

2009 Vermont Yankee Initial NRC Examination Written Examination Review

In accordance with Entergy procedure EN-TQ-105 "NRC Initial License Examination, Development and Administration", and NUREG 1021, Revision 9, Supplement 1, Sections ES-403 and ES-501, an examination analysis was conducted on the 2009 Vermont Yankee NRC Written Examination. This analysis included a detailed review of each question missed by 50% or more of the applicants.

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 2/20/09

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2009 Vermont Yankee Initial NRC Examination Written Examination Review

Executive summary:

The exam analysis identified ten (10) questions that were missed by 50% or more of the applicants. Preliminary reviews of the questions indicate that seven (7) of the questions were valid and the topics are valid. CR-VTY-2009-00579 has been written to initiate a complete review of the questions and ensure that the program will be reviewed to validate the information is covered. The questions captured in the CR are 18, 23, 45, 68, 70, 73, and 94.

The exam analysis and review of the exam identified three (3) questions with flaws. Two of the three questions had no correct answer. The remaining question had two correct answers. One question (52) was on the RO portion and the other two questions (91 & 100) were on the SRO portion of the exam. CR-VTY-2009-00580 has been written to investigate the reason the utility had three questions which were flawed.

Details of 3 questions needing review:

Vermont Yankee 2009 NRC Question Analysis					
Question	Percent Correct	New, Modified, Bank	Higher or Lower Cognitive	System or Topic	Recommendation/Justification
52	0	N	H	EOP 2 Basis	Recommend deleting question from exam. There are NO correct answers provided due to a typographical error in proposed answer.
91	20%	N	H	Fire Protection	Recommend accepting both C and D as correct answers. Both answers state a correct action and a correct procedure entry.
100	0%	B	H	Containment Integrity	Recommend deleting question from exam. There are NO correct answers provided due to a typographical error in the stem.

The remainder of this document shows the questions noted above with the justification and the proposed resolution.

Question 52 Justification

Analysis:

The question is a two part question asking; during an ATWS, based on Torus Water Temperature, when must boron be injected with the second part asking the basis for the Torus Water Temperature.

The question as provided to the candidates did not have a correct choice (See **Question 52, Original Question as Presented to Candidates pg 7**). The intended correct choice was answer A. The temperature in answer A part (1) of the answer should have been 110°F, instead, the provided value was 100°F.

All the candidates chose distracter C. which had the correct Torus Temperature of 110°F but not the correct basis.

- Question: Common 52
In accordance with EOP 2 during an ATWS boron must be injected before Torus water temperature reaches ____ (1) ____ to ensure injection of ____ (2) ____:
- A. (1) 100°F
(2) Hot Shutdown Boron Weight to prevent additional containment heat input which would cause a loss of primary containment integrity.
 - B. (1) 120°F
(2) Hot Shutdown Boron Weight to prevent additional containment heat input which would cause a loss of primary containment integrity.
 - C. (1) 110°F
(2) Cold Shutdown Boron Weight before torus temperature exceeds the Heat Capacity Temperature Limit.
 - D. (1) 120°F
(2) Cold Shutdown Boron Weight before torus temperature exceeds the Heat Capacity Temperature Limit.

Reason for Error:

The original question submitted to the NRC for review had accurate information. When the NRC approved exam was formatted by the utility (to generate the RO and SRO exam copies) the incorrect Torus Water Temperature was entered. The correct number listed for Torus Water Temperature should have been 110°F but was entered as 100°F. The problem was not noted by the utility on the subsequent review.

CR-VTY-2009-00580 has been written to further investigate the reason this question was flawed.

Conclusions:

The question does not have a correct answer.

Recommendation:

Remove the question from the exam.

Question 91 Justification

Analysis:

The question asks what action is required due to a fire in the Cable Vault with a failed CO₂ discharge timer. The answers state a specific procedure entry and a specific action.

