

Final Submittal

CATAWBA EXAM 2003-301 50-413 & 50-414

**March 31 - April 4 &
April 10, 2003**

1. Senior Operator Written Examination

**Nuclear Regulatory Commission
Senior Reactor Operator Licensing
Examination**

Catawba Nuclear Station

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Date of examination

**U.S. Nuclear Regulatory Commission
Site-Specific
SRO Written Examination**

Applicant Information

Name:

Date: 4/18/2003

Region: II

Start Time:

Facility/Unit: Catawba

Reactor Type: W

Finish Time:

Instructions

Use the answer sheets provided to document your answers. Staple this cover sheet on top of the answer sheets. To pass the examination you must achieve a final grade of at least 80.00 percent overall, with a 70.00 percent or better on the SRO-only items if given in conjunction with the RO exam; SRO-only exams given alone require an 80.00 percent to pass. You have eight hours to complete the combined examination, and three hours if you are only taking the SRO portion.

Applicant Certification

All work done on this examination is my own. I have neither given nor received aid.

Applicant's Signature

Results

RO / SRO-Only / Total Examination Values ____ / ____ / ____ Points

Applicant's Scores ____ / ____ / ____ Points

Applicant's Grade ____ / ____ / ____ Percent

1 Pt(s)

Unit 1 is operating in mode 3 preparing for a reactor startup following a refueling outage. Given the following events and conditions:

- NC Pump 1C is running.
- Reactor trip breakers are tagged open.
- Maintenance determines that the MOV test data from the outage indicates that the torque switches for 1ND-65B (*ND TRAIN 1B HOT LEG INJ ISOL*) have been set too low.
- The SWM requests OSM approval to tag closed 1ND-65B for repairs.

Which one of the following statements correctly describes the operating restrictions and implications of tagging closed 1ND-65B?

REFERENCES PROVIDED:

- A. 1ND-65B may be tagged closed for 72 hours, if the steam generator in the running NC loop is operable.
 - B. 1ND-65B may not be tagged closed because this would make both trains of ND inoperable.
 - C. 1ND-65B may not be tagged closed, unless two NCPs are running with operable steam generators.
 - D. 1ND-65B may be tagged closed, if 1ND-65B is restored to operation prior to transitioning to mode 2.
-

1 Pt(s)

Unit 1 is shutdown, in mode 5, following a S/G tube rupture event. Maintenance is dewatering the main condenser into a portable holdup tank outside the turbine building (for disposal offsite). Upon completion of the dewatering and piping flushes, the tank contains 500 gallons. Given the following radiochemistry analysis of the tank contents:

- Total tank activity = 18 Ci with a combined half life of 6 days
- Tritium activity = 1 Ci with a half life of 12.6 years
- Noble gas activity = 5 Ci with a half life of 12 hours

Which one of the following action(s) (if any) meets plant requirements for these conditions?

REFERENCES PROVIDED:

- A. Suspend additions and allow the contents to decay for 48 hours.
 - B. Add 300 gallons of demineralized water to dilute the curie concentration below limits.
 - C. Remove 25 gallons of tank contents and the curie content will be within SLC limits.
 - D. The tank is within limits of the SLC, further additions may be allowed.
-

1 Pt(s)

E-3 (Steam Generator Tube Rupture) step 18 reads as follows:

**WHEN "P-11 PZR S/I BLOCK
PERMISSIVE" status light (ISI-18) is lit,
THEN:**

 a. Depress ECCS Steam Pressure "BLOCK" pushbuttons.

Pressurizer pressure is 1985 psig when the SRO transitions to ECA-3.1.

After the transition into ECA-3.1, which one of the following statements is correct with regard to this step?

