

SRO Written Examination Questions

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Discussion Goals

- Review regulations and guidance regarding SRO-only questions.
- Review regulations and guidance regarding RO tech spec questions.
- Provide examples of questions that are and are not SRO-only and discuss.
- Provide examples of tech spec questions applicable to ROs.
- Answer questions.

10 CFR 55.43(a)

Content. The written examination for a senior operator will contain a representative selection of questions on the knowledge, skills, and abilities needed to perform licensed senior operator duties. The knowledge, skills, and abilities, will be identified, in part, from **learning objectives** derived from a systematic analysis of licensed senior operator duties performed by each facility licensee and contained in its training program and from

10 CFR 55.43(b)

The written examination for a senior operator for a facility will include a representative **sample from among the following seven items** and the 14 items specified in §55.41 of this part, to the extent applicable to the facility:

10 CFR 55.43(b)

1. Conditions and limitations in the facility license.
2. Facility operating limitations in the technical specifications and their bases.
3. Facility licensee procedures required to obtain authority for design and operating changes in the facility.
4. Radiation hazards that may arise during normal and abnormal situations, including maintenance activities and various contamination conditions.
5. Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.
6. Procedures and limitations involved in initial core loading, alterations in core configuration, control rod programming, and determination of various internal and external effects on core reactivity.
7. Fuel handling facilities and procedures.

NUREG-1021

- The SRO outline shall include 25 K/A statements that relate to the topics in 10 CFR 55.43(b). (ES-401, D.1.c)
- **The 25 SRO-level questions shall evaluate the additional knowledge and abilities required for the higher license level in accordance with 10 CFR 55.43(b) or the facility licensee's learning objectives.** Questions related to 10 CFR 55.41(b) topics may also be appropriate SRO-level questions if they evaluate knowledge and abilities at a level that is unique to the SRO job position.

K/A Catalogs

- K/A statements in NUREG-1022, Rev. 2, and NUREG-1023, Rev. 2, contain links to 10 CFR 55.41 and 43 requirements as well as importance values for ROs and SROs.
 - When the NRC revised NUREGs-1122 and -1123 to incorporate cross-references to items in 10 CFR 55, the primary purpose was to establish at least one regulatory connection for every K/A, but it was never intended to be an exhaustive cross-reference between the two documents. **The fact that a particular K/A does not reference 55.41 or 55.43 does not, in and of itself, disqualify the K/A from testing on the RO or SRO written examination.** (OL Program Feedback 401.35 and 401.52)
 - Importance considers direct and indirect impact of the K/A on safe plant operation in a manner ensuring personnel and public health and safety. (NUREG-1022, Rev. 2)

Observations

Note the similarity between the following pairs of items:

- 10CFR55.41(b)(12) Radiological safety principles and procedures.
- 10CFR55.43(b)(4) Radiation hazards that may arise during normal and abnormal situations, including maintenance activities and various contamination conditions.
- 10CFR55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.
- 10CFR55.43(b)(5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

Summary – Regulations and Guidance

- A question that is related to one of the seven topics in 10 CFR 55.43(b) is an SRO question.
 - Determine that a relationship exists by comparing the stem of the question to the 10 CFR 55.43(b) statement (items 1-7), NOT by using the K/A catalog.

Summary – Regulations and Guidance

- A question related to a duty unique to SROs at your facility is an SRO question.
 - Provide evidence that the duty is unique to SROs at your facility, i.e. a learning objective or a reference to your systematic analysis of duties.

Question

- Is a question that has a K/A with an importance rating of less than 2.5 for ROs and greater than 2.5 for SROs an SRO-only question?
 - Maybe. The answer depends on whether or not you can link the stem to 10 CFR 55.43 (b) items 1-7 or a learning objective unique to SROs at your facility. It's not an RO question.

Question

- Is a K/A that is linked to both 10 CFR 55.41 and 10 CFR 55.43 appropriate for an SRO exam?
 - The fact that a K/A is linked to both 10 CFR 55.41 and 10 CFR 55.43 does not mean that the K/A cannot be used to develop an SRO-only question, nor does it exclude the K/A from sampling on the RO examination. (ES-401, D.1.c)
 - Questions related to 55.41 topics may be appropriate SRO-level questions if they evaluate knowledge and abilities at a level that is unique to the SRO job position as determined by the facility licensee's learning objectives. (OL Program Feedback 401.35)

