

WRITTEN EXAMINATION POST-EXAM SUBMITTAL

<u>Exam Question Number</u>	<u>Facility Recommendation</u>	<u>Final Resolution</u>
RO 38	Accept A and C	Change answer to C
RO 74	Delete question	Deleted question
SRO 89	Delete question	No change
SRO 91	Accept A and B	No change

Question 38:

Unit-2 is at 100% power with all 10 trip units bypassed on Channel D RPS for IM Shop wiring modifications, IAW an approved maintenance order. IM determines that the RPS channel must be de-energized to complete the modifications.

What statement best describes the RPS trip logic before and after Channel D RPS is deenergized?

- A. 2 of 3 when energized; 1 of 3 when de-energized.
- B. 2 of 4 when energized; 2 of 3 when de-energized.
- C. 2 of 3 when energized; 2 of 3 when de-energized.
- D. 2 of 4 when energized; 1 of 3 when de-energized.

Answer: A

Facility Comments (Q#38):

During the post-examination review it was determined that both answers A and C are correct.

The question asks about the "RPS trip logic". Technical Specification 3.3.1 (page 3.3.1-7) basis describes the RPS logic as including the matrix and the trip path logic. It also describes the logic matrix relay contacts being arranged into trip paths containing matrix relays. A candidate may understand the question to be associated with the RPS logic matrices and not a trip unit.

Some candidates were confused by what was intended by "RPS trip logic" in the stem of the question—did that mean the remaining logic ladders, or did that mean individual trip unit inputs? For the second part of the question, some understood the question to ask—"If I get a trip signal from another channel, will I get a trip" while others understood the question to ask "If I de-energize another logic matrix will I get a trip".

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The second part could be answered in two ways:

- 1-of-3: Evaluation of a further component de-energization, either at the affected matrix power supply level (matrix power supplies 6, 9, or 13 – the redundant power supplies for the power supplies de-energized from channel D), or at the complete channel level (2Y01, 2Y02, 2Y03) would lead to a determination of a one-out-of-three trip logic. In other words, for these remaining groupings of three power sources, failure of only one would yield a trip of the RPS, and subsequent reactor trip.
- 2-of-3: Evaluation of trip units on channels A, B, and C would indicate a two-out-of-three trip logic. In other words, for these remaining groupings of three trip units, a trip of a minimum of two would yield a trip of the RPS, and subsequent reactor trip.
- See “Additional Supporting Information” packet.

The above information, and the associated drawings, were reviewed in detail with the both the Responsible Design engineer and a senior Instrument Maintenance Supervisor, and were confirmed to be correct.

This plant response was verified in the simulator.

Regrade Request

In accordance with guidance provided in NUREG-1021, ES-403, this question has:

- *“newly discovered technical information that supports a change in the answer key”*

Therefore, the post examination review, in conjunction with the information above, determined that question #38 should have two correct answers, “A” and “C”.

Question Statistics

Question was missed by 9 of 14 students.

A - 5

B - 0

C - 9

D - 0

Justification References

System Description 058, Reactor Protective System

Drawings 12129-xxx series

NRC Resolution (Q#38):

The key answer for Question #38 will be changed from A to C. Choice C is the only correct answer.

The licensee contends that two answers, Choices A and C, are both correct and either should be accepted as the correct answer. They do not contest the validity of the first part of the correct answer that RPS will be in a 2 of 3 trip logic with Safety Channel D trip units bypassed prior to de-energizing Channel D.

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The key answer, as originally submitted, was Choice A. The following justification was provided for this answer:

"A. Correct - Trip logic is 2 of 3 with the Trip Units bypassed while the channel is still energized. De-energizing a channel removes the bypass function, resulting in that channel being tripped. As a result 1 of 3 remaining Trip Units tripping will cause a reactor trip."

This justification was not correct. De-energizing a channel does NOT remove the bypass function. Operation of RPS, under the conditions given in the question stem, is explained in the following paragraphs.

The Reactor Protection System (RPS) consists of four independent safety channels, each of which monitors and responds to selected safety parameters exceeding established threshold values. Trip units on each of these safety channels act to position contacts in selected matrix logic 'ladders' such that if a particular monitored parameter on any two of the four safety channels exceeds the threshold value, then relays in the appropriate matrix logic 'ladders' will de-energize. The de-energized matrix logic relays operate 'K' relays, which, in turn, open selected reactor trip breakers. The six logic matrices (AB, AC, AD, BC, BD, and CD) are identified by the two safety channel inputs that they each compare. For example, Logic Matrix CD compares inputs from Safety Channels C and D.

Figure 1 shows the CD Matrix Ladder in a normal energized state with all trip units reset and no trip units bypassed. In this configuration, the matrix relays (CD1 thru CD4) are energized from their respective power sources (PS 6 and PS 16).