- A. The step is applicable only while in E-3. The SRO shall not return to the step when notified that permissive status light is LIT.
 - B. The step is applicable only while in E-3. The RO shall immediately perform the actions of sub step 18a, only after reentering E-3 upon completion of ECA-3.1.
 - C. The step is applicable while in E-3 and after transition to ECA-3.1 until alternative guidance is provided. The RO shall immediately perform the actions of sub step 18a when the permissive status light is LIT and report this action to the SRO.
 - D. The step is applicable while in E-3 and after transition to ECA-3.1 until alternative guidance is provided. The RO shall notify the SRO that the permissive status light is LIT and the SRO will return to step 18a and direct the action.
-

1 Pt(s)

Unit 1 is responding to a main steam line break into containment.

Given the following events and conditions:

- The operators completed E-0 (*Reactor Trip and Safety Injection*) and transitioned to E-2 (*Faulted Steam Generator Isolation*)
- A RED PATH on Containment Integrity occurred and the operators transitioned to FR-Z.1 (*Response to High Containment Pressure*) at step 8 of E-2.
- A RED PATH on NC Integrity occurred and the operators transitioned to FR-P.1 (*Response to Imminent Pressurized Thermal Shock Condition*) from step 4 of FR-Z.1.

Following the completion of FR-P.1 and a report from the STA that all CSFs are now GREEN, what is the correct procedure transition?

- A. Return to E-2 step 1 and continue.
 - B. Return to E-2 step 8 and continue.
 - C. Return to FR-Z.1 step 4 and complete the procedure, then return to E-2 step 8.
 - D. Enter ES-0.0 (*Rediagnosis*) and rediagnose the situation.
-

1 Pt(s)

Unit 1 is responding to a faulted steam generator from 100% power. Given the following events at their respective times:

- 0200 - a reactor trip occurred, the crew entered E-0, (*Reactor Trip or Safety Injection*)
- 0210- transitioned to E-3, (*Steam Generator Tube Rupture*)
- 0215 - entered FR-Z.1, (*Response to High Containment Pressure*), on a valid orange path
- 0220- safety injection was actuated manually after a failure of auto S/I
- 0225 - completed FR-Z.1

If the SRO determined that they were responding to the event in the wrong procedure, which one of the following is the **EARLIEST** time that the SRO could have transitioned to ES-0.0, (*Rediagnosis*)?

- A. 0211
 - B. 0216
 - C. 0221
 - D. 0226
-

1 Pt(s)

Unit 2 is conducting a containment purge in accordance with OP/2/A/6450/015(*Containment Purge System*). Given the following conditions provided on the GWR permit:

- Most restrictive release rate = 16000 CFM
- Recommended release rate = 16000 CFM
- 2EMF-39(L) trip 1 setpoint = 1.0E5 CPM
- 2EMF-39(L) trip 2 = 2.0E5 CPM
- 1EMF-36(L) is in service

<u>Time</u>	<u>0200</u>	<u>0215</u>	<u>0230</u>	<u>0245</u>
Release rate (CFM)	15750	16800	15900	16500
EMF-39 (CPM)	2.2E5	1.8E5	3.2E5	3.2E5

If the operators restart the VP purge whenever allowed by procedure, what is the **EARLIEST** time that the operators are **required** to terminate the gaseous release and obtain a revised GWR?

- A. 0200
- B. 0215
- C. 0230
- D. 0245

1 Pt(s)

Unit 1 is in mode 6 and refueling operations are in progress. Given the following conditions and events:

- The Fuel Handling Manipulator Crane Operator (FHMCO) has indexed the mast over the location where fuel assembly H-8 will be inserted.
- All conditions and indications on the Fuel Handling Manipulator Crane are satisfied for inserting the fuel assembly.

Which one of the following statements describes the responsibility of the Fuel Handling SRO associated with inserting the fuel assembly?

- A. **Must give his permission to the OATC prior to inserting the assembly. Operates the Latch/Unlatch switch. Verifies the fuel handlers are documenting satisfactory completion of each rod latch.**
- B. **Must obtain permission from the OATC prior to inserting the assembly. Operates the Latch/Unlatch switch. Documents satisfactory completion of each assembly insertion.**
- C. **Supervises reactivity management and verifies maintenance technicians are continuously monitoring the load cell. Must obtain permission from the OATC prior to inserting the assembly.**
- D. **Supervises reactivity management and personally monitors the fuel insertion operation. Must give his permission to the FHMCO prior to unlatching the assembly.**
-

1 Pt(s)

Unit 1 was shutdown in mode 6. Engineering reported that a recent test on the 1B KC heat exchanger showed that fouling had reduced its heat transfer capability.

