

BYRON INITIAL LICENSE EXAM

OCTOBER 29 and
NOVEMBER 5-9, 2001

The licensee opted not to formally submit any post-examination changes. However, during their post-examination review, the examiners identified a total of ten questions on the written examination that required either modification or deletion. The examiners validated these changes with facility personnel.

Written Examination Comments and NRC Resolutions

Written Examination Record Number 1 (SRO Examination Question Number 1):

Comment: The question asked for the applicant to determine the Technical Specification Minimum staffing for both units at power. The original correct answer provided for the question was answer "c" (one unit supervisor and three nuclear station operators). Upon further review, It appeared that answer "a" (two unit supervisors and three nuclear station operators) would also have been correct, in that, a shift staffing of two unit supervisors and three NSOs was consistent with Byron Technical Specification requirements for minimum shift staffing.

NRC Resolution: The Byron Technical Specifications, Section 5.2.2.b. stated that minimum shift crew composition requirements are in accordance with 10 CFR 50.54(m)(2)(i). Paragraph (m)(2)(i) of 10 CFR 50.54 stated that for a site that consists of two units, both units operating, and one main control room (such as Byron), the minimum licensed operator staffing is two SRO licensed individuals and three RO licensed individuals. In accordance Byron Procedure BAP 320-1, "Shift Staffing," this Technical Specification requirement is satisfied by having a shift staffing consisting of one shift manager (SRO licensed individual), one unit supervisor (SRO licensed individual), and three nuclear station operators (RO licensed operators). Therefore, answer "c" was a correct answer when only considering the unit supervisor and nuclear station operator positions. However, having a shift staffing that consisted of two unit supervisors and three nuclear station operators would have also met Technical Specifications requirements. Therefore, answer "a" was also considered a correct answer.

Written Examination Record Number 12 (SRO Examination Question Number 11):

Comment: The question asked the applicant to determine who would be required to sign approving a non-licensed operator, who had accrued 2000 milliRem TEDE during the current year, to receive an additional 50 milliRem of exposure. The original correct answer provided for the question was answer "b" (Operations Manager and the Radiation Protection Manager). Upon further review, it appeared that answer "d" (Station Manager and Radiation Protection Manager) would also have been correct, in that, the Station Manager had direct line authority over all other Department Managers and the Station Manager had signature authority for authorizing exposure extensions in accordance with station procedures.

NRC Resolution: Byron Procedure RP-AA-203, "Annual Administrative Exposure Control Level Extension Approval," Attachment 2 states that for an individual to receive exposure between 2000 and 3000 milliRem, the Department Manager and Radiation Protection Manager are required to sign for

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approval. RP-AA-203, Attachment 2 also states that for an individual to receive exposure between 3000 and 4000 milliRem, the Station Manager's signature would have to be obtained in addition to the Department Manager and Radiation Protection Manager. Since RP-AA-203 provided signature authority to the Station Manager in matters of exposure, and since the Station Manager had direct line authority over all other Department Managers (including the Operations Manager) obtaining the Station Manager and Radiation Protection Manager signatures, answer "d" would be considered a correct answer.

Written Examination Record Number 34 (RO Examination Question 24, SRO Examination Question Number 24):

Comment: The applicant was given a set of plant conditions and asked what must then be accomplished prior to drawing a pressurizer bubble. The original correct answer provided for the question was "b" (drain the pressurizer relief tank to 70-79%). Upon further review, it appeared that answer "d" (pressurize the reactor coolant system (RCS) to 200-275 psig) would also be a correct answer, in that, the RCS would be pressurized to at least 275 pounds, in accordance with station procedure, prior to drawing a pressurizer bubble.

NRC Resolution: Byron Procedure BOP RY-5, "Drawing a Pressurizer Bubble," Prerequisite Step C.1 requires the RCS to be pressurized to between 375 and 400 psig prior to drawing a pressurizer bubble. In order to pressurize the RCS to between 375 and 400 psig, the system must first be pressurized to between 200 and 275 psig. Therefore, answer "d" would also be a correct answer.

Written Examination Record Number 47 (RO Examination Question Number 37):

Comment: The stem of the question stated that train "A" of core exit thermal couples (CETCs) had lost power. The applicant was then asked to determine the actions required to have current, correct, CETC temperatures displayed once power was restored. The original correct answer was "d" (must depress SYSTEM RESET pushbutton only). Upon further review, it appears that answer "a" (no action is required) may actually be the correct answer, in that, once the system is reenergized, the temperature values will be flashing but will indicate current, correct values.

