July 24, 2006

Dr. John S. Bennion
Reactor Manager/Supervisor
Idaho State University
College of Engineering
Campus Box 8060
Pocatello, ID 83209

SUBJECT: INITIAL EXAMINATION REPORT NO. 50-284/OL-06-01, IDAHO STATE UNIVERSITY

Dear Dr. Bennion:

During the week of June 12, 2006, the NRC administered an operator licensing examination at your Idaho State University Reactor. The examination was conducted according to NUREG-1478, "Non-Power Reactor Operator Licensing Examiner Standards," Revision 1. Examination questions and preliminary findings were discussed with those members of your staff identified in the enclosed report at the conclusion of the examination.

In accordance with 10 CFR 2.390 of the Commission's regulations, a copy of this letter and the enclosures will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) http://www.nrc.gov/reading-rm/adams.html. The NRC is forwarding the individual grades to you in a separate letter which will not be released publicly. Should you have any questions concerning this examination, please contact Mr. Kevin Witt at (301) 415-4075 or via internet e-mail kmw@nrc.gov.

Sincerely,

/RA/

Johnny Eads, Chief
Research and Test Reactors Branch B
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-284

Enclosures:
1. Initial Examination Report No. 50-284/OL-06-01
2. Facility comments with NRC resolution
3. Examination and answer key

cc w/encls:
Please see next page

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DHughes Facility File (EBarnhill) O-6 F-2

ADAMS ACCESSION #: ML061940358 **TEMPLATE #:NRR-074**

OFFICE	PRTB:CE	IOLB:LA	PRTB:SC
NAME	KWitt:tls*	EBarnhill*	JEads:tls*
DATE	7/20/2006	7/20/2006	7/24/2006

OFFICIAL RECORD COPY

cc:

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Reactor Administrator
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Idaho State University
ATTN: Dr. Richard R. Brey
Radiation Safety Officer
Physics Department
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Radiation Control Program Director
Division of Environment
450 West State, 3rd Floor
Boise, ID 83720

Test, Research and Training
Reactor Newsletter
202 Nuclear Sciences Center
University of Florida
Gainesville, FL 32611

U. S. NUCLEAR REGULATORY COMMISSION
OPERATOR LICENSING INITIAL EXAMINATION REPORT

REPORT NO.: 50-284/OL-04-01

FACILITY DOCKET NO.: 50-284

FACILITY LICENSE NO.: R-110

FACILITY: Idaho State University

EXAMINATION DATES: June 12-13, 2006

SUBMITTED BY: __________/RA/_____________________ 7/20/2006
Kevin Witt, Chief Examiner Date

SUMMARY:
During the week of June 12, 2006, the NRC administered operator licensing examinations to one Reactor Operator license candidate and one Senior Reactor Operator Instant license candidate. Both candidates passed their respective examinations.

REPORT DETAILS

1. Examiners:
   Kevin Witt, Chief Examiner

2. Results:

	RO PASS/FAIL	SRO PASS/FAIL	TOTAL PASS/FAIL
Written	1/0	1/0	2/0
Operating Tests	1/0	1/0	2/0
Overall	1/0	1/0	2/0

3. Exit Meeting:
   Kevin Witt, NRC, Examiner
   John S. Bennion, Reactor Manager/Supervisor, ISU

   The NRC thanked the facility staff for their cooperation during the administration of the examinations. The NRC did not note any generic weaknesses on the part of the candidates.

ENCLOSURE 1

Facility Comments with NRC Resolution

Question B.7

Facilty Comment
We suggest answers (b) and (c) both be acceptable because although the AGN-201 Technical Specifications require annual calibration of radiation detectors, ISU has a policy that requires all radiation monitoring equipment to be calibrated at 6-month intervals. Since the question did not specify whether the frequency of calibration was that required by the Technical Specifications, or that required by the ISU radiation safety program, we feel that both answers should be accepted as correct.

NRC Resolution
Agree with comment. The answer key has been modified to accept either “B” or “C” as correct.