Both answers 'C' and 'D' correctly state what action should be taken to initiate CO₂. This action is to open a manual cardox valve to start the pneumatic timer. The answers differ in that 'C' states to "Enter OP 2186, Fire Suppression Systems" and 'D' states to "Enter OP 3020, Fire Emergency Response Procedure".

OP 3020 defines plant personnel responsibilities and Control Room actions during a fire emergency. OP 2186 provides guidance for the operation of the fire suppression systems and equipment during normal and abnormal situations by Fire Brigade personnel. Therefore both procedures are required to be entered on report of a fire.

The stem of the question does not provide the candidate with enough information to discriminate and prioritize entering one procedure vice the other because the stem asks specifically, "What action is required?" It does not ask if the action required is in accordance with a specific procedure.

OP 2186 and at the bottom of the page, step A.1.e.1) b) provides direction to refer to OP 3020. OP-3020 page 3 shows that OP 3020 is entered for any fire in the plant.

Reason for Error:

During exam development the exam writers and validation team failed to identify the subtlety in asking "What action is required?" The stem of the question states; "A fire has occurred.....", which requires entry into OP 3020, Fire Emergency Response Procedure". The entry into OP 3020 is a required action, thus the first part of Choice D is correct. The stem goes on to state; the CO₂ discharge failed, which requires entry into OP 2186, Fire Suppression Systems to manually initiate the CO₂ System. Entry into OP 2186 is a required action, thus the first part of Choice C is correct. The second part of Choice C & D is the correct action to initiate the CO₂ system, therefore both C & D are correct answers.

The Exam Team expected this question to prompt the candidates to respond with the exact procedure that needed to be entered and which procedure specifically provides the procedural steps for initiating the Cable Vault Fire Suppression System (CO₂). A better way to have worded this question would have been to ask "What procedure provides the specific required guidance to address the failed timer and what specific actions must be taken to initiate the Cable Vault Fire Suppression System for the stated conditions?"

Conclusions:

Answers C and D are both correct

Recommendation:

Change the answer key to accept both C and D as correct answers.

Question 100 Justification

Analysis:

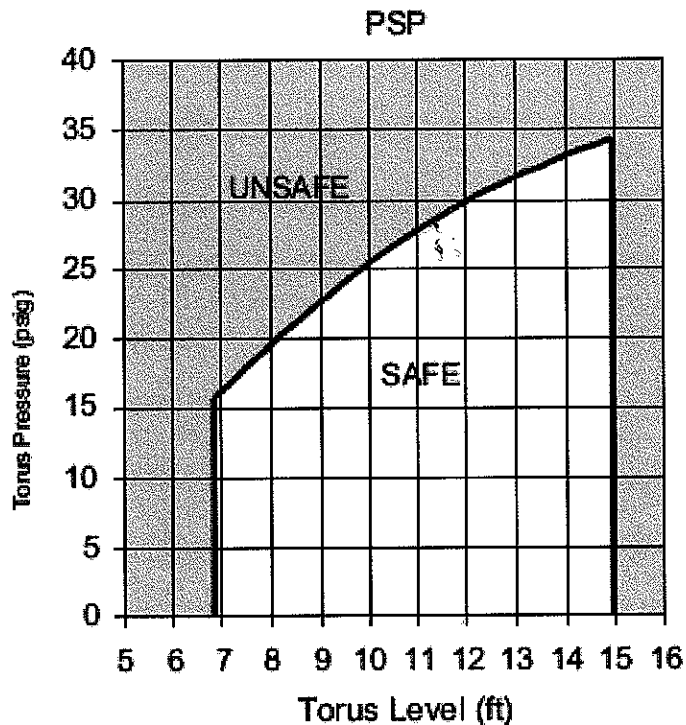
The question asks "determine the LOWEST pressure at which containment integrity could no longer be assured"?

The stem of the question had a value of 11.8 feet Torus level. That level should have stated 10.8 feet.