Figure 2 shows the CD Matrix Ladder when all the Channel D trip units are bypassed. The bypass key switches effectively disable any trip logic effect (in Ladders AD, BD and CD) from a Channel D parameter exceeding its trip threshold value.

Figure 3 shows current flow through the CD Matrix Ladder with all Channel D trip units bypassed and RPS Channel D de-energized. DC Power Supply 16, associated with RPS Channel D, de-energizes when RPS Channel D is de-energized. This causes the Matrix Relays associated with that power supply (CD3 and CD4) to de-energize.

Figure 4 shows the effect of a trip (Trip Unit 5 in this example) on Channel C within the CD matrix ladder when Channel D is de-energized with all Channel D bypasses in the Bypass position. The figure demonstrates that the CD1 and CD2 relays will continue to remain energized through the bypass switches on RPS Channel D. The effect is similar in the other two matrix ladders related to Channel D (AD and BD). A reactor trip will not be generated by any of these three ladders (AD, BD, or CD) because of the position of the bypass keys, even with Channel D de-energized.

Figure 5 shows that K3 and K4 relays de-energize because of contacts operated by the CD3 and CD4 relays in Matrix Ladder CD (as well as equivalent contacts from the AD and BD ladders). This results in opening of the trip breakers in one of the two redundant trip breaker paths. CEAs remain energized through the other trip breaker path.

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Three of the six matrix logic ladders (AB, AC, BC) are unaffected by the condition of Channel D and will operate normally, requiring trip unit actuation on both of their associated channels for any of these ladders to initiate a reactor trip. Trip unit actuation on any 2 of these 3 associated channels will de-energize all the relays in that associated ladder, causing a reactor trip. RPS will be in a 2 out of 3 trip logic after Channel D RPS is deenergized. Therefore, the key answer should be C, not A.

The NRC disagrees with the licensee's contention that Choice A is also a correct response to the question. The question asks:

"What statement best describes the RPS trip logic before and after Channel D RPS is deenergized?"

Each answer choice clearly provides the trip logic before and after Channel D deenergization. For example, Choice A states:

"2 of 3 when energized; 1 of 3 when de-energized."

No information is provided which would lead an applicant to assume the question is asking how many more logic ladders can be de-energized before the reactor will trip. The terminology used in the question is commonly used to describe trip coincidence. For example, the bases for TS 3.3.1 states *"The fourth [instrument] channel provides additional flexibility by allowing one channel to be removed from service (trip bypass) for maintenance or testing, while still maintaining a minimum **two-out-of-three logic**."* As another example of common terminology usage, OI-6A, "Reactor Protection System", contains a note, which states, *"An illuminated BYPASS light indicates that the trip for that Trip Unit is bypassed and the **trip logic** for that parameter is reduced to **2-out-of-3**."* The terminology, "2 of 3" or "1 of 3", makes sense in the context of number of tripped independent RPS channels in order to effect a reactor trip.

Most of the applicants (9 of 14) selected Choice C as the correct answer. Only one question was asked related to this test item during exam administration. An applicant asked if the bypass keys were removed after de-energizing the channel.

The NRC has determined that there is only one correct answer to Question #38 for the conditions provided in the stem, and that answer is Choice C.