Question C.3

Facilty Comment
We suggest that this question be removed for the following reasons: (1) the question is vague in that it does not specify which type of low level interlock, (2) the interlock system has two low level [components]/sensors (low tank temperature and low shield tank water level), (3) the nuclear instrumentation channels are not part of the interlock system, and (4) all three nuclear instrumentation channels have low-level scrams. The question asks for the "Low Level Interlock is controlled by power level indication from..." which is is not accurate and rather vague, since the interlock system is not connected to the nuclear instrumentation channels, and which could lead the examinees to eliminate those answers and choose option (d) Auxiliary Channel as a more accurate answer, since that option could be interpreted as either a low-level temperature or low-level water signal, and hence could be interpreted as an auxiliary channel. For these reasons, we request that the question be eliminated.

NRC Resolution
Comment accepted. This question has been deleted from the examination and will not factor into the candidates’ grades. This question will be modified before it is used again.

Facility General Comment
I wish thank you for the opportunity to comment on the written examination. We appreciate the time and effort spent in preparing and administering the examination, and in conducting the facility inspection. Please contact me if you have any questions or require additional information.

ENCLOSURE 2

OPERATOR LICENSING EXAMINATION
With Answer Key

UNITED STATES NUCLEAR REGULATORY COMMISSION

IDAHO STATE UNIVERSITY
June 12, 2006

ENCLOSURE 3

QUESTION: A.1 [1.0 point]

What is the definition of a cross section?

a. The probability that a neutron will be captured by the nucleus.

b. The most likely energy at which a charged particle will be captured.

c. The length a charged particle travels past the nucleus before being captured.

d. The area of the nucleus including the electron cloud.

QUESTION: A.2 [1.0 point]

Inelastic scattering is the process whereby a neutron collides with a nucleus and:

a. recoils with the same kinetic energy it had prior to the collision.

b. recoils with a lower kinetic energy, with the nucleus emitting a gamma ray.

c. is absorbed by the nucleus, with the nucleus emitting a gamma ray.

d. recoils with a higher kinetic energy, with the nucleus emitting a gamma ray.

QUESTION: A.3 [1.0 point]

Which ONE of the following neutrons would result in the highest probability of fission for ^{235}U?

a. Thermal neutron (0.025 eV)

b. Epi-Thermal neutron (1 eV)

c. Prompt neutron (0.7 MeV)

d. Fast neutron (2 MeV)

QUESTION: A.4 [1.0 point]

Which ONE of the following factors is affected MOST by an increase in fission product poisoning?

a. Resonance Escape Probability

b. Fast Fission Factor

c. Thermal Utilization Factor

d. Reproduction Factor

(*** Category A continued on next page *****)**

QUESTION: A.5 [1.0 point]

A step insertion of positive reactivity to a critical reactor causes a rapid increase in the neutron population known as a **prompt jump**. Which ONE of the following explains the cause of this occurrence?

a. rapid positive reactivity insertion due to the fuel temperature coefficient (Doppler) feedback

b. shift in the prompt neutron lifetime on up-power maneuvers

c. magnitude of the reactivity insertion exceeding the value of the average effective delayed neutron fraction

d. immediate increase in the prompt neutron population

QUESTION: A.6 [1.0 point]

Which of the following power manipulations would take the longest to complete assuming the same period is maintained?

a. 100 mW to 400 mW

b. 400 mW to 500 mW

c. 1 W to 3.5 W

d. 3.5 W to 4.5 W

QUESTION: A.7 [1.0 point]

A critical reactor is operating at a steady-state power level of 1.00 W. Reactor power is increased to a new steady-state power level of 1.05 W. Neglecting any temperature effects, what reactivity insertion is required to accomplish this?

a. 0.05 delta k/k.

b. 5.0% delta k/k.

c. 1.05% delta k/k.

d. Indeterminate, since any amount of positive reactivity could be used.

(*** Category A continued on next page *****)**

QUESTION: A.8 [1.0 point]

Which ONE of the following factors in the six-factor formula can be varied by the reactor operator?

a. Fast fission factor.

b. Reproduction factor.

c. Fast non-leakage factor.

d. Thermal utilization factor.

