

JPM FUNDAMENTALS



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JPM FUNDAMENTALS

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Outline 75d (90d)

▶ Administrative JPMs

- RO (4)
- SRO-I and SRO-U (5)
- RO Admin JPM Retake Exam (5)

▶ Control Room/In-Plant JPM (Simulator) JPMs

- RO 8 cr/3 ip
- SRO-I 7 cr/3 ip
- SRO-U 2 cr/3 ip or 3 cr/2 ip

Exam Outline Quality Checklist 75d(90d)

- ▶ ES-201-2, Section 3
 - ES-301-1, Admin JPM criteria
 - ES-301-2, System JPM criteria
 - No tasks duplicated from the audit exam
 - No tasks duplicated on subsequent days

Facility:		Date of Examination:		
Item	Task Description	Initials		
		a	b*	c#
1. W R I T T E N	a. Verify that the outline(s) fit(s) the appropriate model, in accordance with ES-401.			
	b. Assess whether the outline was systematically and randomly prepared in accordance with Section D.1 of ES-401 and whether all K/A categories are appropriately sampled.			
	c. Assess whether the outline over-emphasizes any systems, evolutions, or generic topics.			
	d. Assess whether the justifications for deselected or rejected K/A statements are appropriate.			
2. S I M U L A T O R	a. Using Form ES-301-5, verify that the proposed scenario sets cover the required number of normal evolutions, instrument and component failures, technical specifications, and major transients.			
	b. Assess whether there are enough scenario sets (and spares) to test the projected number and mix of applicants in accordance with the expected crew composition and rotation schedule without compromising exam integrity, and ensure that each applicant can be tested using at least one new or significantly modified scenario, that no scenarios are duplicated from the applicants' audit test(s), and that scenarios will not be repeated on subsequent days.			
	c. To the extent possible, assess whether the outline(s) conform(s) with the qualitative and quantitative criteria specified on Form ES-301-4 and described in Appendix D.			
3. W / T	a. Verify that the systems walk-through outline meets the criteria specified on Form ES-301-2: (1) the outline(s) contain(s) the required number of control room and in-plant tasks distributed among the safety functions as specified on the form (2) task repetition from the last two NRC examinations is within the limits specified on the form (3) no tasks are duplicated from the applicants' audit test(s) (4) the number of new or modified tasks meets or exceeds the minimums specified on the form (5) the number of alternate path, low-power, emergency, and RCA tasks meet the criteria on the form.			
	b. Verify that the administrative outline meets the criteria specified on Form ES-301-1: (1) the tasks are distributed among the topics as specified on the form (2) at least one task is new or significantly modified (3) no more than one task is repeated from the last two NRC licensing examinations			
	c. Determine if there are enough different outlines to test the projected number and mix of applicants and ensure that no items are duplicated on subsequent days.			
4. G E N E R A L	a. Assess whether plant-specific priorities (including PRA and IPE insights) are covered in the appropriate exam sections.			
	b. Assess whether the 10 CFR 55.41/43 and 55.45 sampling is appropriate.			
	c. Ensure that K/A importance ratings (except for plant-specific priorities) are at least 2.5.			
	d. Check for duplication and overlap among exam sections.			
	e. Check the entire exam for balance of coverage.			
	f. Assess whether the exam fits the appropriate job level (RO or SRO).			
a. Author		Printed Name/Signature _____		Date _____
b. Facility Reviewer (*)		_____		_____
c. NRC Chief Examiner (#)		_____		_____
d. NRC Supervisor		_____		_____
Note: # Independent NRC reviewer initial items in Column "c"; chief examiner concurrence required. Not applicable for NRC-prepared examination outlines				

JPM
Requirements

ADMINISTRATIVE JPM Criteria

- ▶ ES-201-1, Section 3.b.
- ▶ ES 301-1
 - ▶ 1) Direct from bank: RO max 3; SRO and RO Retake max of 4
 - ▶ 2) New or Modified from bank: min of 1
 - ▶ 3) Previous 2 exams: 1 randomly selected
- ▶ How many JPMs can overlap on SRO / RO?

Facility: _____ Date of Examination: _____
 Examination Level: RO SRO Operating Test Number: _____

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations		
Conduct of Operations		
Equipment Control		
Radiation Control		
Emergency Procedures/Plan		

NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when all 5 are required.

