April 15, 2002

Mr. Stephen G. Frantz, Director
Reed Reactor Facility
3203 SE Woodstock Blvd.
Portland, OR 97202

SUBJECT: INITIAL EXAMINATION REPORT NO. 50-288/OL-02-01

Dear Mr. Frantz:

During the week of January 27, 2002, the NRC administered examinations to employees of your facility who had applied for a license to operate your Reed College Reactor. The examination was conducted in accordance with NUREG-1478, "Non-Power Reactor Operator Licensing Examiner Standards," Revision 1.

In accordance with 10 CFR 2.790 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 document system (ADAMS). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) http://www.nrc.gov/NRC/ADAMS/indesx.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 Patrick Isaac at 301-415-1019.

Sincerely,

/RA by Alexander Adams, Jr. Acting for/

Patrick M. Madden, Section Chief
Research and Test Reactors Section
Operating Reactor Improvements Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-288

Enclosures: 1. Initial Examination Report No. 50-288/OL-02-01
2. Examination and answer key

cc w/enclosures:
Please see next page

cc:

Mayor of the City of Portland
1220 Southwest 5th Avenue
Portland, OR 97204

Reed College
ATTN: Dr. Peter Steinberger
Dean of the Faculty
3203 S.E. Woodstock Boulevard
Portland, OR 97202-8199

Reed College
ATTN: Dr. Steven S. Koblik
President
3203 S.E. Woodstock Boulevard
Portland, OR 97202-8199

Oregon Department of Energy
ATTN: David Stewart-Smith, Director
Division of Radiation Control
625 Marion Street, N.E.
Salem, OR 97310

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

April 15, 2002

Mr. Stephen G. Frantz, Director
Reed Reactor Facility
3203 SE Woodstock Blvd.
Portland, OR 97202

SUBJECT: INITIAL EXAMINATION REPORT NO. 50-288/Ol-02-01

Dear Mr. Frantz:

During the week of January 27, 2002, the NRC administered examinations to employees of your facility who had applied for a license to operate your Reed College Reactor. The examination was conducted in accordance with NUREG-1478, "Non-Power Reactor Operator Licensing Examiner Standards," Revision 1.

In accordance with 10 CFR 2.790 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 document system (ADAMS). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) http://www.nrc.gov/NRC/ADAMS/indesx.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 Patrick Isaac at 301-415-1019.

Sincerely,
/RA by Alexander Adams, Jr. Acting for/

Patrick M. Madden, Section Chief
Research and Test Reactors Section
Operating Reactor Improvements Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-288

Enclosures: 1. Initial Examination Report No. 50-288/OL-02-01
2. Examination and answer key

cc w/enclosures:
Please see next page

DISTRIBUTION:

PUBLIC RORP r/f Facility File EBarnhill (O6-D17)

ADAMS ACCESSION #: ML020710154 **TEMPLATE #: NRR-074**

***Please see previous concurrence**

OFFICE	RORP:CE		IEHB:LA		RORP:SC	
NAME	*PIsaac		*EBarnhill		PMadden	
DATE	03/ 18 /2002		03/ 22 /2002		04/ 15 /2002	

C = COVER **E = COVER & ENCLOSURE** **N = NO COPY**

OFFICIAL RECORD COPY

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

REPORT NO.: 50-288/OL-02-01

FACILITY DOCKET NO.: 50-288

FACILITY LICENSE NO.: R-112

FACILITY: Reed College

EXAMINATION DATES: 01/27/2002

EXAMINER: Patrick Isaac, Chief Examiner

SUBMITTED BY: ***/RA/*** 02/26/2002
Patrick Isaac, Chief Examiner Date

SUMMARY:

During the week of January 27, 2002, NRC administered a retake of sections A and B of the written examinations to one (1) Reactor Operator (RO) candidate. The candidate passed the examinations.