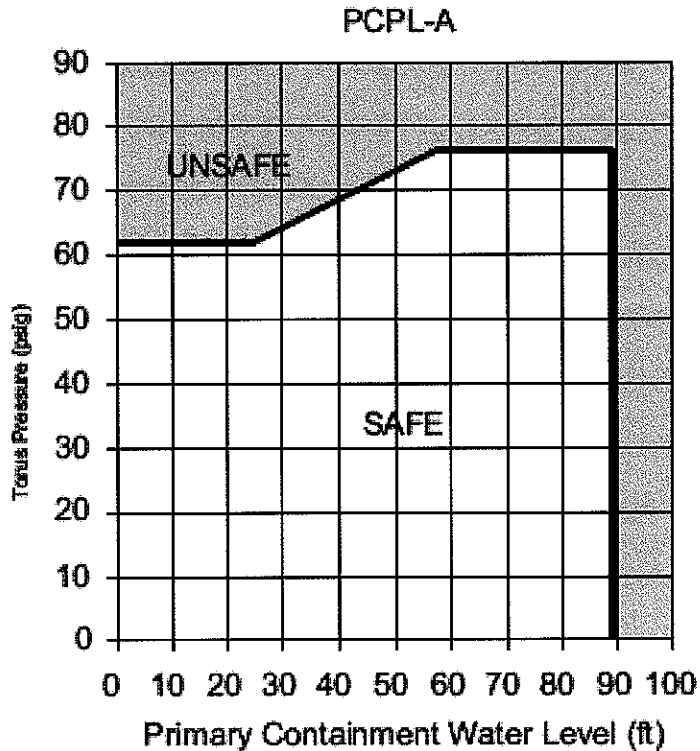
The correct answer stated in the exam answer key was A; Using the information provided in the question stem and the supplied reference of the PSP curve, the candidates plot the position of 27 psig Torus pressure and 11.8 feet Torus level. This results in a point residing in the safe region of the PSP curve. Therefore containment integrity would still be assured and this answer would be incorrect.

Reason for Error:

During the validation process this question was modified several times with Torus Water Level being the center of the discussions. The final conclusion reached was the Torus Water Level provided in the stem should be 10.8 feet instead of 11.8 feet. The agreed upon recommendation was lost in the revision process and the stem was not modified as requested during the validation process.



Distracter “B” states 62 psig Torus Pressure. This answer is INCORRECT with the stated level of 11.8 feet. Using the supplied reference of the PCPL-A curve the candidates would plot the position of 62 psig and 11.8 feet Torus level. This results in a point residing on the maximum primary containment pressure line of PCPL-A. Therefore containment integrity would no longer be assured at this pressure, however it is not the lowest pressure.



Distracter “C”, 77 psig remains Incorrect. The pressure is above the design limit for the containment and is not the LOWEST pressure at which containment integrity could no longer be assured”.

Distracter “D”, +1.5 psid DW/Torus Differential Pressure, remains Incorrect. The Torus Level Limit is based on the TS value for minimum and maximum torus level and is concerned with the ability of the torus to withstand a LOCA prior to the LOCA and is not concerned with containment capabilities in these conditions.

Conclusions:

There is no correct answer.

Recommendation:

Remove the question from the exam.

Question 52 Original Question that was submitted and approved

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	_____
	Group #	1	_____
	K/A #	295037, EA2.04	
	Importance Rating	4.0	_____

(K&A Statement) Ability to determine and/or interpret the following as they apply to
SCRAM CONDITION PRESENT AND REACTOR POWER ABOVE APRM
DOWNSCALE OR UNKNOWN : Suppression pool temperature

Proposed Question: Common 52

In accordance with EOP 2 during an ATWS boron must be injected before Torus water temperature reaches ____ (1) ____ to ensure injection of ____ (2) ____:

- A. (1) 110°F
(2) Hot Shutdown Boron Weight to prevent additional containment heat input which would cause a loss of primary containment integrity.
- B. (1) 120°F
(2) Hot Shutdown Boron Weight to prevent additional containment heat input which would cause a loss of primary containment integrity.
- C. (1) 110°F
(2) Cold Shutdown Boron Weight before torus temperature exceeds the Heat Capacity Temperature Limit.
- D. (1) 120°F
(2) Cold Shutdown Boron Weight before torus temperature exceeds the Heat Capacity Temperature Limit.

