Draft Submittal

(Pink Paper)

DRAFT Written Exam Quality Checklist (ES-401-6)

& Written Exam Sample Plan

ES-401 **Written Examination Quality Checklist** **Form ES-401-6**

DRAFT

Facility: Brunswick Date of Exam: 11/3/08 Exam Level: RO ☒ SRO ☒

Item Description					Initial a	Initial b*	Initial c#
1.	Questions and answers are technically accurate and applicable to the facility.				RB	WM	x'
2.	a. NRC K/As are referenced for all questions. b. Facility learning objectives are referenced as available.				RB	WM	
3.	SRO questions are appropriate in accordance with Section D.2.d of ES-401				RB	WM	
4.	The sampling process was random and systematic (If more than 4 RO or 2 SRO questions were repeated from the last 2 NRC licensing exams, consult the NRR OL program office).				RB	WM	
5.	Question duplication from the license screening/audit exam was controlled as indicated below (check the item that applies) and appears appropriate: X the audit exam was systematically and randomly developed; or __ the audit exam was completed before the license exam was started; or __ the examinations were developed independently; or __ the licensee certifies that there is no duplication; or __ other (explain)				RB	WM	BJC
6.	Bank use meets limits (no more than 75 percent from the bank, at least 10 percent new, and the rest new or modified); enter the actual RO / SRO-only question distribution(s) at right.	Bank: 23 / 4	Modified: 0 / 0	New: 52 / 21	RB	WM	
7.	Between 50 and 60 percent of the questions on the RO exam are written at the comprehension/ analysis level; the SRO exam may exceed 60 percent if the randomly selected K/As support the higher cognitive levels; enter the actual RO / SRO question distribution(s) at right.	Memory: 33 / 5	C/A: 42 / 20		RB	WM	
8.	References/handouts provided do not give away answers or aid in the elimination of distractors.				RB	WM	x'
9.	Question content conforms with specific K/A statements in the previously approved examination outline and is appropriate for the tier to which they are assigned; deviations are justified.				RB	WM	
10.	Question psychometric quality and format meet the guidelines in ES Appendix B.				RB	WM	
11.	The exam contains the required number of one-point, multiple choice items; the total is correct and agrees with the value on the cover sheet.				RB	WM	

	Printed Name / Signature	Date
a. Author	Robert Bolin Robert Bolin	9/18/08
b. Facility Reviewer (*)	LEONARD R. BELLER Leonard R. Beller	9/19/2008
c. NRC Chief Examiner (#)	RON DEESE [illegible]	10/9/08
d. NRC Regional Supervisor	MARCELLUS WIDMANN	10/23/08

Note: * The facility reviewer's initials/signature are not applicable for NRC-developed examinations.
Independent NRC reviewer initial items in Column "c"; chief examiner concurrence required.

x' problems identified

Rec'd 11/24/08

DRAFT

Facility: Brunswick Date of Exam: Oct 27, 2008

Tier	Group	RO K/A Category Points												SRO-Only Points		
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G *	Total	A2	G*	Total
1. Emergency & Abnormal Plant Evolutions	1	6	2	4	N/A			3	3	N/A		2	20	4	3	7
	2	2	2	1				1	1			0	7	2	1	3
	Tier Totals	8	4	5				4	4			2	27	6	4	10
2. Plant Systems	1	4	2	3	2	3	2	2	2	1	2	3	26	3	2	5
	2	1	1	2	0	1	1	2	1	1	0	2	12	2	1	3
	Tier Totals	5	3	5	2	4	3	4	3	2	2	5	38	5	3	8
3. Generic Knowledge and Abilities Categories		1			2			3			4		10	1	2	3	4	7
		3			3			2			2			2	2	2	1	

Note:

1. Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only outlines (i.e., except for one category in Tier 3 of the SRO-only outline, the "Tier Totals" in each K/A category shall not be less than two).
2. The point total for each group and tier in the proposed outline must match that specified in the table. The final point total for each group and tier may deviate by ±1 from that specified in the table based on NRC revisions. The final RO exam must total 75 points and the SRO-only exam must total 25 points.
3. Systems/evolutions within each group are identified on the associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; operationally important, site-specific systems/evolutions that are not included on the outline should be added. Refer to Section D.1.b of ES-401 for guidance regarding the elimination of inappropriate K/A statements.
4. Select topics from as many systems and evolutions as possible; sample every system or evolution in the group before selecting a second topic for any system or evolution.
5. Absent a plant-specific priority, only those K/As having an importance rating (IR) of 2.5 or higher shall be selected. Use the RO and SRO ratings for the RO and SRO-only portions, respectively.
6. Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.
7.* The generic (G) K/As in Tiers 1 and 2 shall be selected from Section 2 of the K/A Catalog, but the topics must be relevant to the applicable evolution or system. Refer to Section D.1.b of ES-401 for the applicable K/As.
8. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings (IRs) for the applicable license level, and the point totals (#) for each system and category. Enter the group and tier totals for each category in the table above; if fuel handling equipment is sampled in other than Category A2 or G* on the SRO-only exam, enter it on the left side of Column A2 for Tier 2, Group 2 (Note #1 does not apply). Use duplicate pages for RO and SRO-only exams.
9. For Tier 3, select topics from Section 2 of the K/A catalog, and enter the K/A numbers, descriptions, IRs, and point totals (#) on Form ES-401-3. Limit SRO selections to K/As that are linked to 10 CFR 55.43.

ES-401	BWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO / SRO)						Form ES-401-1		
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4					X		**AA2.03: Actual core flow**	**3.3/3.3**	
295003 Partial or Complete Loss of AC / 6	X						AK1.03: Knowledge of the operational implications of the following concepts as they apply to PARTIAL OR COMPLETE LOSS OF A.C. POWER - Under voltage/degraded voltage effects on electrical loads	2.9/3.2	
295004 Partial or Total Loss of DC Pwr / 6	X				X		AK1.02: Redundant D.C. power supplies **AA2.01 Cause of partial or complete loss of D.C. power**	3.2/3.4 **3.2/3.6**	
295005 Main Turbine Generator Trip / 3			X				AK3.07: Knowledge of the reasons for the following responses as they apply to MAIN TURBINE GENERATOR TRIP - Bypass valve operation	3.8/3.8	
295006 SCRAM / 1						X X	G2.2.3 (multi-unit license) Knowledge of the design, procedural, and operational differences between units. **G2.2.37: Ability to determine operability and/or availability of safety related equipment.**	3.8/3.9 **3.6/4.6**	
295016 Control Room Abandonment / 7				X			AA1.08: Reactor pressure	4.0/4.0	
295018 Partial or Total Loss of CCW / 8	X				X		AK1.01: Effects on component/system operations **AA2.03: Cause for partial or complete loss**	3.5/3.6 **3.2/3.5**	
295019 Partial or Total Loss of Inst. Air / 8			X				AK3.01: Backup air system supply:	3.3/3.4	
295021 Loss of Shutdown Cooling / 4					X		AA2.05: Reactor vessel metal temperature	3.4/3.5	
295023 Refueling Acc / 8						X	**G2.4.8: Knowledge of how abnormal operating procedures are used in |conjunction with EOPs.**	**3.8/4.5**	
295024 High Drywell Pressure / 5	X						EK1.01: Drywell integrity:	3.9/4.0	
295025 High Reactor Pressure / 3		X					EK2.08: Knowledge of the interrelations between HIGH REACTOR PRESSURE and the following - Reactor/turbine pressure regulating system	3.7/3.7	
295026 Suppression Pool High Water Temp. / 5				X	X		EA1.01: Containment spray **EA2.03 Reactor pressure Mark-III**	3.2/3.4 **3.3/3.3**	
295027 High Containment Temperature / 5		X					EK2.04 SPDS/ERIS/CRIDS/GDS: Mark-III	2.6/3.2	
295028 High Drywell Temperature / 5	X						EK1.02: Equipment environmental qualification	2.9/3.1	
295030 Low Suppression Pool Wtr Lvl / 5						X	G2.1.7: Ability to evaluate plant performance and make operational judgments |based on operating characteristics, reactor behavior, and instrument interpretation.	4.4/4.7	
295031 Reactor Low Water Level / 2			X			X	EK3.04 Steam cooling **G2.2.39: Knowledge of less than or equal to one hour Technical Specification action statements for systems.**	4.0/4.3 **3.9/4.5**	
295037 SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown / 1					X		EA2.03: SBLC tank level	4.3/4.4	
295038 High Off-site Release Rate / 9			X				EK3.02: System isolations	3.9/4.2	
600000 Plant Fire On Site / 8				X			AK1.02: Knowledge of the operation applications of the following concepts as they apply to Plant Fire On Site - Fire Fighting	2.9/3.1	