REPORT DETAILS

1. Examiners:

Patrick Isaac, Chief Examiner

2. Results:

	RO PASS/FAIL	SRO PASS/FAIL	TOTAL PASS/FAIL
Written	**1/0**	**N/A**	**1/0**
Operating Tests	**N/A**	**N/A**	**N/A**
Overall	**1/0**	**N/A**	**1/0**

ENCLOSURE 1

U. S. NUCLEAR REGULATORY COMMISSION
NON-POWER INITIAL REACTOR LICENSE EXAMINATION

FACILITY: Reed College

REACTOR TYPE: TRIGA

DATE ADMINISTERED: 2002/01/27

REGION: IV

CANDIDATE: _____

INSTRUCTIONS TO CANDIDATE:
Answers are to be written on the answer sheet provided. Attach the answer sheets to the examination. Points for each question are indicated in parentheses for each question. A 70% is required to pass the examination. Examinations will be picked up one (1) hour after the examination starts.

CATEGORY VALUE	% OF TOTAL	CANDIDATE'S SCORE	% OF CATEGORY VALUE	CATEGORY
20.00	50.0	_____	____	A. REACTOR THEORY, THERMODYNAMICS AND FACILITY OPERATING CHARACTERISTICS
20.00	50.0	_____	____	B. NORMAL AND EMERGENCY OPERATING PROCEDURES AND RADIOLOGICAL CONTROLS
		_____ FINAL GRADE	____%	TOTALS

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

_____
Candidate's Signature

ENCLOSURE 2

Section A: RX THEORY, THERMO & FAC OP CHARS

A N S W E R S H E E T

Multiple Choice (Circle or X your choice)
If you change your answer, write your selection in the blank.

001 a b c d ___

002 a b c d ___

003 a b c d ___

004 a b c d ___

005 a b c d ___

006 a b c d ___

007 a b c d ___

008 a b c d ___

009 a b c d ___

010 a b c d ___

011 a b c d ___

012 a b c d ___

013 a b c d ___

014 a b c d ___

015 a b c d ___

016 a b c d ___

017 a b c d ___

018 a b c d ___

019 a b c d ___

020 a b c d ___

(***** END OF SECTION A *****)

Section B: NORMAL/EMERG. PROCEDURES & RAD CON

A N S W E R S H E E T

Multiple Choice (Circle or X your choice)
If you change your answer, write your selection in the blank.

001 a b c d ___

002 a b c d ___

003 a b c d ___

004 a b c d ___

005 a b c d ___

006 a b c d ___

007 a b c d ___

008 a b c d ___

009 a b c d ___

010 a b c d ___

011 a b c d ___

012 a b c d ___

013 a b c d ___

014 a b c d ___

015 a b c d ___

016 a b c d ___

017 a b c d ___

018 a b c d ___

019 a b c d ___

020 a b c d ___

(***** END OF SECTION B *****)
(***** END OF EXAMINATION *****)

NRC RULES AND GUIDELINES FOR LICENSE EXAMINATIONS

During the administration of this examination the following rules apply:

1. Cheating on the examination means an automatic denial of your application and could result in more severe penalties.

2. After the examination has been completed, you must sign the statement on the cover sheet indicating that the work is your own and you have neither received nor given assistance in completing the examination. This must be done after you complete the examination.

3. Restroom trips are to be limited and only one candidate at a time may leave. You must avoid all contacts with anyone outside the examination room to avoid even the appearance or possibility of cheating.

4. Use black ink or dark pencil only to facilitate legible reproductions.

5. Print your name in the blank provided in the upper right-hand corner of the examination cover sheet and each answer sheet.

6. Mark your answers on the answer sheet provided. USE ONLY THE PAPER PROVIDED AND DO NOT WRITE ON THE BACK SIDE OF THE PAGE.

7. The point value for each question is indicated in [brackets] after the question.

8. If the intent of a question is unclear, ask questions of the examiner only.

9. When turning in your examination, assemble the completed examination with examination questions, examination aids and answer sheets. In addition turn in all scrap paper.

10. Ensure all information you wish to have evaluated as part of your answer is on your answer sheet. Scrap paper will be disposed of immediately following the examination.