- The heat exchanger was now incapable of meeting the design Δ temperature with a maximum (FSAR) lake water temperature of 90 °F.
- The design Δ temperature could be met with lake water with a maximum temperature of 80 °F.
- Current lake temperature is 68 °F.
- Lake temperature is not expected to reach 80 °F for another 30 days.
- The plant is expected to remain in mode 6 for another 30 days.

Which of the following statements correctly characterizes the operability of the KC system?

REFERENCES PROVIDED

- A. The B train of KC is inoperable because it is unable to maintain KC system temperatures below 120°F during a plant shutdown.
 - B. The B train of KC is inoperable because it is unable to maintain normal KC temperatures below 90 °F.
 - C. The B train of KC is operable but degraded as long as Lake Wylie temperature remains below 90 °F.
 - D. The B train of KC is operable but degraded as long as Lake Wylie temperature remains below 80 °F.
-

1 Pt(s)

Unit 1 experienced a LOCA with a breach of containment at 0200. The OSM assumed the duties of the Emergency Coordinator and declared a general emergency at 0210. The initial recommended protective actions at 0225 were as follows:

- Shelter zones A2, A3, B2, C2, D2, E2, F2, F3
- Evacuate zones A0, A1, B1, C1, D1, E1, F1

At 0235, the initial dose projection information was presented to the OSM. Given the following conditions at 0245:

- Wind direction = 450°
- Wind speed = 4 MPH
- Projected dose at the site boundary
 - TEDE = 250 mrem
 - CDE thyroid = 400 mrem
- Containment radiation levels
 - 1EMF53A = 950 R/hr
 - 1EMF53B = 955 R/hr

Which one of the following protective action recommendations are correct in accordance with RP/0/A/5000/05?

REFERENCES PROVIDED:

- A. Change the protective action recommendation in zones A1 and B1 from evacuate to shelter.
 - B. Extend the evacuation to zones A2, A3, B2, C2
 - C. Extend the evacuation to zones D2, E2, F2
 - D. The initial set of protective action recommendations remain in effect with no changes required.
-

1 Pt(s)

A LOCA occurred on Unit 1 at 2:00 AM. Given the following events and conditions:

- 0201 A containment air release was in progress and was immediately terminated.
- 0205 The control room operators are responding to the events in E-1.
- 0210 The OSM has assumed the role of the Emergency Coordinator.
- 0215 A Site Area Emergency is declared
- 0230 Completed initial notification of the State and Local authorities for declaration of a site area emergency
- 0240 The OSM notes the following plant conditions and determines the appropriate classification for the following indications:
 - Containment pressure indicates 18 psig
 - Containment Hydrogen concentration is 1.5%
 - Containment valve VQ-2B failed to isolate on phase A signal.
 - Core exit T/Cs indicate temperatures of 1300°F
 - RVLIS lower range level indicates 90%
 - IEMF-53A/B indicate 85 R/hr
 - The Operators enter FR-C.1 (*Response to Loss of Core Cooling*)

If the OSM determines the appropriate classification when the conditions are first indicated, which one of the following statements correctly describes the first notification that is required?

REFERENCES PROVIDED:

- A. Notify the State and Local authorities that the plant has declared a general emergency no later than 0255.
 - B. Notify the NRC Headquarters Operations Center of plant conditions no later than 0300.
 - C. Notify the State and Local authorities that the plant has declared a general emergency no later than 0310.
 - D. Provide the first follow-up notification for a site area emergency to the State and Local authorities no later than 0315.
-

1 Pt(s)

Unit 2 is conducting a plant shutdown from 100% power. Given the following events and conditions:

- Reactor power is 6%
- All manual actions have been taken as required in the procedures
- Intermediate Range channel N-36 fails HIGH.