NRC Resolution: Based on discussions with CETC system engineer, and based on observations made by operators during energization of the CETC system, answer "a" (no action is required) is the actual correct answer. Once the CETC system is energized, the temperature values immediately displayed

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will be "flashing" but will be correct, current values. Answer "a" was considered the correct answer to the question.

Written Examination Record Number 49 (RO Examination Question Number 38, SRO Examination Question Number 35):

- Comment:** The question asked the applicant to determine which CETC problem (from a list of four) would cause an indication of degrading natural circulation conditions (i.e., displayed CETC temperature increasing). The original correct answer provided for the question was "c" (corrosion develops at the head connection). Upon further review, it appeared there may have been no correct answer provided, in that, the potential problems listed may not cause increasing CETC indication.
- NRC Resolution:** The four potential problems with the CETCs provided to the applicant were a "short" developing at the head connection, an "open" developing at the head connection, corrosion developing at the head connection and finally, a loss of power occurs. The following is a discussion of the effect that each problem would have on the CETC values displayed on the main control board based on a review of Byron Training Lesson Plan, "Inadequate Core Cooling System":
- If a short were to develop at the head connection, the resultant individual CETC value would be driven to less than 35^oF. Since the display on the main control board is the average of the ten highest CETC values, the CETC with the short would be eliminated from display and have little or no impact on CETC temperature indication;
- If an open were to develop at the head connection, the resultant individual CETC value would be driven to greater than 2300^oF. The CETC display system would sense this error and remove the failed CETC from scan. This problem would have little or no impact on CETC temperature indication;
- The development of corrosion at the head connection *may* cause an increase in resistance thus an increase in the temperature indicated by an individual CETC. However, as previously discussed, the CETC value displayed on the main control board is the average of the ten highest CETC values. Because the magnitude of the change in CETC value due to the development of corrosion is an unknown quantity, and due to the fact that the CETC value displayed is the average of the ten highest CETC values, it would not be reasonable to expect an operator to be able to evaluate this condition and to be absolutely certain that this

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problem would cause the displayed CETC temperature to increase; and

If a loss of power to the CETC display unit were to occur, there would be no indication of CETC values on the main control board. However, individual CETC values would still be available by using a resistance meter to read the individual CETC values (thermocouples need no external power source to function).

Based on a review of Byron Training Lesson Plan, "Inadequate Core Cooling System" and the above discussion, there was no correct answer provided for this question. The question was deleted from the examination.

Written Examination Record Number 58 (RO Examination Question Number 47, SRO Examination Question Number 43):

Comment:

The question stated that a turbine runback had occurred reducing power from 100% to 60%. The question then asked the applicant to determine the initial plant response, if the effects of shrink and swell were ignored. The original correct answer provided for the question was "d" (feed reg valves throttle close to reduce steam generator levels). Upon further review, it appeared that answer "a" (steam dumps arm and open to return T_{ave} to the program value) was also correct, in that, the steam dump system would respond to such a load reduction and reduce RCS temperature to within the steam dump system program band.

NRC Resolution:

In accordance with Byron Training Lesson Plan, "Steam Dumps," and Byron Training Notes MS-4, "Main Steam Dumps," if the steam dump system senses a 10% decrease in turbine impulse pressure within a two minute period, interlock C-7 would be satisfied. Once interlock C-7 is satisfied and RCS average temperature differed from the steam dump system reference temperature by greater than three degrees, the steam dump system would be armed and the steam dumps would open resulting in the system dumping steam from the steam generators to the main condenser cooling the RCS to within the steam dump system program band. A turbine runback results in a rapid power reduction (in this case from 100% to 60%). This reduction in power (and turbine load) would have satisfied interlock C-7, armed the steam dumps, caused RCS average temperature to differ from the steam dump system reference temperature by greater than three degrees, and caused the steam dump system to respond returning RCS average temperature to the system's program value. Therefore answer "a" was also considered correct.

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Written Examination Record Number 100 (RO Examination Question Number 80, SRO Examination Question Number 78):

Comment: The question asked the applicant to determine how the ICONIC display indicated the value of subcooling if it were "unacceptable" (i.e., what color would the value be displayed as). The original correct answer was "d" (magenta). Upon further review, it appeared that answer "c" (yellow) may have been the correct answer, in that, observations made by the applicants during simulator training and by licensed operators in the main control room indicated that the displayed value of subcooling was normally white but would change to yellow if the value of subcooling was low (i.e., unacceptable).

NRC Resolution: The operation of the ICONIC display was discussed with the licensee engineer responsible for the computer program that drives the ICONIC display. The engineer performed a review of the computer code and determined that the color of the value of subcooling displayed would normally be white, would change to yellow if subcooling were reduced below a preestablished limit, and would change to cyan if the value were suspect (i.e., input errors).