700000 Generator Voltage and Electric Grid Disturbances / 6	X				X		AK1.03: Under-excitation AA2.04: VARs outside capability curve	3.3/3.4 3.6/3.6	
K/A Category Totals:	6	2	4	3	3 / **4**	2 / **3**	Group Point Total:		20/7

ES-401	BWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO / SRO)							Form ES-401-1	
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
295002 Loss of Main Condenser Vac / 3									
295007 High Reactor Pressure / 3						X	**G2.1.7: Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.**	**4.4/4.7**	
295008 High Reactor Water Level / 2		X					AK2.03: Knowledge of the interrelations between HIGH REACTOR WATER LEVEL and the following - Reactor water level control	3.6/3.7	
295009 Low Reactor Water Level / 2		X					AK2.01: Knowledge of the interrelations between LOW REACTOR WATER LEVEL and the following - Reactor water level indication	3.9/4.0	
295010 High Drywell Pressure / 5	X						AK1.03: Knowledge of the operational implications of the following concepts as they apply to HIGH DRYWELL PRESSURE - Temperature increases	3.2/3.4	
295011 High Containment Temp / 5	X						AK1.01: Containment pressure: Mark-III	4.0/4.1	
295015 Incomplete SCRAM / 1					X		AA2.02: Control rod position	4.1/4.2	
295022 Loss of CRD Pumps / 1					X		**AA2.02 Ability to determine and/or interpret the following as they apply to LOSS OF CRD PUMPS - CRD system status**	**3.3/3.4**	
295032 High Secondary Containment Area Temperature / 5			X				EK3.01: Knowledge of the reasons for the following responses as they apply to HIGH SECONDARY CONTAINMENT AREA TEMPERATURE - Emergency/normal depressurization	3.5/3.8	
295034 Secondary Containment Ventilation High Radiation / 9				X			EA1.03: Ability to operate and/or monitor the following as they apply to SECONDARY CONTAINMENT VENTILATION HIGH RADIATION - Secondary containment ventilation	4.0/3.9	
295035 Secondary Containment High Differential Pressure / 5					X		**EA2.03: Ability to determine and/or interpret the following as they apply to SECONDARY CONTAINMENT HIGH SUMP/AREA WATER LEVEL - Cause of the high water level**	**3.4/3.8**	
K/A Category Point Totals:	2	2	1	1	1 / 2	1	Group Point Total:		7 / 3

ES-401	BWR Examination Outline Plant Systems - Tier 2/Group 1 (RO / SRO)											Form ES-401-1	
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
203000 RHR/LPCI: Injection Mode					X			X				K5.02: Knowledge of the operational implications of the following concepts as they apply to RHR/LPCI: INJECTION MODE (PLANT SPECIFIC) - Core cooling methods **A2.01: Ability to (a) predict the impacts of the following on the RHR/LPCI: INJECTION MODE (PLANT SPECIFIC) ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations - Inadequate net positive suction head**	3.3/3.7 **3.2/3.4**	
205000 Shutdown Cooling		X										K2.01: Knowledge of electrical power supplies to the following - Pump motors	3.1/3.1	
206000 HPCI											X	2.4.14: Knowledge of general guidelines for EOP usage	3.8/4.5	
207000 Isolation (Emergency) Condenser			X								X X	K2.02: Knowledge of electrical power supplies to the following - Initiation logic **2.2.17 Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, and coordination with the transmission system operator.** 2.2.37 Ability to determine operability and/or availability of safety related equipment.	3.5/3.7 **2.6/3.8** 3.6/4.6	
209001 LPCS										X		A4.02: Ability to manually operate and/or monitor in the control room - Suction valves	3.5/3.4	
209002 HPCS	X											KI.12: Knowledge of the physical connections and/or causeeffect relationships between HIGH PRESSURE CORE SPRAY SYSTEM (HPCS) and the following - Reactor vessel	3.4/3.6	
211000 SLC					X							K5.02: Knowledge of the operational implications of the following concepts as they apply to STANDBY LIQUID CONTROL SYSTEM - Chugging (as it pertains to boron mixing)	2.8/3.0	
212000 RPS								X				**A2.15: Ability to (a) predict the impacts of the following on the REACTOR PROTECTION SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations - Load rejection**	**3.7/3.8**	