Question

- How does the fact that we train our ROs to the same level as our SROs affect how you select SRO test items?
 - The fact that you expect your ROs to master certain 10 CFR 55.43 K/S/As does not mean that they can no longer be used as the basis for “SRO-level” questions. **Questions that test knowledge and abilities per 10 CFR 55.43(b) can be considered “SRO-level” per Section D.2.d of ES-401 even though the facility licensee’s training program requires the same level of knowledge for its ROs.** (OL Program Feedback 401.36)
 - Although ES-401 does not specifically address using a K/A linked to 10 CFR 55.43 to develop an RO written examination question, it does allow the facility licensee to use plant-specific priorities (and a site-specific task list) to justify using an otherwise unimportant K/A for questioning. Therefore, questions associated with topics in 10 CFR 55.43(b) should be acceptable for the RO examination if they are supported by documented RO learning objectives derived from the RO job task analysis at the site. (OL Program Feedback 401.37)

Question

- ES-401 says that “special attention is required to ensure that the SRO exam tests at the appropriate license level.” Can you give me an example of how to do this?
 - Both 10 CFR 55.41(b)(10) and 10 CFR 55.43(b)(5) require emergency operating procedure (EOP) knowledge, but the latter requires the “SRO-level” question to evaluate the additional knowledge and abilities necessary for “assessment of facility conditions and selection of appropriate procedures during...emergency situations.” Questions that evaluate the knowledge of specific bases for EOPs and/or the operational implications of EOP cautions (e.g. K/As 2.4.18 and 2.4.20), but not the higher level “assessment and selection” knowledge, would generally not be valid “SRO-level” questions because they are applicable only to 10 CFR55.41(b)(10). However, questions that evaluate knowledge of the parameters and logic used to assess the status of EOP safety functions (e.g. K/A 2.4.21) would generally be considered valid “SRO-level” questions even if the facility licensee’s SAT-based program has identified this additional knowledge as an RO job requirement. (OL Program Feedback 401.36)

Question

- What is the relationship between the RO/SRO exams and level of difficulty?
 - Between 50 and 60 percent of the questions on the RO exam shall be written at the comprehension/analysis level. The SRO exam could exceed 60 percent because the K/A categories emphasized on the SRO-only exam are generally consistent with the higher cognitive levels. (ES-401.D.2.c)
 - The SRO only questions are not required to be written at the higher cognitive levels (comprehension/analysis) but shall be consistent with the cognitive level of the approved K/A statement. (ES-401.D.2.d)

Question

- I've got a K/A in my SRO exam outline that I can't seem to fit to one of the seven items in 10 CFR 55.43(b). Now what?
 - **Contact the Chief Examiner.** Options include:
 - Replacing the K/A with one that you can match to 10 CFR 55.43(b).
 - “Systematically and randomly” per ES-401, D.1.d.
 - Document and justify the change on Form ES-401-4.
 - Write a question that matches the K/A AND incorporates an element from 10 CFR 55.43(b).
 - For example, you may be able to write a question that requires knowledge of system parameters AND tech specs.

Question

- 10 CFR 55.41(b) for ROs does not list technical specifications. Additionally, the RO portion of our training program only requires ROs to know 1-hour or less tech specs. What guidelines do you use when developing tech spec questions for ROs?
 - **Section 55.41(b)(5) addresses the tech specs.** An RO needs to know about the limits on operation of the plant, as they relate to the list of items under the written examination. ROs, as in 55.41(5), are expected to know LCOs, particularly those things they should recognize and communicate to the SRO in a timely manner. (NUREG-1262, Q. 136)
 - **The NRC licensing examination is not a part of the facility licensee's SAT-based training process.** The **systematic sampling procedures** for preparing the written (and walkthrough) exam outlines per NUREG-1021 **are designed around the structure of the NRC's K/A Catalogs** and may not be compatible with the facility-specific task lists. Thus, the content of the NRC licensing examination is not necessarily restricted by the SAT-based training process and the NRC is not limited to those learning objectives. (OL Program Feedback 401.12)
 - **The NRC expects ROs to recognize TS entry conditions, immediate actions,** and (in the case of SROs) bases when presented in a multiple choice format on a written examination. (OL Program Feedback 401.11)

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Question (continued)