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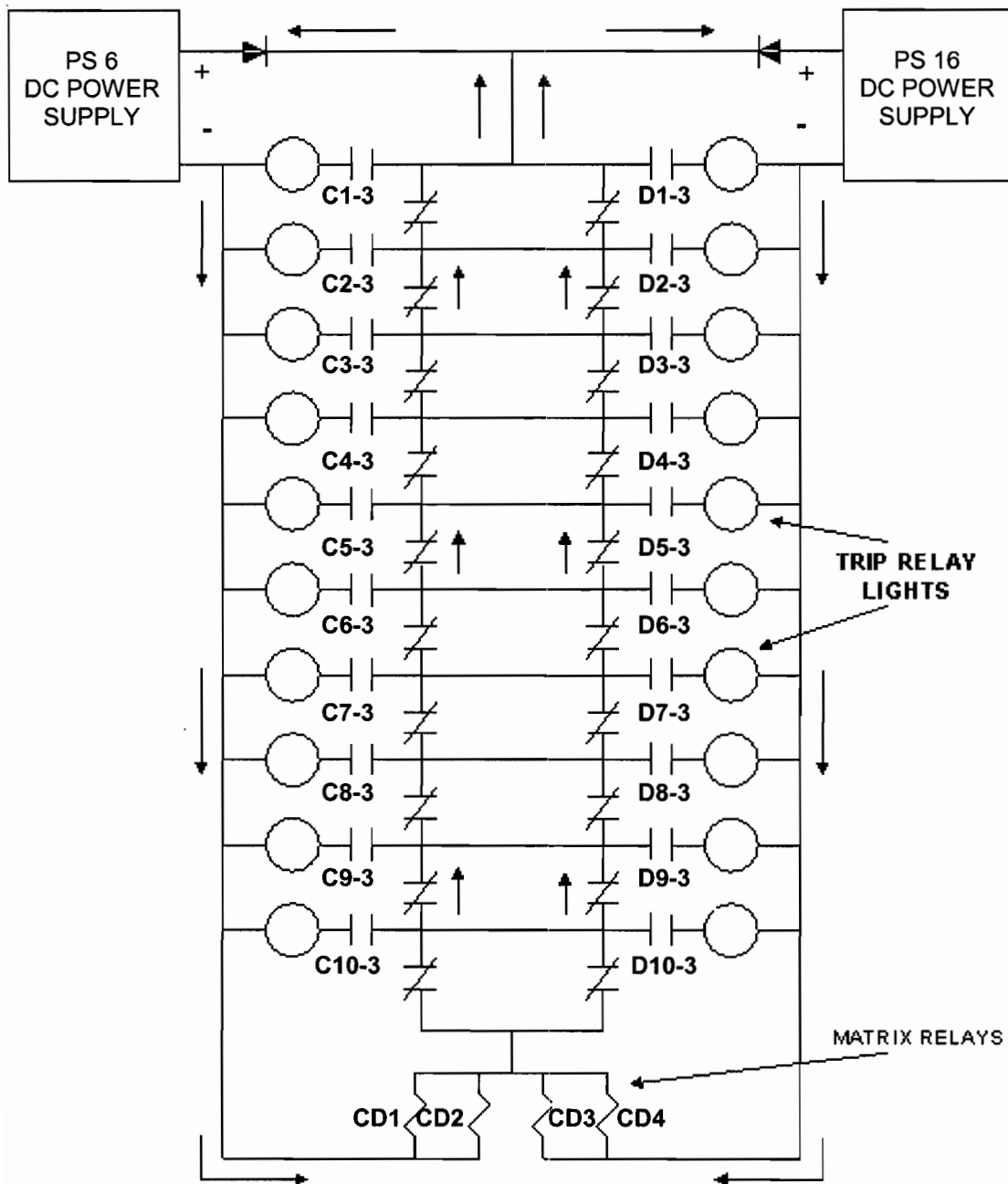


Figure 1
CD Matrix Ladder Energized – No Trip Exists

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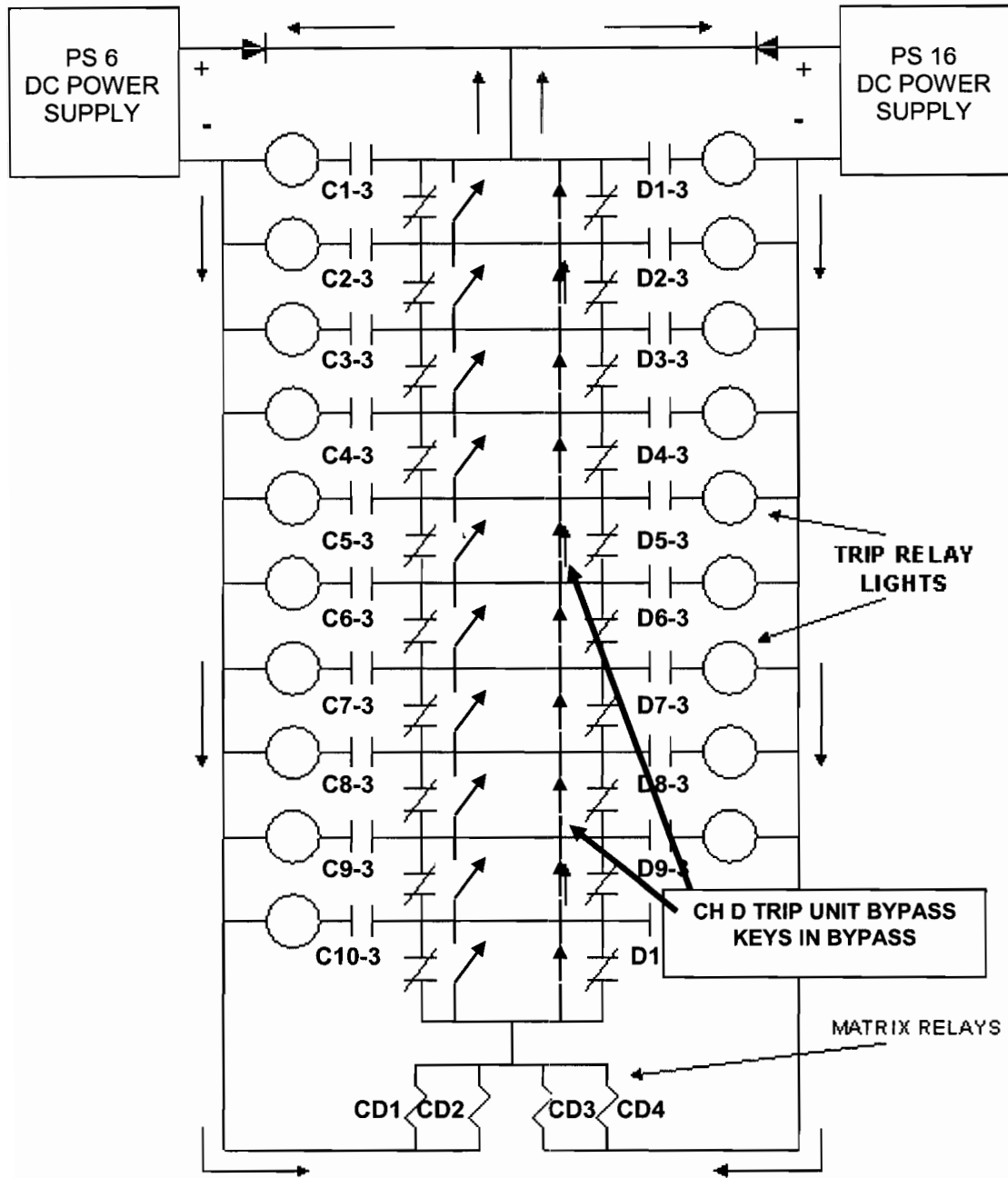