215003 IRM									X		A4.07: Ability to manually operate and/or monitor in the control room - Verification of proper functioning/ operability	3.6/3.6	
215004 Source Range Monitor				X							K4.01: Knowledge of SOURCE RANGE MONITOR (SRM) SYSTEM design feature(s) and/or interlocks which provide for the following - Rod withdrawal blocks	3.7/3.7	
215005 APRM / LPRM								X			A3.03: Ability to monitor automatic operations of the AVERAGE POWER RANGE MONITOR/LOCAL POWER RANGE MONITOR SYSTEM including - Meters and recorders	3.3/3.3	
217000 RCIC	X						X				K1.01: Knowledge of the physical connections and/or causeeffect relationships between REACTOR CORE ISOLATION COOLING SYSTEM (RCIC) and the following - Condensate storage and transfer system **A2.05: Ability to (a) predict the impacts of the following on the REACTOR CORE ISOLATION COOLING SYSTEM (RCIC) ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations - D.C. power loss**	3.5/3.5 **3.3/3.3**	
218000 ADS							X				A2.01: Ability to (a) predict the impacts of the following on the AUTOMATIC DEPRESSURIZATION SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations - Small steam line break L0CA	4.1/4.3	
223002 PCIS/Nuclear Steam Supply Shutoff				X		X					K4.08: Knowledge of PRIMARY CONTAINMENT ISOLATION SYSTEM/NUCLEAR STEAM SUPPLY SHUT-OFF design feature(s) and/or interlocks which provide for the following - †Manual defeating of selected isolations during specified emergency conditions K6.08: Knowledge of the effect that a loss or malfunction of the following will have on the PRIMARY CONTAINMENT ISOLATION SYSTEM/NUCLEAR STEAM SUPPLY SHUT-OFF - Reactor protection system	3.3/3.7 3.5/3.7	
239002 SRVs						X					K6.03: Knowledge of the effect that a loss or malfunction of the following will have on the RELIEF/SAFETY VALVES - A.C. power: Plant-Specific	2.7/2.9	
259002 Reactor Water Level Control							X				A1.05: Ability to predict and/or monitor changes in parameters associated with operating the REACTOR WATER LEVEL CONTROL SYSTEM controls including - FWRV/startup level control position	2.9/2.9	

261000 SGTS							X					A1.02: Ability to predict and/or monitor changes in parameters associated with operating the STANDBY GAS TREATMENT SYSTEM controls including - Primary containment pressure	3.1/3.2	
262001 AC Electrical Distribution			X					X				K3.04: Knowledge of the effect that a loss or malfunction of the A.C. ELECTRICAL DISTRIBUTION will have on following - Uninterruptible power supply A2.03: Ability to (a) predict the impacts of the following on the A.C. ELECTRICAL DISTRIBUTION ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations - Loss of off-site power	3,1/3.3 3.9/4.3	
262002 UPS (AC/DC)	X		X									K1.16: Knowledge of the physical connections and/or causeeffect relationships between NINTERRUPTABLE POWER SUPPLY (A.C./D.C.) and the following - MSIV's K3.02: Knowledge of the effect that a loss or malfunction of the UNINTERRUPTABLE POWER SUPPLY (A.C./D.C.) will have on following - Recirculation pump speed	3.1/3.2 2.9/2.0	
263000 DC Electrical Distribution		X										K2.01: Knowledge of electrical power supplies to the following - Major D.C. loads	3.1/3.4	
264000 EDGs					X						X	K5.06: Knowledge of the operational implications of the following concepts as they apply to EMERGENCY GENERATORS (DIESEL/JET) - Load sequencing **2.4.41: Knowledge of the emergency action level thresholds and classifications**	3.4/3.5 **2.9/4.6**	
300000 Instrument Air											X	2.1.20: Ability to interpret and execute procedure steps	4.6/4.6	
400000 Component Cooling Water	X											K1.03: Knowledge of the physical connections and / or cause-effect relationships between CCWS and the following - Radiation monitoring systems	2.7/3.0	
K/A Category Point Totals:	4	2	3	2	3	2	2	2 / **3**	1	2	3 / **2**	Group Point Total:		26/ 5