* Type Codes & Criteria:
 (C)ontrol room, (S)imulator, or Class(R)oom
 (D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes)
 (N)ew or (M)odified from bank (≥ 1)
 (P)revious 2 exams (≤ 1; randomly selected)

Admin JPM title, short description,
KA

Criteria Code

Admin JPM Criteria

SYSTEM (Control Room/In-Plant)

JPMs Criteria

- ▶ ES-201-1, Section 3.a.
- ▶ ES 301-2
 - ▶ 1) RO; SRO-I; SRO-U;
 - ▶ 2) Alternate Path
 - ▶ 3) Direct from bank
 - ▶ 4) Emergency/Abnormal in-plant
 - ▶ 5) ESF
 - ▶ 6) Low Power or Shutdown
 - ▶ 7) New or Modified from bank
 - ▶ 8) RCA
 - ▶ 9) Simulator
 - ▶ 10) Previous 2 Exams

Facility: _____ Date of Examination: _____
 Exam Level: RO SRO-I SRO-U Operating Test No.: _____

Control Room Systems[®] (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)

System / JPM Title	Type Code	Safety Function
a.		
b.		
c.		
d.		
e.		
f.		
g.		
h.		

In-Plant Systems[®] (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)

i.		
j.		
k.		

[®] All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all S SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for RO / SRO-I / SRO-U
(A) alternate path	4-6 / 4-6 / 2-3
(C) control room	
(D) direct from bank	≤ 9 / ≤ 8 / ≤ 4
(E) emergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1
(EN) engineered safety feature	- / - / ≥ 1 (control room system)
(L) low-Power / Shutdown	≥ 1 / ≥ 1 / ≥ 1
(N) new or (M) modified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1
(P) previous 2 exams	≤ 3 / ≤ 3 / ≤ 2 (randomly selected)
(R) CA	≥ 1 / ≥ 1 / ≥ 1
(S) simulator	

System JPM Title, short description, KA

Criteria Code

Safety Function

System JPM Criteria

Little GOTCHAs!!

- ▶ 1) Safety Functions and Systems
 - All RO and SRO-I control room (or in-plant) must have different SFs and systems
 - In-Plant may overlap control room systems and SFs
 - All 5 SRO-U systems must have different SFs

- ▶ 2) Replacing JPMs

Little GOTCHAs!! (continued)

- ▶ 3) ES-301, Section D.4.b. (2nd paragraph, 2nd sentence):
- ▶ “ ...at least one in-plant task **shall** implement actions for emergency or abnormal condition, **and another shall** require the applicant to enter the RCA. “
- ▶ If an applicant performs one in-plant JPM that enters the RCA **and** performs an emergency or abnormal task, is that sufficient to meet this criteria?

JPM Developmental Goals

- ▶ Operationally Significant
- ▶ Discriminating
- ▶ Meaningful Performance Requirements
- ▶ Observable Verifiable Actions

JPM Developmental Goals (continued)

- ▶ “We want JPMs that contribute to the test’s overall capacity to differentiate between those applicants who are competent to safely operate the plant and those who are not.”
- ▶ We need to see the individual:
 - address a problem;
 - incorporate a procedure;
 - and perform observable, verifiable actions
 - to accomplish the task or mitigate the consequences.

Verifiable Actions

- ▶ We are **not** looking for JPMs that require the applicant to identify a malfunction, then merely inform someone;
- ▶ or only only require the applicant to direct another operator to perform an action or procedure.
- ▶ ES-301, Section D says that an applicant should only be given credit for those events that require an applicant to perform verifiable actions that provide insight to the applicant's competence.

Verifiable Actions (continued)

- ▶ 1) This means the applicant must ***perform*** some action, not just observe some control room indications while making a phone call to an operator to take some action in the field.
- ▶ In this instance the applicant is directing, not performing a verifiable action.
- ▶ Provides insight to the applicant's understanding of the system, but does not allow the examiner to evaluate the applicant's capability of actually operating the equipment/equipment controls and controlling the system response.

Verifiable Actions (continued)

- ▶ 2) Another instance of incorrectly applying “verifiable actions” is only having an applicant perform a calculation.
- ▶ The results need to have significance. The credit for performing a calculation should relate directly to the competency that is being examined, and not just giving credit for performing the calculation correctly.
- ▶ Calculation and results should be related to an assessment.

Verifiable Actions (continued)

- ▶ It is only acceptable to give credit for performing a verifiable action if the applicant diagnoses a malfunction or an event and then performs a meaningful calculation (ie, SDM or leak rate calculation) which can be graded by the examiner against meaningful evaluation.

Verifiable Actions (continued)

- ▶ The intent of performing a verifiable action is to actually **observe** the applicant perform an action and describe exactly what it takes to perform an action.

Verifiable Actions (continued)

- ▶ As an example, when an applicant performs a JPM in the plant, the examiner expects the applicant to describe how he closes a valve or repositions a switch. The examiner doesn't just accept that the applicant points to a valve or switch and says "the valve is closed" or "the breaker is closed." The applicant must describe how he would perform a verifiable action, such as "I am turning the handwheel in the clockwise direction observing the stem move inward until I feel resistance."