Proposed Answer: A.

Explanation (Optional):

A. Correct - The combination of high reactor power (above the APRM downscale trip), high torus temperature (above 110°F, the Boron Injection Initiation Temperature), and an open SRV or high drywell pressure (2.5 psig), are symptomatic of heat being rejected to the torus at a rate in excess of that which can be removed by the torus cooling system. Unless mitigated, these conditions ultimately result in loss of NPSH for ECCS pumps taking suction on the torus, containment over pressurization, and (ultimately) loss of primary containment integrity.

The Boron Injection Initiation Temperature (BIIT) is the highest torus temperature at which initiation of boron injection will permit the injection of the Hot Shutdown Boron Weight of boron before torus temperature exceeds the Heat Capacity Temperature Limit

B. Incorrect – Boron injection should be started prior to exceeding 110°F.

C. Incorrect –By starting injection at 110°F Hot, NOT COLD, Shutdown Boron Weight can be injected prior to exceeding the HCTL.

D. Incorrect – Boron injection should be started prior to exceeding 110°F. By starting injection at 110°F Hot, NOT COLD, Shutdown Boron Weight can be injected prior to exceeding the HCTL.

Technical Reference(s): EOP Study Guide, Rev 13, Sect 13.1, pg 3 of 54 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: (As available)

Question Source: Bank # Lot more
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam No

Question Cognitive Level:	Memory or Fundamental Knowledge	
	Comprehension or Analysis	X

10 CFR Part 55 Content: 55.41 X
55.43

Comments:

15-12-08, added HSBW to A and B.

Question 52 Original Question as Presented to Candidates

Question: Common 52

In accordance with EOP 2 during an ATWS boron must be injected before Torus water temperature reaches ____ (1) ____ to ensure injection of _____ (2) _____:

- A. (1) 100°F
(2) Hot Shutdown Boron Weight to prevent additional containment heat input which would cause a loss of primary containment integrity.
- B. (1) 120°F
(2) Hot Shutdown Boron Weight to prevent additional containment heat input which would cause a loss of primary containment integrity.
- C. (1) 110°F
(2) Cold Shutdown Boron Weight before torus temperature exceeds the Heat Capacity Temperature Limit.
- D. (1) 120°F
(2) Cold Shutdown Boron Weight before torus temperature exceeds the Heat Capacity Temperature Limit.

Question 91 Original Question As Presented To The Candidates

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	_____	<u>2</u>
	Group #	_____	<u>2</u>
	K/A #	<u>286000, A2.02</u>	
	Importance Rating	_____	<u>3.3</u>

(K&A Statement) Ability to (a) predict the impacts of the following on the FIRE PROTECTION SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Failure to actuate when required

Proposed Question: SRO 91

A fire has occurred in the Cable Vault. The CO₂ discharge timer TL-30U-1 starts but fails 20 seconds into the 30 second timeout and does not timeout.

Which one of the following actions is required?

- A. Enter OP 2186, Fire Suppression Systems, and place the INITIATE/ABORT switch in 1st SHOT to immediately initiate a CO₂ discharge into the Cable Vault.
- B. Enter OP 3020, Fire Emergency Response Procedure, and place the INITIATE/ABORT switch in 1st SHOT to immediately initiate a CO₂ discharge into the Cable Vault.
- C. Enter OP 2186, Fire Suppression Systems, and open a manual cardox valve on one of the CARDOX bottles to start the pneumatic timer allowing 70 seconds before CO₂ discharge into the Cable Vault.
- D. Enter 3020, Fire Emergency Response Procedure, and open a manual cardox valve on one of the CARDOX bottles to start the pneumatic timer allowing 70 seconds before CO₂ discharge into the Cable Vault.

