Start all available Iodine Filter Units

D. (a) Containment refueling pool level increases, (b) Continue refueling operations.

Original answer accepted was A

Original Answer Explanation: (*Note that the original answer justification is incorrect. The responses do not match the exam responses, D is listed as correct in the justification and does not match the wording of response A*)

A. Containment pressure rises 1 to 2 PSIG--incorrect, containment pressure will change, but experience indicates, the change will be less than .5 PSIG.

B. Area radiation monitors (RE-5316A-D) indicate higher--incorrect, the area monitors would not change if Purge is lost.

C. Refueling pool level increases--Incorrect The Main Exhaust Fan tripping would cause Containment Purge to secure. This would cause containment pressure to rise slightly, with the transfer tube gate valve open, refueling pool level will decrease (Not Increase) accordingly due to the differential pressure between the SFP area and containment.(SFP is maintained at a slight negative pressure)

D. Refueling pool level increases--**Is Correct**. The Main Exhaust Fan tripping would cause Containment Purge to secure. This would cause containment pressure to rise slightly, with the transfer tube gate valve open, refueling pool level will decrease accordingly due to the differential pressure between the SFP area and containment. (SFP is maintained at a slight negative pressure)Continue refueling operations since no loss of RFP level.

per OI-36 general precaution F. The Main Exhaust Fan tripping would cause Containment Purge to secure which would cause a change in the differential pressure between the SFP and the RFP

Licensee's Justification for Change
There is no correct answer. The question asks: (a) What is the effect on containment parameters, (b) What is the correct action?
The Effect on containment parameters is there will be a small containment pressure rise due to the Purge Exhaust and Supply fans tripping. This increase in pressure will cause Refuel Pool water to shift to the Spent Fuel Pool through the open transfer tube. The net result being, Containment Pressure increases and Refuel Pool Level lowers.

The correct action would be to suspend fuel handling operations due to the loss of the Auxiliary Building and Waste Processing Supply Fan, which is required by plant procedures.

From OI-22A pg. 5, (see prints also)

B. The following fans will trip if the only operating Main Exhaust Fan on Unit 2 is secured:

- Unit 2 Containment Purge Supply and Exhaust Fan
- 21 Auxiliary Building and Waste Processing Supply Fan
- 21 **AND** 22 Auxiliary Building and Waste Processing Exhaust Fans
- 11 **AND** 12 Access Control Area Exhaust Fans

The Fuel Handling Procedure FH-305 requires fuel handling to be suspended upon a change in Ventilation. (From FH-305 pg 14)

5.6 Ventilation

Fuel movement will be suspended in the event of the loss of one of two operating air supply fans, or a change in Auxiliary Building ventilation lineup with a single fan operating. **[B-152]**

Also The Refuel Machine Procedure OI-25C requires the performance of OI-22D Appendix C Checklist before use of the Refuel machine is permitted. (From OI-25C pg. 10)

c. **IF** Refueling Operations will begin,
THEN PERFORM the following:

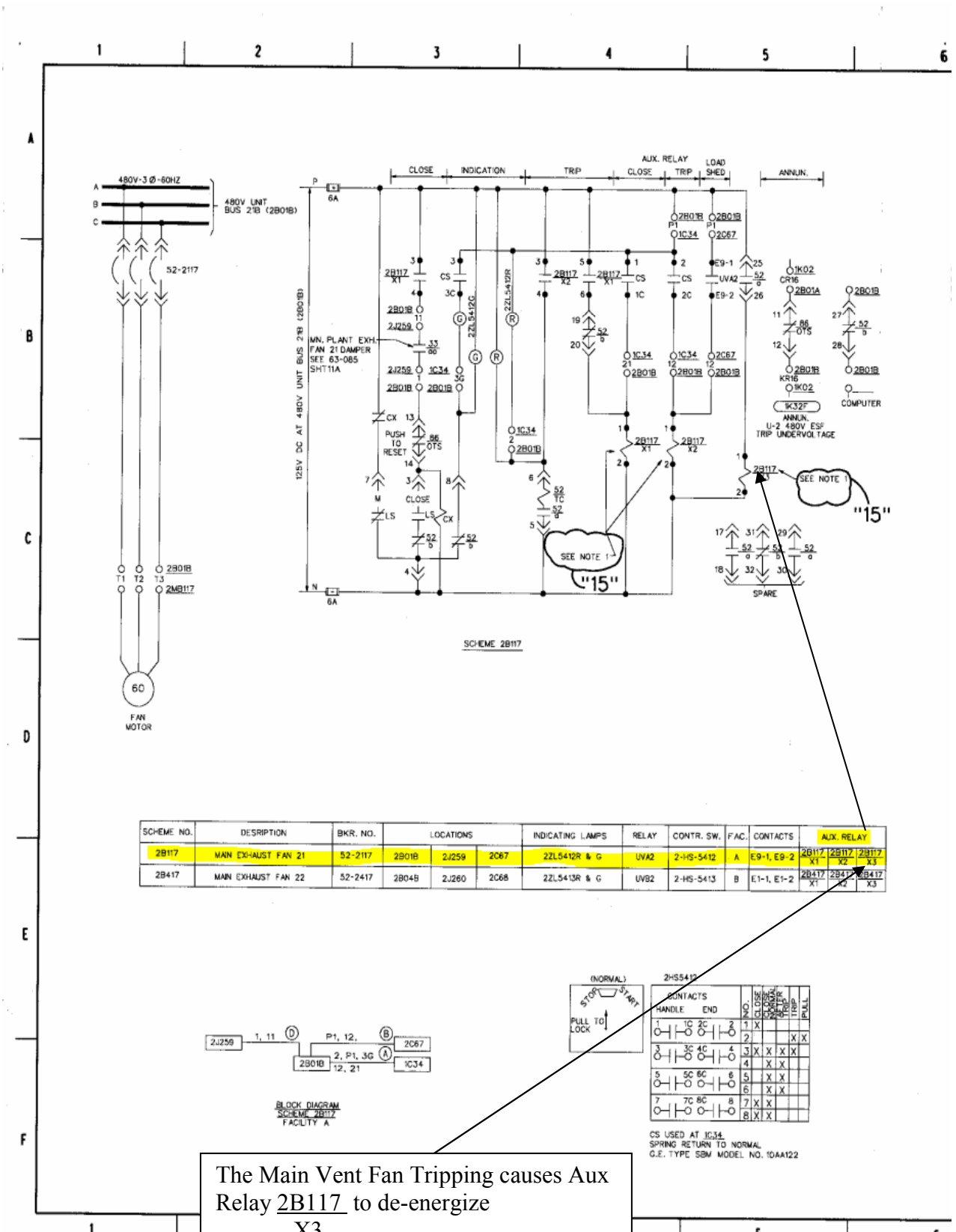
- **ENSURE** APPENDIX C, REFUELING OPERATIONS CHECKLIST is complete. **[B0408]** (N/A if performed as part of APPENDIX A)
- **ENSURE** OI-22D, FUEL HANDLING AREA VENTILATION SYSTEM APPENDIX C, VENTILATION WALKDOWN CHECKLIST is complete. **[B0408]**

The OI-22D Appendix C checklist requires one Aux bldg supply fan running per unit. (From OI-22D Appendix C. pg 2)

VENTILATION WALKDOWN CHECKLIST [B0408]

D. Spent Fuel Pool Area Ventilation Systems and Components
(N/A if **NOT** moving recently irradiated fuel assemblies in the Auxiliary Building)

- **VERIFY** 11 or 12 Main Vent Exhaust Fan in operation ____
- Locally **VERIFY** two Auxiliary Building Supply Fans are running (one per unit) ____
- Locally **VERIFY** Spent Fuel Pool Exhaust Fan running ____
- **VERIFY** standby Spent Fuel Pool Exhaust Fan **NOT** rotating backwards ____
- **VERIFY** Spent Fuel Pool Supply Fans **NOT** in operation ____
- **VERIFY** Spent Fuel Pool Exhaust Ventilation filters in service:
  - 0-HS-5416 in FILTER position at 1C34 ____
  - 0-PDI-5417 reads greater than or equal to .9" H_2O. ____
  - **SUM** the readings on 0-PDI-5417 and 0-PDIS-5418 to ensure the combined SFP Roughing, HEPA, and Charcoal Filter delta p are less than 4.0" H_20. ____