Verifiable Actions (continued)

- ▶ Likewise, it is important in some instances to calculate the leak rate for the primary coolant system to determine entry into Tech Specs or to determine a possible location for the leak (primary or secondary), in which case credit could be given.

Verifiable Actions (continued)

- ▶ However, credit should not be given to an applicant if the only action taken is to perform a leak rate calculation based upon a procedure requirement or for information only.
- ▶ This is because the calculation did not involve any type of diagnosis of the malfunction or event by the applicant.

Verifiable Actions (continued)

- ▶ Therefore, unless the applicant actually manipulates some piece of equipment or equipment controls, or performs a meaningful calculation which includes diagnosis of the event/malfunction, then the JPM may not provide a meaningful evaluative tool to grade the individual.

JPM Critical Step

Procedural Step(s) Required to Accomplish *Task*:

- performed correctly;
- performed accurately;
- performed in correct sequence;
- performed at proper time

Critical Steps shall:

- be identified
- have an associated *performance standard*

Alternate Path JPMs

- ▶ Success Path
- ▶ Procedurally Driven
- ▶ Logical Sequence
- ▶ Independent of Crew Dynamics
- ▶ Validated in Advance

Alternate Path JPMs (continued)

Example 1:

A system is in normal operation when Steam Leak Detection actuates. The associated isolation valve fails to auto isolate. The operator manually closes the valve using the associated control switch.

Is this an alternate path JPM?

Alternate Path JPMs (continued)

Example 2:

An injection valve receives an auto-open signal, but the valve fails to open. The RNO procedure step directs the operator to manually open the valve with the associated control switch.

Would this be considered an alternate path JPM?

Significantly Modified JPMs

- ▶ ES-301 D.2.a.

In order to protect the integrity and security of the examination process, the examination author must limit how much of the examination is taken directly from the facility's testing materials without **significant modification** and how much of the walk-through test is repeated from the last two NRC licensing examinations at the facility.

A significant modification means that at least one condition has been substantively changed in a manner that alters the course of action of the JPM.

Significantly Modified JPMs (continued)

- ▶ Examples:
 - ▶ 1) NON-SIGNIFICANT Example – Perform a surveillance on a specific Power Range NIS channel when the same surveillance of another Power Range channel was performed under the same conditions.
 - ▶ 2) A MORE SIGNIFICANT Example – Perform a surveillance on a specific Power Range NIS channel under different conditions (lower power level, with a failure present, etc.) such that the procedural flow path or result is different.

Significantly Modified JPMs (continued)

“Feedback Question” 301.4“ Can there be scenario repetition with similar transients?

Although the same scenarios and job performance measures may not be repeated on subsequent days during the examination week(s), events and tasks that are similar to those that were tested on previous days during that examination are permitted provided the actions required to mitigate the transient or complete the task are **significantly different** from those required on the previous examination. This is consistent with the policy for repeating events and tasks from the applicants' audit examination as stated in Section D.1.a of ES-301.

Significantly Modified JPMs (continued)

ES-301 D.1.d. – When selecting and developing JPMs and scenarios for the operating test, ensure that the materials contribute to the test's overall capacity to differentiate between those applicants who are competent to safely operate the plant and those who are not.

Additionally, **all of the test items should include the three facets of test validity** (i.e., content, operational, and discrimination) discussed in **Appendix A**. Any test items that, when missed, would raise questions regarding adequate justification for denying the applicant's license should not be included on the operating test.

Significantly Modified JPMs (continued)

- ▶ **“Operationally Significant”** – Appendix A, C.1 (a component of *Validity*)

For a test to be considered **valid**, it must be shown to measure that which it is intended to measure. In the case of the NRC examinations, the intent is to measure the examinee’s knowledge and ability, such that those who pass will be able to perform the duties of a reactor operator (RO) or senior reactor operator (SRO) to ensure the safe operation of the plant.