QUESTION: A.9 [1.0 point]

The AGN-201 is designed to produce a fission rate within the thermal fuse that is approximately twice the average of the core. Which ONE of the following describes how this higher reaction rate is accomplished?

a. The polystyrene media used in the thermal fuse is a better moderator, raising the thermal flux in the fuse area.

b. The non-uniform fuel loading in the upper fuel disc increases the thermal flux in fuse area.

c. The fuel enrichment used in the thermal fuse is twice that of the balance of the core resulting in a higher fission rate in the fuse area.

d. The fuel density used in the thermal fuse is twice that of the balance of the core resulting in a higher fission rate in the fuse area.

QUESTION: A.10 [1.0 point]

At the beginning of a reactor startup, Keff is 0.90 with a count rate of 30 CPS. Power is increased to a new, steady value of 60 CPS. The new Keff is:

a. 0.91

b. 0.925

c. 0.95

d. 0.975

(*** Category A continued on next page *****)**

QUESTION: A.11 [1.0 point]

What is the normal AGN-201 neutron startup source for a startup when the reactor has only been shut down for a few hours?

a. Gamma produced from Po results in a neutron from Li-10

b. Spontaneous fission from U-238

c. Beta produced from fuel results in a neutron from C-12

d. Alpha produced from Ra results in a neutron from Be-9

QUESTION: A.12 [1.0 point]

Which ONE of the following statements describes the difference between Differential (DRW) and Integral (IRW) rod worth curves?

a. DRW relates the worth of the rod per increment of movement to rod position. IRW relates the total reactivity added by the rod to the rod position.

b. DRW relates the time rate of reactivity change to rod position. IRW relates the total reactivity in the core to the time rate of reactivity change.

c. IRW relates the worth of the rod per increment of movement to rod position. DRW relates the total reactivity added by the rod to the rod position.

d. IRW is the slope of the DRW at a given rod position

QUESTION: A.13 [1.0 point]

The reactor is initially subcritical with a K_{eff} of 0.94. Two (2) safety rods worth a total of 2.4% delta k/k are inserted into the core. Which ONE of the following is the new K_{eff}?

a. 0.950

b. 0.954

c. 0.962

d. 0.971

(*** Category A continued on next page *****)**

QUESTION: A.14 [1.0 point]

A reactor is operating at criticality. Instantaneously, all of the delayed neutrons are suddenly removed from the reactor. The K_{eff} of the reactor in this state would be approximately:

a. 1.007

b. 0.993

c. 0.000

d. 1.000

QUESTION: A.15 [1.0 point]

Of the approximately 200 Mev of energy released per fission event, the largest amount appears in the form of:

a. Beta and gamma radiation

b. Prompt and delayed neutrons

c. Kinetic energy of the fission fragments

d. Alpha radiation

QUESTION: A.16 [1.0 point]

Which ONE of the following is the direct source of delayed neutrons in the fission process?

a. Decay of the fission product daughters

b. Spontaneous fissioning of the fission products

c. Absorption by ^{238}U

d. Fissioning of ^{235}U

QUESTION: A.17 [1.0 point]
During a fuel loading of the AGN-201 core, as the reactor approaches criticality, the value of 1/M:

a. Increases toward one

b. Decreases toward one

c. Increases toward infinity

d. Decreases toward zero

(*** Category A continued on next page *****)**

QUESTION: A.18 [1.0 point]

Which condition below describes a critical reactor?

a. K = 1; ΔK/K = 1

b. K = 1; ΔK/K = 0

c. K = 0; ΔK/K = 1

d. K = 0; ΔK/K = 0

QUESTION: A.19 [1.0 point]

A reactor with a negative fuel temperature reactivity coefficient is critical at full power. A control rod is removed and the power decreases to a lower steady-state value. The reactivity of the reactor at the lower power level is zero because:

a. the positive reactivity due to the fuel temperature decrease balances the negative reactivity due to the control rod removal.

b. the negative reactivity due to the fuel temperature decrease balances the negative reactivity due to the control rod removal.

c. the positive reactivity due to the fuel temperature increase balances the negative reactivity due to the control rod removal.

d. the negative reactivity due to the fuel temperature increase balances the negative reactivity due to the control rod removal.