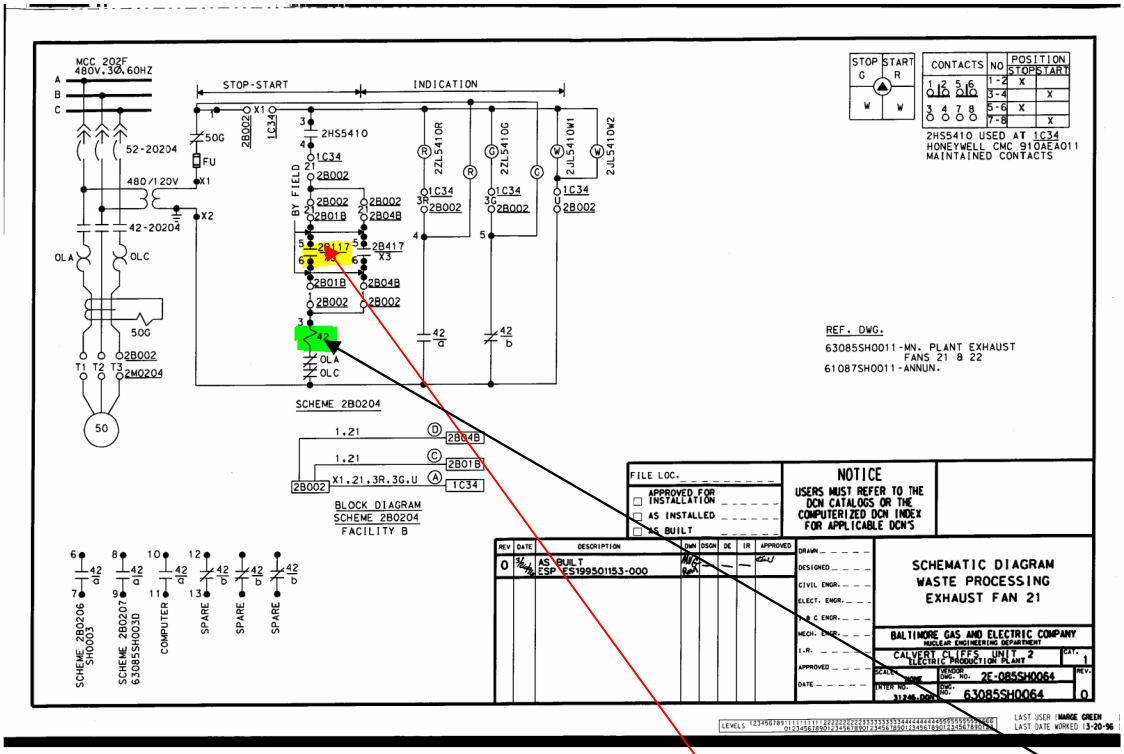


SCHEME NO.	DESRIPTION	BKR. NO.	LOCATIONS			INDICATING LAMPS	RELAY	CONTR. SW.	F.AC.	CONTACTS	AUX. RELAY		
2B117	MAIN EXHAUST FAN 21	52-2117	2B01B	2J259	2C67	22L5412R & G	UVA2	2-HS-5412	A	E9-1, E9-2	2B117 X1	2B117 X2	2B117 X3
2B417	MAIN EXHAUST FAN 22	52-2417	2B04B	2J260	2C68	22L5413R & G	UVB2	2-HS-5413	B	E1-1, E1-2	2B417 X1	2B417 X2	2B417 X3