Which one of the following statements correctly describes how this failure affects the reactor shutdown and subsequent operation of the Nuclear Instrumentation System?

- A. **The reactor will trip; the source range detectors will reenergize when N-35 decreases to the proper setpoint.**
 - B. **The reactor will trip; the source range detectors will have to be manually reenergized.**
 - C. **The reactor will not trip; the source ranges will reenergize when N-35 decreases to the proper setpoint.**
 - D. **The reactor will not trip; the source ranges will have to be manually reenergized.**
-

1 Pt(s)

Unit 1 recently shut down. Given the following events and conditions:

- NCS temperature is 230°F.
- Both trains of ND are operable with A train in service
- KC loops A and B are operating.
- CAPT is tagged for maintenance.
- CA pump 1B and CA pump 1A are isolated for differential pressure testing.
- Engineering has reported that a test on the 1B KC heat exchanger showed that fouling had reduced its heat transfer capability below the minimum design value.
- The plant is expected to remain in mode 4 for another 7 days for special testing.

Which one of the following is the FIRST required action that must be taken?

REFERENCES PROVIDED:

- A. Return at least one motor driven CA pump to operable status or be in mode 5 within 24 hours.
 - B. Return at least one motor driven CA pump to operable status or be in mode 5 within 72 hours.
 - C. Clean the 1B KC heat exchanger within 72 hours or be in mode 5 within the next 36 hours.
 - D. Clean the 1B KC heat exchanger within 72 hours or be in mode 5 within the next 42 hours.
-

1 Pt(s)

Unit 1 is conducting a containment air release at 85% power. Given the following events and conditions:

- The last containment atmosphere sample at 0600 was consistent with the current gaseous waste release (GWR) permit.
- The latest air release was started at 1400.
- The release flow indicator on 1MC-5 reads 200 CFM.
- 1EMF-36 (*Unit Vent Gas Monitor*) is at the trip 1 setpoint.
- The VQ flow totalizer is out of service.

Which of the following conditions reported at 1700 requires isolation of the air release until a new GWR permit is approved?

- A. **The VQ air release flow indicator on 1MC-5 fails high.**
 - B. **1EMF-39 (*Containment Gas Monitor*) increases to Trip 2 alarm due to a power supply fluctuation.**
 - C. **The 1800 containment atmosphere sample must be delayed for 4 hours due to sample valve repairs.**
 - D. **1EMF-37 (*Unit Vent Iodine Monitor*) increases to Trip 2 alarm due to a fuel pin failure.**
-

1 Pt(s)

Unit 1 is operating at 65% power. Given the following events and conditions:

- Annunciator 1AD-2, B/9 (*Control Rod Bank Lo-Lo Limit*) failed to illuminate during annunciator testing.
- IAE has reported that a failed annunciator card must be replaced but the part will not be available until next week.

Which one of the following actions is required in response to this failed alarm?

- A. The shift work manager must direct reactor engineering to initiate a temporary modification to change the *Control Rod Bank Lo Limit* (1AD-2, A/9) annunciator setpoint to the *Control Rod Bank Lo-Lo* rod insertion limit.**
 - B. The unit supervisor must initiate a control panel information tag for the 1AD-2, B/9.**
 - C. The operations shift manager shall ensure that alternate indications are monitored to duplicate the function of the failed annunciator.**
 - D. The reactor operator must enter the requirement to verify RIL limits manually during transients in the shift turnover log.**
-

1 Pt(s)

Unit 1 was operating at 100% power when the pressurizer spray line developed a leak. Which one of the following conditions would cause the safety injection system to be inoperable during this accident?