QUESTION: A.20 [1.0 point]

What effect does Doppler Broadening for U-238 have on neutrons in a critical core?

a. More fissioning

b. More absorption

c. More scattering

d. More leakage

(*** End of Category A *****)**

QUESTION: B.1 [1.0 point]

A radiation survey of an area reveals a general radiation reading of 1 mRem/hr. However, a small section of pipe (point source) reads 10 mRem/hr at one (1) meter. Which ONE of the following is the posting requirement for the area, in accordance with 10 CFR Part 20?

a. “CAUTION - RADIATION AREA”

b. “CAUTION - HIGH RADIATION AREA”

c. “CAUTION - RADIOACTIVE MATERIAL”

d. “CAUTION - AIRBORNE RADIOACTIVITY AREA”

QUESTION: B.2 [1.0 point]

As a licensed reactor operator at the AGN-201 facility, who is allowed to operate the controls of the reactor under your direction?

a. A local college newspaper reporter who wants to write a story on the safety of nuclear reactors.

b. A new student participating in a nuclear engineering laboratory course.

c. A health physicist who is trying to gain a certified health physicist (CHP) license.

d. An NRC inspector trying to make sure that all set points of the reactor are the same as those in the technical specifications.

QUESTION: B.3 [1.0 point]

“A channel test of Nuclear Safety Channels #1, #2 and #3 shall be performed prior to the first reactor startup of the day or prior to each reactor operation extending more than one day.” This is an example of a(n):

a. safety limit.

b. limiting condition for operation.

c. limiting safety system setting.

d. surveillance requirement.

(*** Category B continued on next page *****)**

QUESTION: B.4 [1.0 point]

A survey instrument with a window probe is used to measure the beta-gamma dose rate from an irradiated experiment. The dose rate is 100 mR/hr with the window open and 60 mR/hr with the window closed. The gamma dose rate is:

a. 100 mR/hr.

b. 60 mR/hr.

c. 40 mR/hr.

d. 160 mR/hr.

QUESTION: B.5 [1.0 point]

The reactor is operating at steady-state power. Under this circumstance:

a. At least two persons must be present in the laboratory. One NRC-licensed operator must be present at the reactor console.

b. Two NRC-licensed operators must be present in the laboratory. One of the operators must be present at the reactor console.

c. One NRC-licensed operator and a Reactor Supervisor must be present at the reactor console.

d. Only one NRC-licensed operator must be present at the reactor console.

QUESTION: B.6 [1.0 point]

Which ONE of the following is the basis for the maximum core temperature safety limit?

a. Prevent separation of the core.

b. Prevent melting of the polyethylene core material.

c. Prevent operating personnel from being exposed to high temperature.

d. Prevent spontaneous ignition of the graphite reflector.

(*** Category B continued on next page *****)**

QUESTION: B.7 [1.0 point]

During the pre-startup area survey, the procedures specify that the radiation detector calibration due date shall be checked to ensure that it has not expired. Which one of the following specifies the frequency of calibration for the radiation monitoring instrumentation?

a. 1 month.

b. 6 months.

c. 1 year.

d. 2 years.

QUESTION: B.8 [1.0 point]

Which ONE of the following defines a CHANNEL CHECK?

a. Connection of output devices for the purpose of measuring the response to a process variable.

b. Adjustment such that the output responds within standards of accuracy and range to known inputs.

c. Introduction of a signal into a channel to verify it is operable.

d. A qualitative verification of acceptable performance by observation of channel behavior.

QUESTION: B.9 [1.0 point]

In the event of any emergency, if the radiation level outside of the operations area exceeds _______ mR/hr, the operator shall order an evacuation.

a. 10.

b. 50.

c. 75.

d. 100.

(*** Category B continued on next page *****)**

QUESTION: B.10 [1.0 point]

Which ONE of the following precautions must be taken to reduce the likelihood of damage to reactor components and/or radioactivity releases during an experimental failure?

a. Any experiment containing gaseous or liquid fissionable material can only be inserted into a subcritical reactor.

b. Any experiment containing corrosive materials shall be doubly encapsulated.

c. Any experiment containing explosive materials shall be doubly encapsulated.

d. The mass of any corrosive material in an experiment shall be less than two (2) grams.