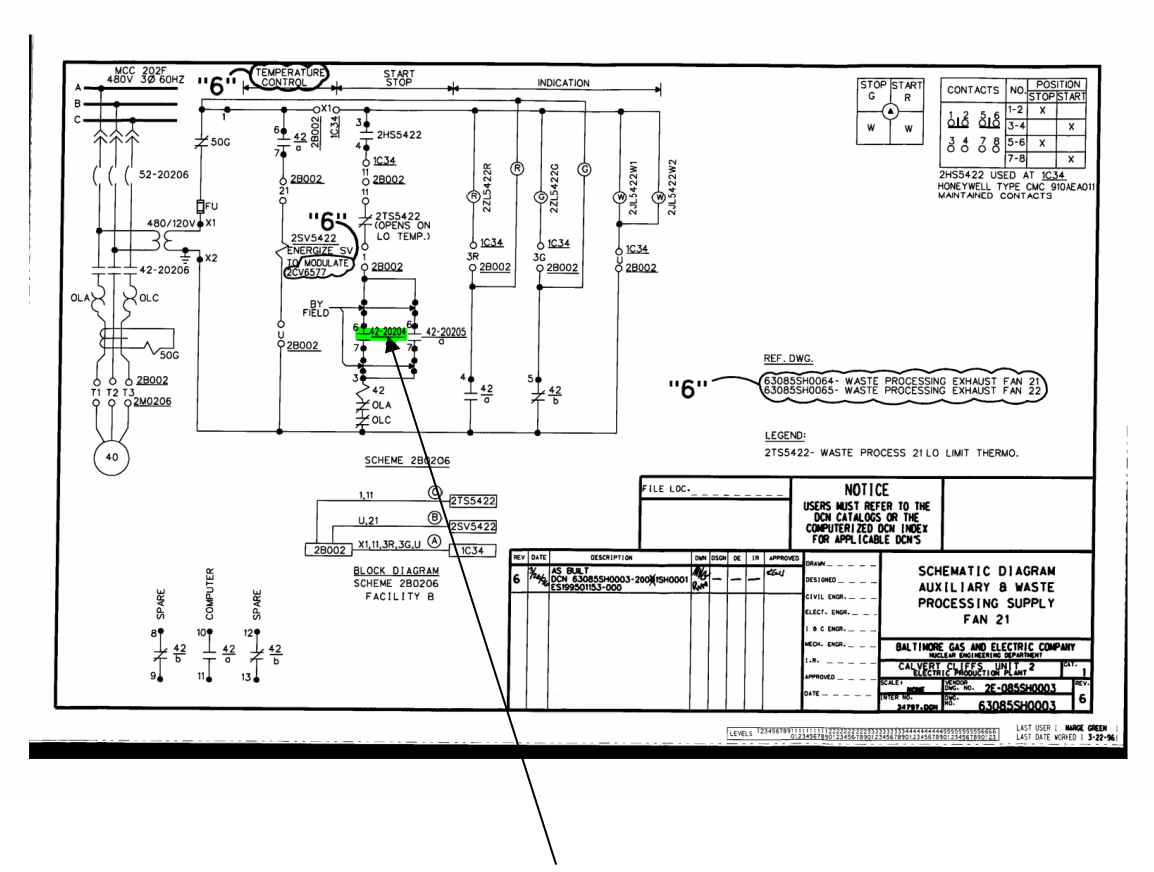
BLOCK DIAGRAM SCHEME 2B117 FACILITY A

CS USED AT 1C34
SPRING RETURN TO NORMAL
G.E. TYPE SBM MODEL NO. 1DAA122

The Main Vent Fan Tripping causes Aux Relay 2B117 to de-energize X3



Aux Relay 2B117 de-energizing will Open contact 2B117 , which will de-energize 42 relay X3 X3



The 42 relay de-energizing will cause the 42-20204 contact to open causing the Auxiliary Building supply fan to trip a

Regrade Request

SRO Question #24 should be deleted due to no correct answer.

A. Refueling pool level decreases--**Is Correct**. The Main Exhaust Fan tripping would cause Containment Purge to secure. This would cause containment pressure to rise slightly, with the transfer tube gate valve open, refueling pool level will decrease accordingly due to the differential pressure between the SFP area and containment. (SFP is maintained at a slight negative pressure) Continue refueling operations is **Incorrect** due to the above justification.

B. (a) Containment pressure rises 1 to 2 PSIG, (b) Initiate additional containment cooling --**Incorrect** The Main Exhaust Fan tripping would cause Containment Purge to secure. This would cause containment pressure to rise slightly, Containment pressure rises 1 to 2 PSIG--**incorrect**, containment pressure will change only a few tenths of a pound per square inch and there is no procedural guidance to increase containment cooling.

C. Area radiation monitors (RE-5316A-D) indicate higher--**incorrect**, the area monitors' indications do not change if Containment Purge is lost.

D. Refueling pool level increases-- **incorrect**. The Main Exhaust Fan tripping would cause Containment Purge to secure. This would cause containment pressure to rise slightly, with the transfer tube gate valve open, refueling pool level will decrease accordingly due to the differential pressure between the SFP area and containment. (SFP is maintained at a slight negative pressure)

Question Statistics
Question SRO 24 was missed by 5 candidates. Two candidates selected A, one selected B, one selected C and three selected D.

Post Examination Review References

FH-305	CORE ALTERATIONS
OI-25C	MAIN EXHAUST FAN SYSTEM
OI-22D	FUEL HANDLING AREA VENTILATION SYSTEM
DWG No.63085SH0003	SCHEMATIC DIAGRAM AUXILIARY & WASTE PROCESSING SUPPLY FAN 21
DWG No.63085SH0064	SCHEMATIC DIAGRAM WASTE PROCESSING EXHAUST FAN 21
DWG No.63085-D SH11	SCHEMATIC DIAGRAM HEATING AND VENTILATIONMAIN PLANT EXHAUST FANS 21 & 22