Figure 2
CD Matrix Ladder Energized – Channel D Trip Units Manually Bypassed

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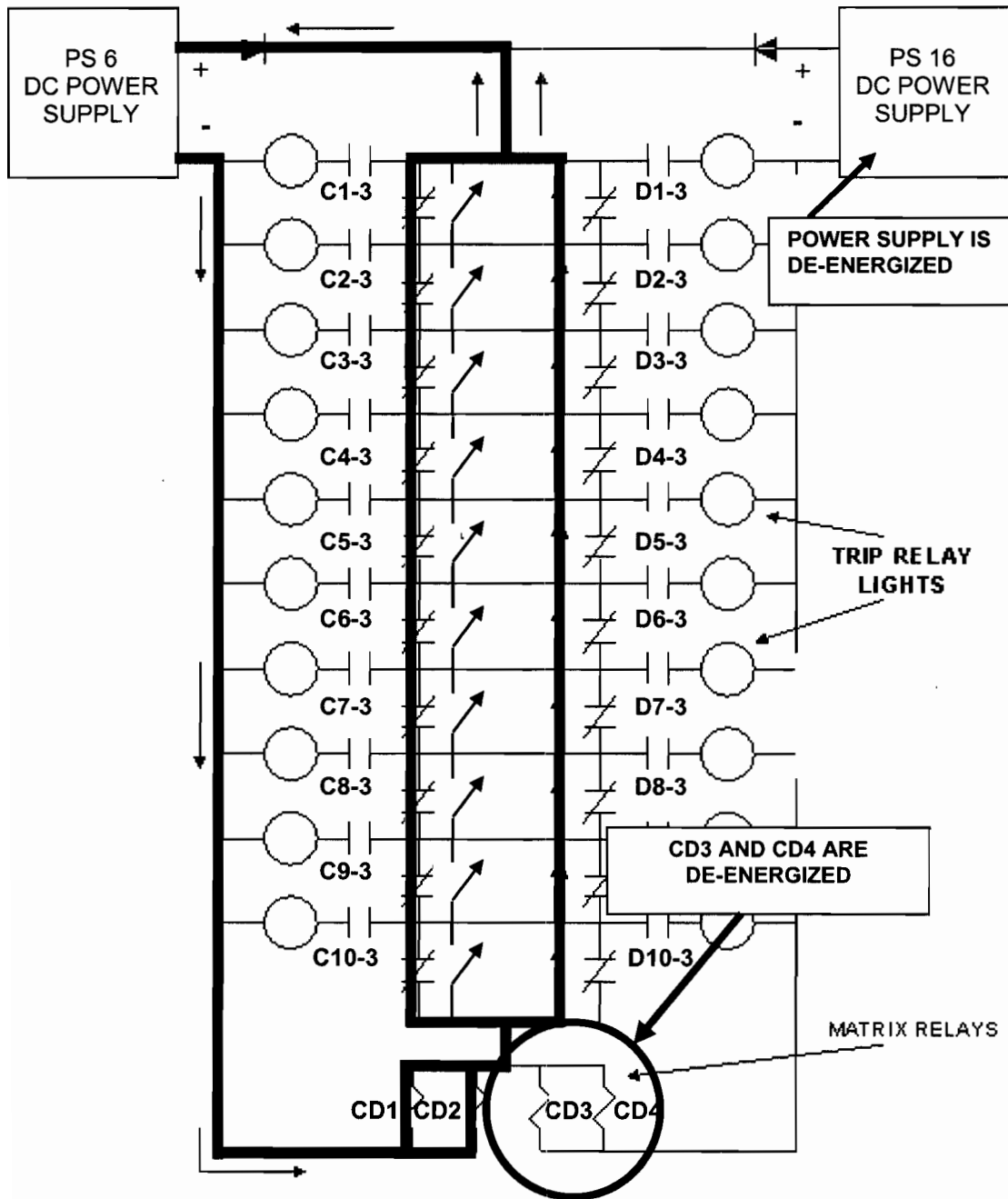