- Regarding the second sub-bullet on the previous page, examples related to technical specifications include (each of these K/A's has an IR for ROs greater than or equal to 2.5):
 - G2.1.11 Knowledge of less than one hour technical specification action statements for systems. (CFR: 43.2 / 45.13) 3.0/3.8
 - G2.1.12 Ability to apply technical specifications for a system. (CFR 43.2/43.5/45.3) 2.9/4.0
 - G2.1.22 Ability to determine Mode of Operation. (CFR 43.5/45.13) 2.8/3.8
 - G2.1.33 Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications. (CFR 43.2/43.3/45.3) 3.4/4.0
 - G2.2.22 Knowledge of limiting conditions for operations and safety limits. (CFR 43.2/45.2) 3.4/4.1
 - G2.2.23 Ability to track limiting conditions for operations. (CFR 43.2/45.13) 2.6/3.8
 - G2.2.24 Ability to analyze the affect of maintenance activities on LCO status. (CFR: 43.2/45.13) 2.6/3.8
 - G2.2.25 Knowledge of bases in technical specifications for limiting conditions for operations and safety limits. (CFR 43.2) 2.5/3.7
 - G2.4.3 Ability to identify post-accident instrumentation. (CFR: 41.6 / 45.4) 3.5/3.8
- Other examples, related to refueling, can be found in K/As 2.2 (Generic - Equipment Control), 034 (Fuel Handling), and 036 (Fuel Handling Incidents).

Question

- What Tech Specs, and what elements of Tech Specs, are testable for ROs?
 - Chief Examiner Judgment.
 - Based on the K/A catalog and implied guidance.
 - Based on Program Office guidance.
 - Includes:
 - Recognition of TS entry conditions (i.e. LCO description, including Mode of Applicability and modifying Notes)
 - Less than one hour action statements (Condition, Required Action, and Completion Time)
 - Ability to determine Mode of operation
 - Safety Limits and Bases

Your Questions?

Examples – SRO-Only Questions

K/A: 008AA2.22: Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident (CFR: 43.5 / 45.13): Consequences of loss of pressure in RCS; methods for evaluating pressure loss. 3.8/4.2

- A pressurizer steam space LOCA has caused PPLS and SIAS actuation.
- CETs are stable at 550 °F.
- RCS pressure is stable at 1300 psia.
- Pressurizer level is 20% and rising.
- HPSI flow is 390 gpm.

With no operator action and assuming temperatures remain constant, how will pressurizer level, pressurizer pressure, and HPSI flow respond?

- A. Pressurizer level will stabilize slightly above 20%, pressure will lower and HPSI flow will increase.
- B. Pressurizer level will rise to 100% , pressure and HPSI flow will remain constant.
- C. Pressurizer level will rise to 100%, pressure will rise and HPSI flow will decrease.
- D. Pressurizer level will stabilize slightly above 20%, pressure will rise and HPSI flow will decrease

G2.1.11 Knowledge of system status criteria which require the notification of plant personnel. (CFR 43.5 / 45.12) 2.5 / 3.3

In which one of the following situations would you need to direct the auxiliary building operator to operate the containment cooler interface valves to restore containment cooling?

- A. One of the DC busses is de-energized due to a ground.
- B. The instrument air header pressure is 0 psig due to an air header leak.
- C. Component cooling water header pressure has been lost due to a header rupture.
- D. One of the containment cooling fans has tripped and will not restart.

G2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation (CFR 43.5 / 45.12 / 45.13) 3.7/4.4

Reactor power is 29% during a reactor startup when the reactor operator trips the main turbine due to high vibration. The SRO should now anticipate implementing procedures that will:

- A. Maintain reactor power less than 29% since power will increase after the main turbine trip.
- B. Recover from the reactor scram caused by the turbine trip.
- C. Recover vessel level using the feed and condensate system.
- D. Scram the reactor.

025AK1.01 Knowledge of the operational implications of the following concepts as they apply to Loss of Residual Heat Removal System (CFR 41.8/41.10/45.3): Loss of RHRS during all modes of operation. 3.9 / 4.3

Plant conditions are as follows:

- Unit is in Mode 5
- DH has been isolated from RCS due to a LOCA in RCS
- RCS CET temps are 175 °F and rising
- RCS pressure is 110 psig
- RCS is intact with loops NOT filled
- Time to steam release is 90 minutes

Which of the following portions of 1203.028, Loss of Decay Heat Removal, should be in use?

- A. Section 1, Loss of Inventory
- B. Attachment G, Containment Closure
- C. Section 2, DH Removal System Leak
- D. Section 8, Loss of Both DH Systems – RCS Pressure Boundary Intact

G2.2.34 Knowledge of the process for determining the internal and external effects on core reactivity (CFR 43.6) 2.8/3.2

Technical Specification 3.1.9, Physics Test Exceptions – Mode 2, allows the number of required channels for LCO 3.3.1, Reactor Trip System (RTS) Instrumentation, Functions 2 (Power Range Neutron Flux), 3 (Power Range Neutron Flux Rate), and 18d (Power Range Neutron Flux, P-10) to be reduced to “3” required channels.

Which one of the following correctly describes the basis for allowing “3” required channels for the functions described above?