QUESTION: B.11 [1.0 point]

In accordance with Emergency procedures, in the event of a fire, which ONE of the following actions should the reactor operator perform immediately after scramming the reactor?

a. Notify the Pocatello Police Department.

b. Attempt to extinguish the fire.

c. Initiate a building evacuation.

d. Notify the Reactor Supervisor.

QUESTION: B.12 [1.0 point]

What type of radiation detector is used for surveying contaminated areas?

a. Ionization chamber

b. Proportional counter

c. Geiger-Mueller tube

d. Scintillation detector

QUESTION: B.13 [1.0 point]
The total scram withdrawal time of the coarse control rod and the safety rods must be less than:

a. 200 milliseconds.

b. 500 milliseconds.

c. 800 milliseconds.

d. 1000 milliseconds.

(*** Category B continued on next page *****)**

QUESTION: B.14 [1.0 point]

Which ONE of the following items will ALLOW a reactor operator to continue to operate the reactor? (Assume today is the three year anniversary of receiving your RO license)

a. Last physical examination was 3 years ago.

b. Written exam administered by Reactor Supervisor was 10 months ago.

c. 2 hours on the console last quarter performing the functions of a licensed operator.

d. Performing one startup over the past year.

QUESTION: B.15 [1.0 point]

Which ONE of the following federal regulations establish procedures and criteria for the issuance of licenses to operators and senior operators?

a. 10 CFR 20

b. 10 CFR 50

c. 10 CFR 55

d. 10 CFR 73

(*** End of Category B *****)**

QUESTION: C.1 [1.0 point]

Which ONE control rod listed below will NOT instantaneously eject from the core in the event of a SCRAM?

a. Coarse.

b. Fine.

c. Safety 1.

d. Safety 2.

QUESTION: C.2 [1.0 point]

Which ONE of the following IS the location of a fixed radiation area monitor?

a. Control console.

b. Radiation Counting Laboratory.

c. Above the reactor tank.

d. Observation Classroom.

QUESTION: C.3 [1.0 point]

The Low Level Interlock is controlled by power level indication from:

a. Channel 1.

b. Channel 2.

c. Channel 3.

d. Auxiliary Channel.

QUESTION: C.4 [1.0 point]

Which ONE of the following conditions will prevent the operator from inserting the control rods into the core?

a. Shielding water less than 1 inch from the manhole opening.

b. Earthquake of negligible horizontal amplitude.

c. Water temperature of 20°C.

d. Channel #1 reset button depressed.

(*** Category C continued on next page *****)**

QUESTION: C.5 [1.0 point]

Which ONE of the following identifies the type of detector used in the Channel 2 Neutron Monitoring system?

a. GM tube.

b. Fission chamber.

c. Ionization chamber.

d. Scintillation detector

QUESTION: C.6 [1.0 point]

The U-235 fuel in the AGN is contained in fuel disks and control rods. Of the total fuel in the reactor, approximately how much is contained in the control rods?

a. 9%.

b. 24%.

c. 55%

d. 78%.

QUESTION: C.7 [1.0 point]

What material is typically placed in the glory hole to ensure the reactor stays in a sub-critical mode when no one is present?

a. Cadmium.

b. Boron.

c. Polyethylene.

d. Beryllium.

(*** Category C continued on next page *****)**

QUESTION: C.8 [1.0 point]

Which ONE of the following describes the design purpose of the space in the top section of the core tank above the reactor core and the reflector?

a. Ensures free fall of the bottom half of the core during the most severe transient.

b. Increases the fast neutron population in the vicinity of experiments placed in the access ports.

c. Allows for accumulation of fission product gases created during reactor operation.

d. Prevents core damage during the design basis earthquake and 6 cm. displacements.

QUESTION: C.9 [1.0 point]

The detector used for the shield tank water level signal is a:

a. manometer.

b. float switch.

c. pressure switch.