- ▶ NOTE: We want to do this consistently and fairly – **Uniformly!** (Ref: NUREG-1021 Appendix A)

Significantly Modified JPMs (continued)

Sec. 107. Atomic Energy Act of 1954: Operators' Licenses

- ▶ *The Commission shall—*
 - a. *prescribe **uniform conditions** for licensing individuals as operators of any of the various classes of production and utilization facilities licensed in this Act;*
 - b. *determine the qualifications of such individuals;*
 - c. *issue licenses to such individuals in such form as the Commission may prescribe; and*
 - d. *suspend such licenses for violations of any provision of this Act or any rule or regulation issued thereunder whenever the Commission deems such action desirable.*

Significantly Modified JPMs (continued)

- Test Validity–3 facets
 - 1) Content Validity
 - 2) Operational Validity
 - 3) Discrimination Validity

Significantly Modified JPMs (continued)

▶ 1. Content Validity

- a) Establish a Link to Job Duties
- b) Use a Sample Plan - we must sample the required knowledge or performance in a manner that allows inferences to be made regarding the examinees' performance on the broader population of knowledge, even though it was not tested. (IF WE GIVE A PREDICTABLE EXAM, WE ARE NOT TESTING THE APPLICANT'S ABILITY TO SOLVE PROBLEMS OR UNDERSTANDING; WE'RE ONLY TESTING RECOGNITION/MEMORY).

Significantly Modified JPMs (continued)

2. Operational Validity –

- a) To the extent possible, **test items** [i.e., written examination questions, job performance measures (JPMs), and simulator events] should address an actual or conceivable mental or psychomotor **activity performed on the job**. In this regard, the more operationally oriented a test item is, the more valid the test item.
- b) The higher the level tested in the test item, generally the more operationally valid that test item will be, since it is at the higher levels that questions invoke problem-solving, diagnosis, prediction, and analysis of conditions, events, and responses.

Significantly Modified JPMs (continued)

3. Discrimination Validity –

- a) Criterion-Referenced Testing - vs. norm-referenced tests.
- b) Cut Scores – **80%**
- c) Level of Knowledge vs. Level of Difficulty (Level of Knowledge represents the range of mental demands required to answer a question or perform a task. A test item at the higher level of knowledge requires operators to determine or identify the appropriate fact, rule, or principle and then correctly apply it to a **novel** situation.)
 - a. POOR Example – A valve fails to OPEN/CLOSE, answer; simply OPEN/CLOSE the valve!
 - b. BETTER Example - A valve fails to OPEN/CLOSE, answer; the applicant determines that a valve interlock is not met, corrects that, and THEN aligns the valve.

Significantly Modified JPMs (continued)

- ▶ Other Issues:
 - ▶ 1) Exam Item Novelty
 - 2) Cues
 - Initiating Cue
 - System Response Cue(s)

Significantly Modified JPMs (continued)

1. **Question Novelty** - Per **ES-602, Attachment 1**; one of the most effective ways to ensure that an operator has a high level of knowledge is to present novel situations and require the operator to realize both what information is relevant and how to apply it. If a test item does not contain unique or varied circumstances different from those presented in training, the item will be reduced to eliciting simple recall. When candidates are able to memorize test items and answers to respond to test items, we cannot determine if they can truly solve the problems or if they have merely memorized the answers.

Significantly Modified JPMs (continued)

1. **Question Novelty (continued):**
2. Once a test item and its answer have been seen and rehearsed, then the item ceases to be a viable discriminator of safe operator performance. It is no longer challenging or testing problem-solving ability; rather, it is simply testing recall. Therefore, test items must be dynamic, replacing or substituting items of like kind and difficulty to preserve integrity in the test discrimination process.

Significantly Modified JPMs (continued)

Examples:

- a. POOR Example – Perform a frequently used attachment/surveillance and simply find the errors/misalignments!
- b. BETTER Example - Perform an infrequently used attachment/surveillance and correct any errors/misalignments by demonstrating system knowledge.

Significantly Modified JPMs (continued)

1. Cues – Give them enough but not too much!
2. **(Appendix C)**
 - a. The JPM shall also include an **initiating cue** that provides the stimulus for the examinee to begin performing the task. When appropriate, the cue should clearly specify the desired endpoint for the task. For example, if it is desired for the examinee to start and load the emergency diesel generator, the cue should state the load at which the task will be considered complete. Alternate path tasks may have an actual endpoint different from that stated in the initiating cue.

Significantly Modified JPMs (continued)

- a. The JPM shall identify **appropriate** system response cues so that the examiner can provide the examinee with specific feedback regarding the component and system reactions to the examinee's manipulations, especially those procedural steps that are identified as critical to task completion. The response cues are particularly important for **in-plant** tasks that will be simulated because the examinee will not have available the normal indications (e.g., alarms, flow rates, temperatures, and pressures) that would be observed during actual task performance alternate path JPMs that require the examinee to perform auxiliary procedures when equipment or instrumentation fails during use.

Significantly Modified JPMs (continued)

- I. POOR Example – Perform a simple surveillance step given all prerequisites/precautions and initial conditions are met (start pump X by turning switch Y).
- II. BETTER Example - Perform a surveillance step after determining that all prerequisites/precautions and initial conditions have been met (start pump X by turning switch Y after verifying ...).

QUESTIONS?