Figure 3
CD Matrix Ladder – Channel D RPS De-Energized
With Bypass Keys in Bypass

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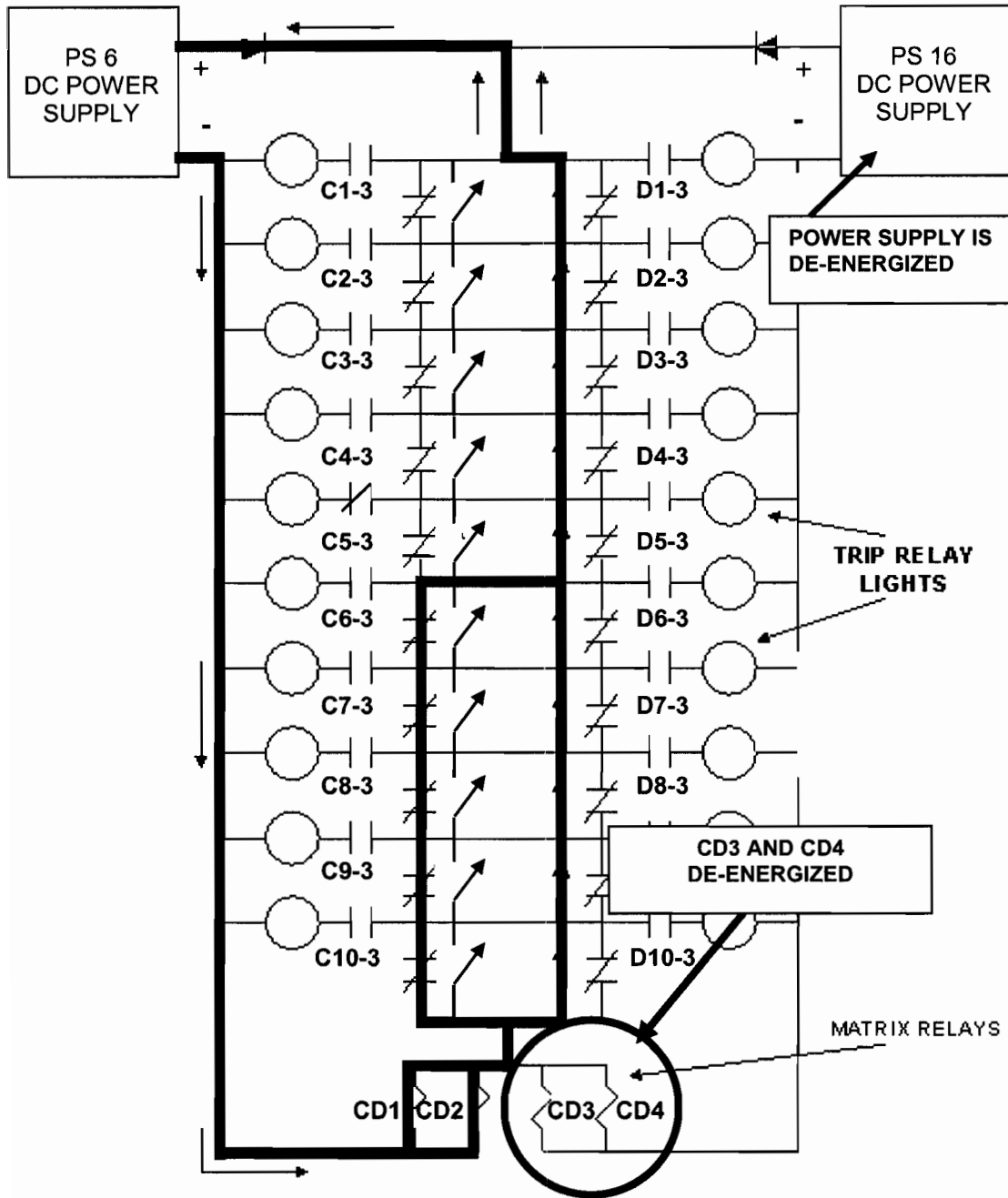