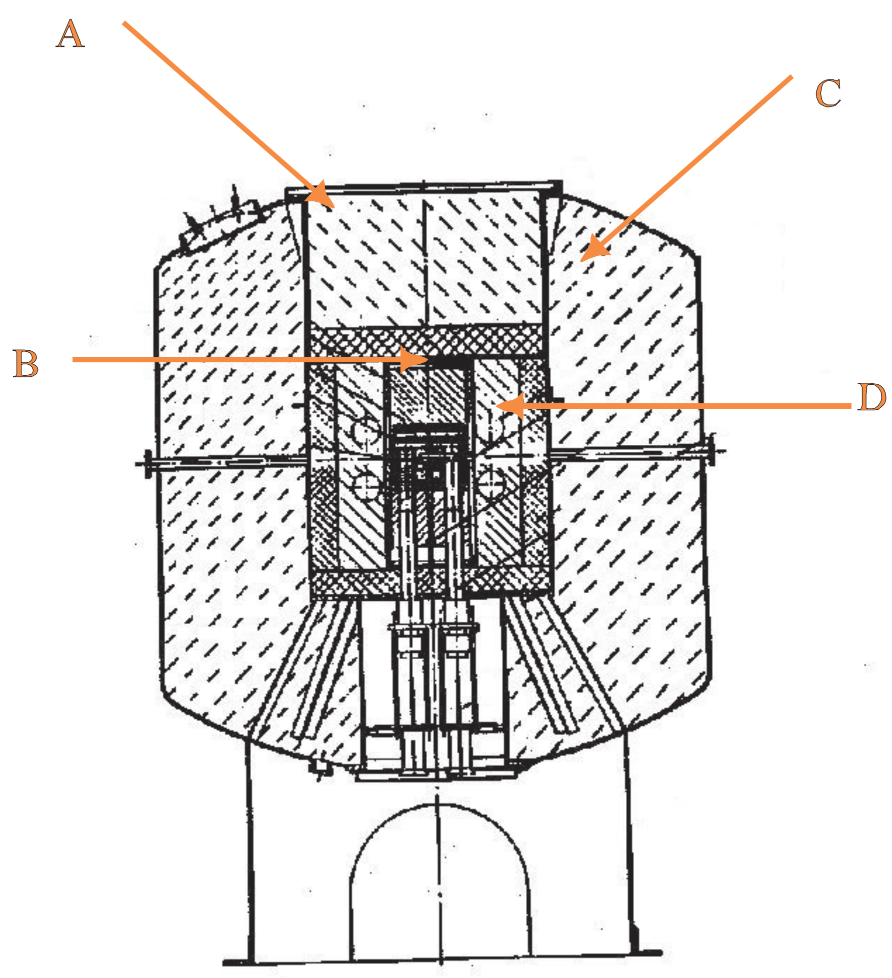
d. differential pressure switch.

(*** Category C continued on next page *****)**

QUESTION: C.10 [½ point each 2.0 points total]

In the following diagram, match the appropriate materials with the locations they belong in:

a.	_____	1.	Graphite
b.	_____	2.	Lead
c.	_____	3.	Water
d.	_____	4.	Polyethylene



(***** Category C continued on next page *****)

QUESTION: C.11 [1.0 point]

What is one of the purposes for the neutron count interlock?

a. To prevent the reactor from being manipulated to a critical position before channel 1 is verified to be operable.

b. To provide a reference point where all instruments undergo a check before the reactor is brought to a critical position.

c. To allow for all experiments to be installed before the reactor is critical.

d. To ensure that the reactor is not started up without a neutron source.

QUESTION: C.12 [1.0 point]

Which one of the following describes the mechanism that allows the Channel No. 1 neutron monitoring system to be operable over the entire range of power?

a. Campbell circuit.

b. Automatic voltage reduction.

c. Natural buoyancy of plastic tube.

d. Rotation of neutron absorbing material.

QUESTION: C.13 [1.0 point]

Which ONE of the following does NOT automatically cause a reactor scram?

a. Reactor period.

b. Radiation level.

c. Water level.

d. Power failure.

(*** Category C continued on next page *****)**

QUESTION: C.14 [1.0 point]

An aluminum baffle plate separates the fuel disks in the upper section of the core from the fuel disks in the lower section of the core. Of the total of ______ fuel disks, ______ are in the upper section and _____ are in the lower section.

a. 7; 4; 3

b. 7; 3; 4

c. 9; 6; 3

d. 9; 5; 4

QUESTION: C.15 [1.0 point]

Which ONE of the following is designed to contain fission product gases that might leak from the core?

a. Aluminum Core Tank.

b. Lead shielding.

c. Water shield.

d. Steel Reactor Tank.