Proposed Answer: C.

Explanation (Optional):

C. Correct – OP 2186, gives detailed instructions for the operation of fire suppression systems. Since the electrical timer failed the CO2 system will remain waiting for the timer to complete its 30 sec time-out. This timer can be bypassed by manually opening one of the CO2 bottles and starting the pneumatic timer. Placing the INITIATE/ABORT switch in 1st SHOT starts the electric timer which has failed.

A. Incorrect – Placing the INITIATE/ABORT switch in 1st SHOT starts the electric timer which has failed so no initiation will occur. Additionally this timer then opens valves on two CO2 bottles which start another 70 sec timer, so any initiation would not occur immediately.

B. Incorrect – OP 3020, Fire Emergency Response Procedure, contains checklists for control room actions during the fire and assume normal system operation. Placing the INITIATE/ABORT switch in 1st SHOT starts the electric timer which has failed so no initiation will occur. Additionally this timer then opens valves on two CO2 bottles which start another 70 sec timer, so any initiation would not occur immediately.

D. Incorrect – OP 3020, Fire Emergency Response Procedure, contains checklists for control room actions during the fire and assume normal system operation.

Technical Reference(s): OP 2186, Sect A, Pgs 15- 22 (Attach if not previously provided)
OP 3020, App W.

Proposed references to be provided to applicants during examination: _____ None

Learning Objective: _____ (As available)

Question Source: Bank # _____ Lot more
Modified Bank # _____ (Note changes or
attach parent)
New X

Question History: Last NRC Exam No

Question Cognitive Level: Memory or Fundamental Knowledge _____
Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 _____
55.43 5

PROCEDURE

A. **CP-115-1: CABLE VAULT FIRE PROTECTION PANEL (CWD 1506 & 1506A)**

Location: Cable Vault Entrance

1. **ACTIONS ON CABLE VAULT FIRE ALARM**

- a. Expediently proceed to cable vault fire panel.

CAUTION

If Discharge Time Delay red LED is lit, only shutting DISCHARGE HEADER ISOLATION, FP-750 (in Cable Vault) will stop the discharge.

The ABORT switch will not stop the discharge if the discharge time delay red LED is lit.

- b. If the DISCHARGE TIMEDELAY red LED is **LIT**:
- 1) CO₂ discharge will occur.
 - 2) Do not enter without SCBA.
- c. If the DISCHARGE TIMEDELAY red LED is **NOT LIT**:
- 1) Place INITIATE/ABORT Switch to ABORT.
 - 2) Enter the Cable Vault to rapidly evaluate situation (personnel in room, fire in safety related equipment etc).
 - 3) Upon exit, if warranted, place INITIATE/ABORT switch to 1" SHOT to initiate CO₂ discharge.
- d. If desired, place SM-30-1 Switch 1, SILENCE OUTSIDE BELL, in OPERATED to silence local alarm bell.
- e. Report situation to the Control Room.
- 1) Control Room shall:
 - a) Consider a manual scram of the reactor.
 - b) Refer to OP 3020 for guidance.

OP 2186 Rev. 57
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Full Copy of Procedure OP 2186 Attached

PURPOSE

The plant response to fires is based upon the coordinated actions of various personnel and organizations. Figure 1 provides the Control Room procedural guidance in the form of a flow chart. Refer to OP 2186 for specific fire panel and suppression system procedural guidance. The duties and responsibilities of other organizations are established within the sections of this procedure.

Compliance with the requirements of this procedure satisfies the requirements of TRM 6.1.E and 6.5.A.7.