- A. To permit setpoint adjustment of the channel following Physics Testing.
- B. To permit a PRNI to be connected to the reactivity computer for the Flux Symmetry Test
- C. To permit a PRNI to be connected to the reactivity computer for the Differential Boron Worth Test
- D. To permit calibration of the channel during the Bank Worth Test – Rod Swap Method

036AA2.01 Ability to determine and interpret the following as they apply to the Fuel Handling Incidents: (CFR 43.5 / 45.13) ARM system indications. 3.2/3.9

Unit 1 conditions are as follows:

- Unit 1 is in Refueling Shutdown
- The Refueling SRO stopped core alterations at 11:15 after a fuel rod separated from a fuel assembly in transit in containment.
- Containment closure is not established
- Fission products were detected in a containment air sample taken at 11:30.
- Radiation monitor readings are as follows....

The Emergency Action Level classification for this event is a/an _____ and, when acceptable radiological conditions exist, containment closure should be established within _____.

Examples – RO Tech Spec Questions

G2.1.12 Ability to apply technical specifications for a system. (CFR 43.2/43.5/45.3) 2.9/4.0

Which one of the following describes the components which may be aligned to either AFW Train (in accordance with plant procedures and Technical Specifications) in order to maintain dual train redundancy?

- A. MOV-1403, AFW Steam supply from 'A' S/G: 'B' AFW pump.
- B. MOV-1403, AFW Steam supply from 'A' S/G: 'C' AFW pump.
- C. MOV-1403, AFW Steam supply from 'B' S/G: 'B' AFW pump.
- D. MOV-1403, AFW Steam supply from 'B' S/G: 'C' AFW pump.

G2.4.3 Ability to identify post-accident instrumentation. (CFR 41.6 / 45.4) 3.5/3.8

Which one of the following is required to be operable in Mode 3 per Post Accident Monitoring Technical Specification 3.3.3?

- A. Containment Temperature
- B. AFW Flow Rate
- C. Accumulator Level
- D. Spent Fuel Pool Level

058G2.1.33

058: Loss of DC Power

G2.1.33: Ability to recognize indications for system operating parameters which are entry level conditions for technical specifications.

Assuming that all other equipment is operable, which of the following would require an entry into Technical Specification 3.8.2.1, DC Sources – Operating (Modes 1-4), action statements?

- A. Emergency Bus A-SA to Aux Bus D Tie Breaker 105 SA trips open and EDG 1A-A automatically starts and loads
- B. 480V Emergency Bus 1A3-SA main feeder breaker trips open
- C. Battery Charger 1A-SA is placed under clearance
- D. Emergency Battery 1A-SA is placed on a float charge

069AA2.01 Ability to determine and interpret the following as they apply to the Loss of Containment Integrity: Loss of containment integrity.
(CFR 43.5 / 45.13) 3.7/4.3

Which one of the following conditions is a loss of containment integrity as defined in Technical Specifications?

- A. The emergency air lock inner door is found with strong backs installed at Intermediate Shutdown.
- B. The fuel transfer tube blind flange is not installed with the fuel building transfer tube valve shut while in Intermediate Shutdown.
- C. The leakage rate of a containment penetration exceeds the limits of Technical Specifications while in Cold Shutdown.
- D. An inner airlock door seal is leaking and the outer door is opened for 2 minutes to allow access for repairs during power operation.

071K5.04 Knowledge of the operational implication of the following concepts as they apply to the Waste Gas Disposal System:
Relationship of hydrogen/oxygen concentration to flammability. (CFR 41.5 / 45.7) 2.5/3.1

Which one of the following combinations of oxygen and hydrogen requires IMMEDIATE suspension of additional waste gas and a reduction of the oxygen concentration in the waste holdup system, per Technical Specification 3.11.2.5?

- A. 1% Oxygen and 7% Hydrogen
- B. 3% Oxygen and 5% Hydrogen
- C. 5% Oxygen and 3% Hydrogen
- D. 7% Oxygen and 1% Hydrogen

Your Questions?

Discussion Goals

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- Review regulations and guidance regarding RO tech spec questions.
- Provide examples of questions that are and are not SRO-only and discuss.
- Provide examples of tech spec questions applicable to ROs.
- Answer questions.

What should I remember from all of this?

- If you develop an SRO exam, WITHOUT reviewing the stems of the questions against the seven 10 CFR 55.43 topics and your learning objectives, you can NOT be sure that the questions are “SRO-only.”
- An NRC exam may include questions that have K/As with IRs greater than 2.5 (e.g. RO tech specs), even if you do not have an associated learning objective.
- ROs are expected to know and apply elements of Technical Specifications consistent with NRC OL Program Office guidance and the specific K/A being tested.