Figure 4
CD Matrix Ladder – Channel D RPS De-Energized
With Bypass Keys in Bypass and Trip on Channel C

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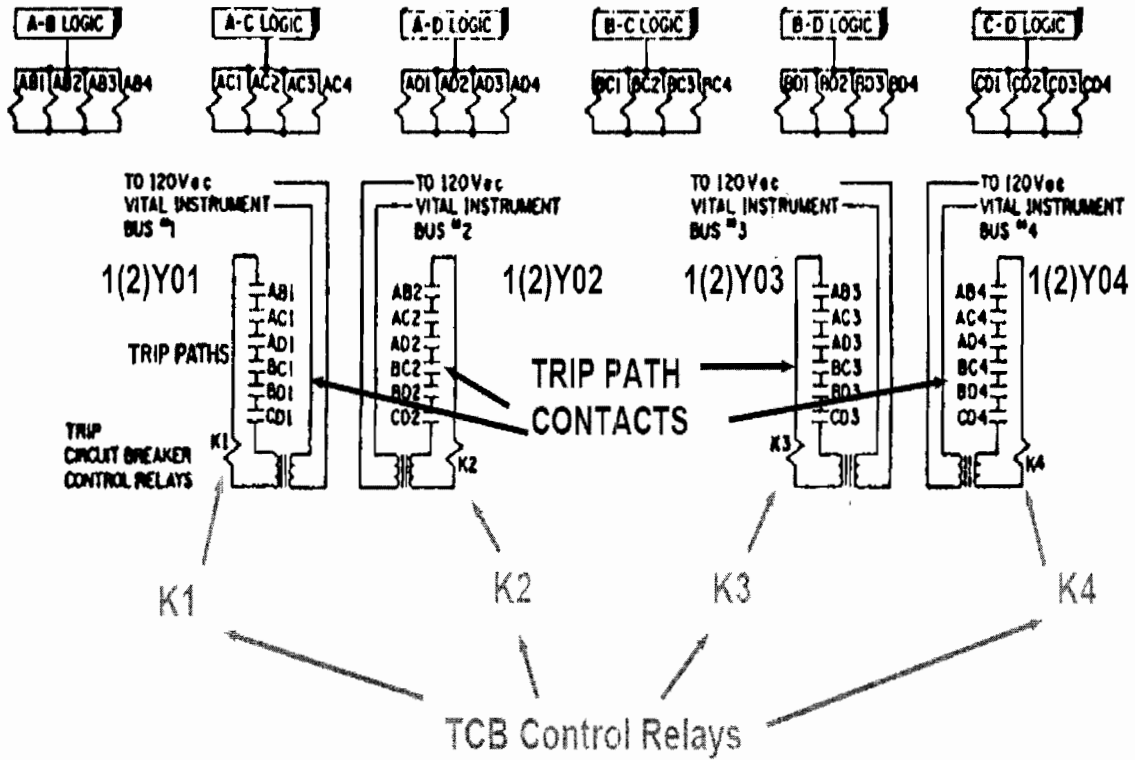


Figure 5
K-Relay Trip Paths

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Question 74:

What limitations, if any, does NO-1-201, Calvert Cliffs Operating Manual, place on the use of "Working Copies" of technical procedures?

Working copies:

- A. Must be verified current prior to use on subsequent shifts.
- B. Must be verified current at least once every twenty four hours.
- C. Must **NOT** be used for evolutions lasting longer than one shift.
- D. Must complete Procedure Working Copy Cover Sheet prior to use.

Answer: A

Facility Comments (Q#74):

During the post-examination review it was determined that no answer is correct.

NO-1-201 definitions sections states: "*Working copies are approved for use when controlled by this procedure.*"

NO-1-201, section 5.1.E.2 states: "*Evolutions lasting less than one shift do not require an Attachment 7, Procedure Working Copy Coversheet. Evolutions lasting greater than on [sic] shift do not require an Attachment 7 as long as the procedure user verifies the current working copy is still the current approved revision prior to using the procedure at the beginning of the next shift. Otherwise, the procedure user shall complete an Attachment 7 for the working copy generated.*"

- Answer A is true only if no Working Copy Coversheet has been used. Therefore answer A is not an absolutely true "must" statement, and so is wrong. If a working copy coversheet has been applied, then the revision verification is not required to be performed on subsequent shifts.

Regrade Request

In accordance with guidance provided in NUREG-1021, ES-403:

- "*If... there is no correct answer, the question shall be deleted.*"

Therefore, the post examination review determined that question #74 should be deleted.