- A. 1NI-118A (*NI Pump 1A C-Leg INJ ISOL*) and 1NI-150B (*NI Pump 1A C-Leg INJ ISOL*) are open with power applied
 - B. 1NI-162A (*NI to C-Legs INJ HDR ISOL*) is closed with power applied
 - C. 1NI-121A (*NI Pump 1A To H-Legs B&C*) and 1NI-152B (*NI Pump 1B To H-Legs A&D*) are closed with power removed
 - D. 1NI-100B (*NI PMPS SUCT FROM FWST*) is open with power removed
-

1 Pt(s)

Unit 1 was operating at 100% power when the following containment floor and equipment sump indications were noted:

<u>Time</u>	<u>Sump A level indication</u>	<u>Sump B level indication</u>
0200	4.1	5.9
0215	4.2	6.0
0230	4.3	6.1
0245	4.4	6.2
0300	6.5	6.9

A chemistry sample from the sumps shows the presence of boric acid in the water.

If the OAC is unavailable, which one of the following statements correctly describes the required actions by Tech Specs?

REFERENCES PROVIDED:

- A. Shutdown to mode 3 required no later than 0815
 - B. Shutdown to mode 3 required no later than 0900
 - C. Shutdown to mode 3 required no later than 1300
 - D. Operations may continue indefinitely.
-

1 Pt(s)

Unit 1 is operating at 100% power. Given the following events and conditions:

- CF REG valves drift close
- Reactor trip occurs on S/G Lo-Lo level
- ES-0.1 (*Reactor Trip Response*) has been entered
- Total CA flow indicates 460 gpm
- Steam dumps do not operate
- S/G PORVs do not open in "AUTO"
- S/G pressure in all S/Gs is 1150 psig
- All S/G NR levels are 15%
- NC system pressure 2345 increasing
- NC PORVs do not operate

Which one of the following procedures should be implemented?

REFERENCES PROVIDED:

- A. FR-H.1 (*Loss Of Secondary Heat Sink*)
 - B. FR-H.4 (*Response To Loss Of Normal Steam Release Capabilities*)
 - C. AP-22 (*Loss of Instrument Air*)
 - D. AP-29 (*Loss of Vital or Aux Control Power*)
-

1 Pt(s)

Unit 1 was operating at 100% power, all rods out at 226 steps. Given the following events and conditions:

- A runback occurs
- Reactor power is lowered to 60%
- Rod D-4 is stuck out at 226 steps

Which one of the following statements correctly describes the indications for this stuck rod?

REFERENCES PROVIDED:

- A. Core exit T/C T-3 is lower than T-61
N-43 is lower than N-44
 - B. Core exit T/C T-3 is higher than T-61
N-43 is lower than N-44
 - C. Core exit T/C is T-3 lower than T-61
N-43 is higher than N-44
 - D. Core exit T/C T-3 is higher than T-61
N-43 is higher than N-44
-

1 Pt(s)

Fire suppression valve position is currently verified semiannually. The required review of fire suppression valve position reveals that the valves were in the correct position 98.5% of the time.

Which one of the following actions should be taken concerning the frequency of performing the valve position check?

REFERENCES PROVIDED:

- A. The check could be decreased to an annual frequency.
 - B. The check should continue on a semiannual frequency.
 - C. The check should be increased to a quarterly frequency.
 - D. The check should be increased to a monthly frequency.
-

1 Pt(s)

Unit 2 was shutdown in accordance with OP/2/A/6100/002 (*Controlling Procedure for Unit Shutdown*) is in progress. Given the following events and conditions:

- I&E was testing the safety injection actuation relay for the 2B NI pump.
- A human error by a technician caused the NI pump to start
- The 2B NI pump injected into the NC system

Which one of the following is the correct requirement for notifying the NRC?

REFERENCES PROVIDED:

- A. 1 hour notification in accordance with 10CFR50.72
 - B. 4 hour notification in accordance with 10CFR50.72
 - C. 8 hour notification in accordance with 10CFR50.72
 - D. 60 day notification in accordance with 10CFR50.73
-

1 Pt(s)

Unit 1 is operating at 50% power. Given the following events and conditions:

- Diesel air compressor is out of service for maintenance
- VI compressors D, E, and F are running
- VI and VS pressure were decreasing slowly due to an air leak
- VI and VS air pressures are equalized at 74 psig

If all air system components operate as designed (no component failures other than the air leak), which one of the following statements correctly describes the location of the air leak and the required action to isolate the VI system?