Byron Training Lesson Plan, "Plant Computer," states that the color of the value of subcooling will be white when containment conditions are normal and yellow when containment conditions are "adverse." Regardless of containment conditions, the lesson plan states that if subcooling is "unacceptable" (i.e., less than established setpoints), the color of the value of subcooling will be magenta.

The question asked how the ICONIC display would indicate the value of subcooling if it were "unacceptable." Based on the review of the computer code, the correct answer would have been "c" (yellow). However, based on the training given to the applicants, the correct answer would have been "d" (magenta). Because of the discrepancy between training and the actual operation of the ICONIC display, both answers "c" and "d" were considered correct.

Written Examination Record Number 106 (RO Examination Question Number 84, SRO Examination Question Number 83):

Comment: The question stated that a small spill of reactor coolant escaped onto the floor and was quickly covered, contained, and cleaned up using a mop. The question also stated that there was no airborne contamination present. The applicant was then asked to determine if the exposure from this type of work was primarily a threat to the whole body, the skin, the extremities, or the lens of the eye. The original correct answer provided

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for the question was "a" (whole body). Upon further review, it appeared that all of the answers were correct, in that, radiation encountered during this type of work would be an equal threat to the whole body, the skin, the extremities, and the lens of the eyes.

NRC Resolution: Due to the nature of reactor coolant water, it contains corrosion products that are primarily a beta/gamma radiation source. Beta radiation would not constitute a legitimate threat to the whole body, the skin, the extremities, or the lens of the eye because Beta radiation does not easily penetrate clothing or gloves and does not travel far in air (approximately two feet). However, gamma radiation is a high energy photon and as such, passes easily through air as well as gloves and other clothing worn during spill recovery work. The whole body, skin, extremities, and lens of the eyes would be equally threatened by gamma radiation exposure. As a result, there were considered to be four correct answers to this question. NUREG-1021, ES-403, Section D.1.b required the deletion of any question that had three or more answers that were considered to be correct. In accordance with NUREG-1021, the question was deleted.

Written Examination Record Number 115 (RO Examination Question Number 91, SRO Examination Question Number 91):

Comment: The licensee had initially determined that this question was not suitable for an NRC examination due to poor wording in the stem and multiple correct answers. Although the licensee had taken action to correct the question, they failed to ensure the corrected version was incorporated into the examination administered to the applicants. As a result, the version of the question reviewed by the NRC was different than that administered to the applicants. This was contrary to NUREG-1021 which required the written examination to be reviewed and validated by the NRC prior to its being administered.

NRC Resolution: The NRC chief examiner assigned to the Byron examination performed a post-examination validation and review of the question.

The question referenced procedure 1BEP ES-0.0, "Rediagnosis," and asked the applicant to determine why steam generator (SG) pressures were checked stable or increasing in all SGs. The original correct answer provided for the question was "a" (*any* SG secondary pressure boundary is intact). Upon further review, it appeared that answer "b" (*all* SG secondary pressure boundaries are intact) would also be considered a correct answer, in that, checking SG pressures would be performed to determine if *any* and *all* SG secondary pressure boundaries were intact.

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Although the chief examiner determined that question was technically valid, it contained a psychometric error due to there being two correct answers provided. Procedure 1BEP ES-0.0, Steps 1 and 2 both direct operators to check pressure in the SGs to determine the status of SG secondary pressure boundaries. Although it would be reasonable to expect an operator to understand why SG pressures were checked during the performance of this procedure, it would not be reasonable to expect an operator to have memorized the *exact* verbiage of Steps 1 and 2 and to be able to differentiate the difference between the two steps based on phraseology alone. Both answers "a" and "b" were considered correct.

Written Examination Record Number 126 (RO Examination Question Number 99):

Comment:

The question described an on-going event, including the fact that heavy radio traffic was limiting access to an available channel, and asked the applicant to determine how to report the event. The original correct answer provided for the question was "a" (use the orange emergency call button on the top of the portable radio to call the control room). Upon further review, it appeared that answer "a" was not completely correct, in that, using the orange emergency call button would only contact the control room. The operator would still be required to transmit his/her report of the event.

NRC Resolution:

The question asked the applicant to determine how the event would be *reported*. Based on discussion with licensee Operations Department personnel, answer "a" was only partially correct, in that, use of the orange emergency call button would only result in *contacting* the main control room. The operator would still be required to transmit information in order to *report* the event. Because no answer provided for the question was completely correct, this question was deleted from the examination.