- Answer "A" is incorrect, as it is not an absolutely true "must" statement under all circumstances.
- Answer "B" is still incorrect, as originally justified in the answer key.

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- Answer “C” is still incorrect, as originally justified in the answer key.
- Answer “D” is still incorrect, as originally justified in the answer key.

Question Statistics

Question was missed by 4 of 14 students.

A - 10

B - 0

C - 0

D - 4

Justification References

NO-1-201, Calvert Cliffs Operating Manual

NRC Resolution (Q#74):

Question #74 will be deleted from the exam. There is no correct answer to this question.

Both Choice A (the original key answer) and Choice D (a distractor choice) state that NO-1-201 requires that the action described in the choice must be taken. However, the described actions in each choice (A and D) are conditional upon the other. For Choice A, the working copy must be verified current prior to use on subsequent shifts *if a procedure copy cover sheet has not been completed.* And for Choice D, a procedure copy cover sheet must be completed *if the procedure is to be used on subsequent shifts and it has not been verified current.* Neither answer choice on the exam contained this necessary conditional ‘if’ information (underlined and italicized in each of the statements above). Therefore, Choice A and Choice D are each only true under specific conditions not provided in the question. Without these conditions, neither answer is correct.

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Question 89:

A fire exists in the Unit-2 45' West Electrical Penetration Room. Which of the following lists documents that must be reviewed, per ERPIP 3.0, to assist the Fire Brigade in firefighting efforts?

- A. AOP-11 Series; Fire Strategies Manual; Interactive Cable Analysis.
- B. AOP-11 Series; Interactive Cable Analysis; ES-013, Loss of Power Effects /Load List.
- C. AOP-9 Series; Fire Strategies Manual; Plant Area Fire Strategy Templates (Maps).
- D. AOP-9 Series; Plant Area Fire Strategy Templates (Maps); ES-013, Loss of Power Effects /Load List.

Answer: C

Facility Comments (Q#89):

During the post-examination review it was determined that the question as written was unclear and did not provide all necessary information.

The phrase "to assist the Fire Brigade in firefighting efforts" results in the question having no correct answer. Neither AOP-9 series nor AOP-11 provides information that helps the fire brigade, nor would the fire brigade be given any direction in these procedures. While choice 'C' is the most correct answer, it is not a correct answer.

Regrade Request

In accordance with guidance provided in NUREG-1021, ES-403, this is:

- *"a question with an unclear stem that confused the applicants or did not provide all the necessary information"*

Therefore, the post examination review determined that question #89 should be deleted.

Question Statistics

Question was missed by 2 of 9 students.

- A - 2
- B - 0
- C - 7
- D - 0

Justification References

SA-1-101, FIRE FIGHTING

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ERPIP 3.0, Attachment (16), Fire in the Protected Area, ISFSI, or MPF

NRC Resolution (Q#89):

Question 89 will remain on the exam as administered.

The licensee contends the question should be deleted because it was unclear and did not provide necessary information. The NRC disagrees. The question asks for identification of documents *“that must be reviewed, per ERPIP 3.0, to assist the Fire Brigade in firefighting efforts”* ERPIP 3.0, Attachment 16, “Fire in the Protected Area, ISFSI, or MPF”, Step 6.a. requires the following:

6. **CONTINUE** to monitor the event **AND** direct assistance to the scene.
 - a. **REVIEW** the following for fire strategy information on the fire location, potential fire affects, **AND** for mitigating and compensatory measures that not need to be involved:
 - Fire Strategies Manual
 - Plant Area Fire Strategy Templates
 - AOP-9 Series
 - Interactive Cable Analysis, Attachment 8

Step 6.a of the ERPIP Attachment clearly directs review of specific documents and this review is part of the broader step to “continue to monitor the event and direct assistance to the scene”. The step lists those documents that must be reviewed.

Most of the applicants (7 of 9) were able to correctly answer the question. None of the applicants asked any questions relating to this test item during exam administration.

The question stem is clear. An applicant could conclude there is little or nothing to be gained by reviewing some of the listed documents. But that does not alter the fact that the ERPIP directs performance of the review, looking for fire strategy information which could be used to direct assistance to the scene, thereby assisting the Fire Brigade in firefighting efforts.

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Question 91:

Unit-1 is operating at 100% power with Group 5 CEAs at 131 inches when the pulse counting position indication system is lost due to a power supply malfunction. It has become apparent the TRM restoration time will not be met.

Which **ONE** of the following actions is required?

- A. Initiate a Condition Report for a Reactivity Management event.
- B. Contact Systems Engineering to complete a Functionality Assessment.
- C. Initiate the Event Notification Worksheet for a Licensee Event Report.
- D. Contact Generation Dispatcher to inform of plant status.