(*** End of Category C *****)**

Section A: ℞ Theory, Thermodynamics & Facility Operating Characteristics
ANSWERS

ANSWER: A.1 (1.00)
A.
REFERENCE:
Lamarsh, Introduction to Nuclear Engineering, 3rd Edition, page 55

ANSWER: A.2 (1.00)
B.
REFERENCE:
Lamarsh, Introduction to Nuclear Engineering, 3rd Edition, page 64.

ANSWER: A.3 (1.00)
A.
REFERENCE:
Lamarsh, Introduction to Nuclear Engineering, 3rd Edition, page 78.

ANSWER: A.4 (1.00)
C.
REFERENCE:
Lamarsh, Introduction to Nuclear Engineering, 3rd Edition, page 312.

ANSWER: A.5 (1.00)
D.
REFERENCE:
Lamarsh, Introduction to Nuclear Engineering, 3rd Edition, page 340.

$$P = P_0 e^{t/\tau}$$

ANSWER: A.6 (1.00)
A.
REFERENCE:
Lamarsh, Introduction to Nuclear Engineering, 3rd Edition, page 346.

ANSWER: A.7 (1.00)
D.
REFERENCE:
Lamarsh, Introduction to Nuclear Engineering, 3rd Edition, page 329.

ANSWER: A.8 (1.00)
D.
REFERENCE:
Lamarsh, Introduction to Nuclear Engineering, 3rd Edition, page 312.

ANSWER: A.9 (1.00)
D.
REFERENCE:
Safety Analysis Report, dated November 23, 1995, pg. 104.

ANSWER: A.10 (1.00)
C.
REFERENCE:
Lamarsh, Introduction To Nuclear Engineering, 3rd Edition.
$(CR_2/CR_1) = (1-K_{eff0})/(1-K_{eff1})$ $(60/30) = (0.90)(1-K_{eff1})$ Keff1 = 0.95

ANSWER: A.11 (1.00)
D.
REFERENCE:
Safety Analysis Report, dated November 23, 1995, pg. 48.

ANSWER: A.12 (1.00)
A.
REFERENCE:
Lamarsh, Introduction to Nuclear Engineering, 3rd Edition, page 361, 362.

ANSWER: A.13 (1.00)
C.
REFERENCE:
Lamarsh, Introduction to Nuclear Engineering, 3rd Edition, page 336.

Initial reactivity = (0.94 - 1)/0.94 = -0.0638 delta k/k; + .024 delta k/k added by safety rods
Final reactivity = -.0638 + .024= -0.0398 delta k/k; K_{eff} = 1/(1 - [-0.0398])= 0.9617

ANSWER: A.14 (1.00)
B.
REFERENCE:
Lamarsh, Introduction to Nuclear Engineering, 3rd Edition, page 340.

ANSWER: A.15 (1.00)
C.
REFERENCE:
Lamarsh, Introduction to Nuclear Engineering, 3rd Edition, page 88.

ANSWER: A.16 (1.00)
A.
REFERENCE:
Lamarsh, Introduction to Nuclear Engineering, 3rd Edition, page 87.

ANSWER: A.17 (1.00)
D.
REFERENCE:
Lamarsh, Introduction to Nuclear Engineering, 3rd Edition, page 118.

ANSWER: A.18 (1.00)
B.
REFERENCE:
Lamarsh, Introduction to Nuclear Engineering, 3rd Edition.

ANSWER: A.19 (1.00)
A.
REFERENCE:
Lamarsh, Introduction to Nuclear Engineering, 3rd Edition, page 365.

ANSWER: A.20 (1.00)
B.
REFERENCE:
Lamarsh, Introduction to Nuclear Engineering, 3rd Edition, page 369.

Section B: Normal / Emergency Procedures & Radiological Controls
ANSWERS

ANSWER: B.1 (1.00)
B.
REFERENCE:
For a point source, 10 mrem/hr at 100 cm (1 meter) = 111.1 mrem/hr at 30 cm.
10 CFR 20.1003

ANSWER: B.2 (1.00)
B.
REFERENCE:
General Operating Rules, Revision 4, dated September 19, 1994.
10 CFR 55.13

ANSWER: B.3 (1.00)
D.
REFERENCE:
Technical Specification 4.2.c, dated May 17, 1989, pg. 14.