DISCUSSION

This procedure describes the general plan for response to fires occurring on Vermont Yankee plant property and establishes specific requirements for response to certain types of fire events. The objectives of the VY fire emergency plan are to preserve plant operational safety and shutdown capability and protect human life.

Fires are unplanned, dynamic events. Effective planning coordinates the use of available resources (personnel and systems/equipment) in a manner that ensures a high probability for prompt fire suppression and minimal risk to plant and personnel safety.

The Shift Manager maintains overall authority for ensuring plant operational safety and shutdown capability are maintained. To assist Operations' evaluation of Safe Shutdown Capability, appendices are available for most in-plant fire areas.

For the purpose of establishing fire fighting command authority, fires are classified as in-plant or on-site (defined herein). The plant Fire Brigade has primary authority for fighting in-plant fires. The responding local fire department(s) have primary authority for fighting on-site fires.

If any fire is extinguished prior to activating the Vernon Fire Department, a courtesy call should be made to the Vernon Fire Department Chief via the business number. This call would typically be performed by the Fire Protection Engineer.

Prior to sending brigade members into an IDLH environment or anytime a Cooling Tower fire is reported, request off-site assistance from the Vernon Fire Department. If the fire is of sufficient magnitude, consider requesting the Vernon Fire Department to call-in the Brattleboro Fire Department for additional support. If medical support is needed, request assistance from Rescue Inc. This can be accomplished by dialing 9-911 for all Emergencies.

All calls requesting support should use 9-911. If the 9-911 number is not available, the following direct emergency numbers are provided. **Vermont Yankee's 9-911 address is 546 Governor Hunt Road, Vernon, Vermont.**

Question 100 Original Question As Presented To The Candidates

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	_____	3
	Group #	_____	_____
	K/A #	2.1.25	_____
	Importance Rating	_____	4.2

(K&A Statement) Ability to interpret reference materials, such as graphs, curves, tables, etc.

Proposed Question: SRO 100

The plant experienced a large LOCA. Adequate core cooling has been established in accordance with applicable EOPs.

The following plant conditions currently exist:

- Reactor pressure is 170 psig and steady
- Drywell pressure is 23.3 psig and rising slowly
- Torus pressure is 22.1 psig and rising slowly
- Torus level 11.8 ft and steady
- DW Temp 190°F and steady

Using the EOP charts determine the LOWEST pressure at which containment integrity could no longer be assured?

- A. 27 psig Torus pressure
- B. 62 psig Torus pressure
- C. 77 psig Torus pressure
- D. +1.5 psid DW/Torus Differential Pressure

Proposed Answer: A.

Explanation (Optional):

- A. Correct - The PSP pressure limit is based on the maximum pressure that can exist in the Torus that will prevent exceeding PCPL during a blowdown. Since RPV pressure is above 50 psid with the Torus a blowdown could exceed the PCPL based on PSP.
- B. Incorrect - For Vermont Yankee s PCPL- , the maximum pressure (62 psig) at which the primary containment vent valves can be opened and closed however the lowest pressure is 27 psig.
- C. Incorrect – This pressure is above the design limit for the Drywell based on the upper limit of the PCPL-A for water levels above 57 feet.
- D. Incorrect – The Torus Level Limit is based on the TS value for minimum and maximum torus level and is concerned with the ability of the torus to withstand a LOCA prior to the LOCA and is not concerned with Containment capabilities in these conditions.

Technical Reference(s): EOP 3 Basis document (Attach if not previously provided)
Must integrate the following:
PCPL-A graph maintains containment integrity.
T.S. Basis 3.7. A

Proposed references to be provided to applicants during examination: EOP Graphs for PCPL-A, PSP, Torus Level Limit

Learning Objective: LOT-00-607, SRO 4 (As available)

Question Source: Bank # 5652 Lot more
Modified Bank # _____ (Note changes or attach parent)
New _____

Question History: Last NRC Exam No

Question Cognitive Level: Memory or Fundamental Knowledge _____
Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 _____
55.43 5, 2