REFERENCES PROVIDED:

- A. An air leak exists between 1VS-78 and the VS air receivers. 1VS-78 must be closed to isolate the VS leak from the VI system.
 - B. An air leak exists between 1VS-78 and 1VI-500 in the VS oil removal filters. 1VS-78 must be closed to isolate the VS leak from the VI system.
 - C. An air leak exists downstream of a VI system purge exhaust muffler. The VI exhaust muffler must be manually isolated.
 - D. An air leak exists between 1VI-12 and the 1A VI air receiver. The 1VI-12 must be closed to isolate the VI leak.
-

1 Pt(s)

Unit 2 is responding to a LOCA and trip from full power.

Given the following conditions:

- A safety injection has occurred
- Train "B" Sp signal failed to actuate (automatically and manually)
- The 2A NS pump started automatically
- The 2B NS pump was started manually by an operator
- The Ss signal and sequencer have been reset
- The Train "A" Sp signal has not been reset
- Both pumps were stopped for shifting suctions to the containment sump
- Containment pressure is 2.5 psig

Following the completion of the swapover, which one of the statements correctly describes the operation of the NS pumps?

- A. **The operator will need to manually restart the 2A and 2B NS pumps.**
 - B. **The operator will need to manually restart the 2B NS pump only.**
 - C. **No action required because containment pressure is less than 3 psig.**
 - D. **No action required because both NS pumps should automatically restart.**
-

1 Pt(s)

Unit 1 was operating at 100% power when a LOCA occurred. Given the following events and conditions:

- The Crew has entered E-0 (*Reactor Trip or Safety Injection*)
- Containment pressure reached 5 psig
- The inadequate core cooling monitor indicates -10 °F subcooling
- All NI and NV pumps have malfunctioned and will not start.

What action (if any) should the crew take regarding the NCPs?

- A. **Secure all the NCPs.**
 - B. **Secure 3 NCPs and leave 1 running.**
 - C. **No action, the NCPs must continue to run.**
 - D. **Monitor trip parameters and secure the NCPs if trip parameters are reached.**
-

1 Pt(s)

A Unit 1 startup is in progress in accordance with OP/1/A6100/001 (*Controlling Procedure for Unit Startup*). Given the following events and conditions:

- Auxiliary steam from Unit 2 was being used for turbine warming.
- NC system pressure is 2235 psig
- Steam dumps are controlling NC Tave at 557 F

The crew is preparing to restore AS to a normal alignment by closing 1AS-4, (*Main Steam to AS HDR CTRL Bypass*).

Who should be notified prior to the operator closing 1AS-4?

- A. **Plant personnel should be notified to remain clear while closing the valve.**
 - B. **The NLO in the field should be notified to monitor the closing of the valve.**
 - C. **The CRSRO should be notified to expect an increase in unit 2 generator megawatts.**
 - D. **The unit 2 CRO should be notified that reactor power may decrease slightly.**
-

1 Pt(s)

Unit 1 is operating at 100% power with a 1gpm condenser tube leak present. Given the following plant conditions and events:

- 8:00 AM Chemistry reports that secondary chlorides have increased to action level 3.
- 8:15 AM Power reduction in accordance with OP/1/A/6100/003 (*Controlling Procedure For Unit Operation*) initiated.
- 8:45 AM Chemistry reports that chloride sample analysis was verified correct.
- 2:00 PM power has been reduced to 35%.

Which one of the following actions must be performed at 2:00 PM?

REFERENCES PROVIDED:

- A. **Initiate a rapid power reduction in accordance with AP-9 (*Rapid Downpower*).**
 - B. **Continue power reduction in accordance with OP/1/A/6100/003 (*Controlling Procedure For Unit Operation*).**
 - C. **Enter OP/1/A/6100/002 (*Controlling Procedure For Unit Shutdown*).**
 - D. **Trip the reactor and enter E-0 (*Reactor Trip or Safety Injection*).**
-