ANSWER: B.4 (1.00)
B.
REFERENCE:
Beta radiation cannot pass through the window. With window closed, gamma dose rate = 60 mR/hr.

ANSWER: B.5 (1.00)
A.
REFERENCE:
General Operating Rules, Revision 4, dated September 19, 1994.

ANSWER: B.6 (1.00)
B.
REFERENCE:
Technical Specification 2.1.b, dated May 17, 1989, pg. 5.

ANSWER: B.7 (1.00)
C.
REFERENCE:
Technical Specification 4.2.i, dated May 17, 1989, pg. 14.

ANSWER: B.8 (1.00)
D.
REFERENCE:
Technical Specification 1.2, dated May 17, 1989, pg. 2.

ANSWER: B.9 (1.00)
A.
REFERENCE:
Emergency Plan, Appendix 3, “Emergency Evacuation Plan”, dated April 26, 1994, revision 5.

ANSWER: B.10 (1.00)
B.
REFERENCE:
Technical Specification 3.3.a, dated May 17, 1989, pg. 11

ANSWER: B.11 (1.00)
C.
REFERENCE:
Emergency Plan, Section 4, “Fire or Exolosion”, dated April 26, 1994, revision 5, pg. 16.

ANSWER: B.12 (1.00)
C.
REFERENCE:
General Radiation Protection Practice.

ANSWER: B.13 (1.00)
A.
REFERENCE:
Technical Specification 3.2.a, dated May 17, 1989, pg. 9.

ANSWER: B.14 (1.00)
B.
REFERENCE:
Reactor Operator Requalification Program for the Idaho State University Reactor, Revision 2.
10 CFR Part 55.53

ANSWER: B.15 (1.00)
C.
REFERENCE:
10 CFR 55.1(a)

Section C: Facility and Radiation Monitoring Systems
ANSWERS

ANSWER: C.1 (1.00)
B.
REFERENCE:
Safety Analysis Report, dated November 23, 1995, pg. 55.

ANSWER: C.2 (1.00)
A.
REFERENCE:
Safety Analysis Report, dated November 23, 1995, pg. 55.

ANSWER: C.3 (1.00)
A.
REFERENCE:
Safety Analysis Report, dated November 23, 1995, pg. 58.

ANSWER: C.4 (1.00)
D.
REFERENCE:
Safety Analysis Report, dated November 23, 1995, pg. 69.

ANSWER: C.5 (1.00)
C.
REFERENCE:
Safety Analysis Report, dated November 23, 1995, pg. 61.

ANSWER: C.6 (1.00)
A.
REFERENCE:
Safety Analysis Report, dated November 23, 1995, pg. 46-47.

ANSWER: C.7 (1.00)
A.
REFERENCE:
AGN Operating Procedure #1, Revision 3, dated April 26, 1994, pg. 10.

ANSWER: C.8 (1.00)
C.
REFERENCE:
Safety Analysis Report, dated November 23, 1995, pg. 41.

ANSWER: C.9 (1.00)
B.
REFERENCE:
Safety Analysis Report, dated November 23, 1995, pg. 70.

ANSWER: C.10 (2.00)
A-1, B-4, C-3, D-2
REFERENCE:
Safety Analysis Report, dated November 23, 1995, pg. 44.

ANSWER: C.11 (1.00)
D.
REFERENCE:
Safety Analysis Report, dated November 23, 1995, pg. 58.

ANSWER: C.12 (1.00)
C.
REFERENCE:
Safety Analysis Report, dated November 23, 1995, pg. 58.

ANSWER: C.13 (1.00)
B.
REFERENCE:
Safety Analysis Report, dated November 23, 1995, pg. 57.

ANSWER: C.14 (1.00)
C.
REFERENCE:
Safety Analysis Report, dated November 23, 1995, pg. 45.

ANSWER: C.15 (1.00)
A.
REFERENCE:
Safety Analysis Report, dated November 23, 1995, pg. 40