Answer: B

Facility Comments (Q#91):

During the post-examination review it was determined that selection "A" is also correct.

CNG-OP-3.01-1000, Reactivity Management, revision 00600 (effective as of 04/28/2010) provides detailed information regarding classification of Reactivity Management Events, within the body of the procedure, as well as in attachments. The information provided in the stem meets the threshold of a reactivity "event" as described below.

- CNG-OP-3.01-1000, Attachment 1, Example Reactivity Related Event Classifications, page 9 of 12 of the attachment, provides "*Examples of Level 5 Reactivity Control Related Events...*" Example B of this section of the attachment list "*Degraded reactivity-related equipment function*" as an example of an event.
- CNG-OP-3.01-1000, Attachment 2, Reactivity-Related Systems, page 1 of 2, lists systems to which reactivity event classification may be applied. "*Control Rod Drive*" is a listed system in the PWR section of this table.
- CNG-OP-3.01-1000, Attachment 1, Example Reactivity Related Event Classifications, page 11 of 12, step 7.a, states: "*A CR shall be generated for severity level 1, 2, 3, 4 and 5 events.*"
- CNG-CA-1.01-1000, Corrective Action Program, revision 00400 (effective as of 7/28/2010) contains Condition Report threshold guidance. Attachment 2 of this procedures, Condition Report Threshold Guidance, page 2 of 3, lists "*Reactivity Management event or near miss*" as a threshold for initiating a Condition Report (under the "*Nuclear Safety*" section of the attachment).
- A copy of the rolling list of Reactivity Events was obtained from the Operations Performance Improvement Coordinator. On 02/04/2010 a deficiency with indications of the Control Rod Drive system (specifically, CEA 54 upper electrical limit light -- not lit with CEA full out) was captured in the corrective action program under CR-2010-000918. This item was classified a severity level 5 event (SL5) on the Reactivity Management Performance Indicator.

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Regrade Request

In accordance with guidance provided in NUREG-1021, ES-403:

- The answers do not "...contain conflicting information."

Therefore, the post examination review determined that two selections should be counted as correct for question #91.

- Answer "A" should be counted as correct, based on the information described above from CNG-OP-3.01-1000, Reactivity Management, and from CNG-CA-1.01-1000, Corrective Action Program.
- Answer "B" is still a correct answer, as originally justified in the answer key.

Question Statistics

Question was missed by 4 of 9 students.

- A - 2
- B - 5
- C - 1
- D - 1

Justification References

CNG-OP-3.01-1000, Reactivity Management

CNG-CA-1.01-1000, Corrective Action Program

NRC Resolution (Q#91):

Choice B will remain the only correct answer for Question 91. Choice A is not a second correct answer to this question.

The licensee contends that the condition described in the stem meets the definition of a Reactivity Management **Event**. The NRC disagrees. Conditions are given as steady state, no reactivity changes in effect when pulse counting position indication is lost to a specific CEA due to a power supply failure. No other information is given that would support a determination that rod position has changed or that core reactivity is in any way affected.

CNG-OP-3.01-1000, "Reactivity Management", Revision 0600 provides specific definitions for the terms "Reactivity Management Event", "Reactivity Management Concern" and "Reactivity Management Event Precursor". Section 5.3, "Reactivity Management Incident Reporting and Trending", describes Severity Levels (SL) of reactivity management issues. SL1, SL2 and SL3 are described as "Reactivity Management **Events**". SL4 issues are described as "Reactivity Management **Precursors**". SL5 issues are described as "Reactivity Management **Concerns**".

The licensee cites CR 2010-00319 as a plant example where a CR was written for a reactivity management event due to a problem with position indication. The unexpected indication issue described in the CR occurred while moving CEAs. It brought CEA

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position into question and necessitated termination of the CEA positioning that had been in progress. This example is different than the one given in the exam question in that the CR describes ongoing manual actions to change CEA position. The exam question clearly describes degraded position indication on a single CEA due to the loss of a power supply at steady state conditions, with no CEA position changes in progress. The situation described by the question is therefore less of a reactivity management concern than the situation described in the CR, and the CR was classified at a Severity Level 5, per CNG-OP-3.01-1000 guidance.

The situation described in the question stem would be classified per CNG-OP-3.01-1000 at SL 5 or SL 6. It does not rise to the classification of SL1, 2 or 3, which are the levels of "Events". Choice A is not a second correct answer since the question stem situation would be classified as a "Concern" or a "Performance Trending Issue" and not as a Reactivity Management "Event". A condition report would be initiated for the situation described but not because the situation is a "Reactivity Management Event", as stated in the question choice.

Only 2 of 9 applicants selected Choice A, the choice proposed by the licensee as a second correct answer. None of the applicants asked any questions relating to this test item during exam administration.