ES-401	BWR Examination Outline Plant Systems - Tier 2/Group 2 (RO / SRO)												Form ES-401-1	
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
201001 CRD Hydraulic														
201002 RMCS								X						
201003 Control Rod and Drive Mechanism							X							
201004 RSCS														
201005 RCIS														
201006 RWM														
202001 Recirculation							X							
202002 Recirculation Flow Control														
204000 RWCU														
214000 RPIS														
215001 Traversing In-core Probe											X			
215002 RBM														
216000 Nuclear Boiler Inst.								X						
219000 RHR/LPCI: Torus/Pool Cooling Mode	X													
223001 Primary CTMT and Aux.														
226001 RHR/LPCI: CTMT Spray Mode								X						
230000 RHR/LPCI: Torus/Pool Spray Mode														
233000 Fuel Pool Cooling/Cleanup											X			
234000 Fuel Handling Equipment														
239001 Main and Reheat Steam			X											
239003 MSIV Leakage Control					X									
241000 Reactor/Turbine Pressure Regulator														
245000 Main Turbine Gen. / Aux.														
256000 Reactor Condensate									X					
259001 Reactor Feedwater														
268000 Radwaste														
271000 Offgas			X											
272000 Radiation Monitoring											X			
286000 Fire Protection														
288000 Plant Ventilation		X												
290001 Secondary CTMT														
290003 Control Room HVAC														
290002 Reactor Vessel Internals						X								
K/A Category Point Totals:	1	1	2	0	1	1	2	1 / 2	1	0	2 / 1	Group Point Total:		12/3

Facility:	Date of Exam:

Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.1	**Knowledge of conduct of operations requirements**			**4.2**	**X**
	2.1.4	Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance |of active license status, 10CFR55, etc	3.3	X		
	2.1.7	Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation	4.4	X		
	2.1.17	**Ability to make accurate, clear, and concise verbal reports**			**4.0**	**X**
	2.1.19	Ability to use plant computers to evaluate system or component status	3.9	X		
	2.1.					
	Subtotal			3		**2**
2. Equipment Control	2.2.4	(multi-unit license) Ability to explain the variations in control board/control room layouts, systems, instrumentation, and procedural actions between units at a facility	3.6	X		
	2.2.6	Knowledge of the process for making changes to procedures	3.0	X		
	2.2.12	**Knowledge of surveillance procedures**			**4.1**	**X**
	2.2.18	Knowledge of the process for managing maintenance activities during shutdown operations, such as risk assessments, work prioritization, etc	2.6	X		
	2.220	**Knowledge of the process for managing troubleshooting activities**			**3.8**	**X**
	2.2.					
	Subtotal			3		**2**
3. Radiation Control	2.3.6	**Ability to approve release permits**			**3.8**	**X**
	2.3.12		3.2	X		
	2.3.14	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities	3.4	X		
	2.3.15	**Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring| equipment, etc**			**3.1**	**X**
	2.3.					
	2.3.					
	Subtotal			2		**2**
4. Emergency Procedures / Plan	2.4.9	Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies	3.8	X		
	2.4.27	**Knowledge of "fire in the plant" procedures**			**3.9**	**X**
	2.4.45	Ability to prioritize and interpret the significance of each annunciator or alarm	4.1	X		
	2.4.					
	2.4.					
	2.4.					
	Subtotal			2		**1**
Tier 3 Point Total				10		7