11. To pass the examination you must achieve a grade of 70 percent or greater.

12. There is a time limit of two (2) hours for completion of the examination.

*QUESTION (A.1) (1.00)
Which one of the following is the principal source of heat in the reactor after a shutdown from extended operation at 100 KW?

a. Production of delayed neutrons

b. Subcritical reaction of photoneutrons

c. Spontaneous fission of U^{238}

d. Decay of fission fragments

QUESTION: 002 (1.00)
As power level increases, the Prompt Negative Temp. Coefficient (PNTC) causes:

a. 238U to absorb neutrons over a wider range, thus decreasing the number of neutrons available for fission with 235U.

b. Doppler resonance effects to decrease.

c. The hydrogen atoms in the ZrH2 to slow down more neutrons.

d. More thermal neutron absorption by the moderator.

QUESTION: 003 (1.00)
Which ONE of the following statements correctly describes the influence of delayed neutrons on the neutron life cycle?

a. Delayed neutrons decrease the average period of a reactivity addition because they thermalize more quickly than prompt neutrons.

b. Delayed neutrons take longer to thermalize because they are born at higher energies than prompt neutrons.

c. Delayed neutrons cause the length of the average neutron generation time to increase.

d. Delayed neutrons are born later than prompt neutrons and make up a larger fraction of the fission neutrons.

QUESTION: 004 (1.00)
Which alteration or change to the core will most strongly affect the thermal utilization factor.

a. Build up of fission products in fuel.

b. Removal of moderator.

c. Addition of 238U

d. Removal of a control rod.

QUESTION: 005 (1.00)

With the reactor on a constant period, which transient requires the longest time to occur?

A reactor power change of:

a. 5% power -- going from 1% to 6% pwr

b. 10% power -- going from 10% to 20% pwr

c. 15% power -- going from 20% to 35% pwr

d. 20% power -- going from 40% to 60% pwr

QUESTION: 006 (1.00)
What is the stable Reactor period which produces a power rise from 1 watt to 5 KW in 186 secs?

a. 10 secs.

b. 22 secs.

c. 30 secs.

d. 116 secs.

QUESTION: 007 (1.00)
During a fuel loading, as the reactor approaches criticality, the value of 1/M:

a. decreases toward zero

b. decreases toward one

c. increases toward infinity

d. increases toward one

QUESTION: 008 (1.00)
Which ONE of the following is the reason for the 80 second period following a reactor scram?

a. U-235 affinity for source neutrons.

b. Fuel temp. coefficient adding positive reactivity.

c. Longest lived delayed neutron precursors decay constant.

d. Amount of negative reactivity added on a scram exceeds the shutdown margin.

QUESTION: 009 (1.00)
Which ONE of the following statements describes Count Rate characteristics after a control rod withdrawal with the reactor subcritical? (Assume the reactor remains subcritical.)

a. Count rate will rapidly increase (prompt jump) then gradually increase to a stable value.

b. Count rate will rapidly increase (prompt jump) then gradually decrease to the previous value.

c. Count ratel will rapidly increase (prompt jump) to a stable value.

d. There will be no change in Count rate until criticality is achieved.

QUESTION: 010 (1.00)
In a subcritical reactor, Keff is increased from 0.861 to 0.946. Which ONE of the following is the amount of reactivity that was added to the core?

a. 0.085 delta-K/K

b. 0.220 delta-K/K

c. 0.104 delta-K/K

d. 0.125 delta-K/K

QUESTION: 011 (1.00)
Which one of the following describes "Excess Reactivity"?

a. A measure of the additional fuel loaded to overcome fission product poisoning.

b. A measure of remaining control rod worth with the reactor exactly critical.

c. The combined control rod negative reactivity worth required to keep the reactor shutdown.

d. The maximum reactivity by which the reactor can be shutdown with one control rod fully withdrawn.

QUESTION: 012 (1.00)
Which ONE of the following is a correct statement concerning the factors affecting control rod worth?

a. Fuel burn up causes the rod worth for periphery rods to decrease.

b. Fuel burn up causes the rod worth to increase in the center of the core.

c. The withdrawal of a rod causes the rod worth of the remaining inserted rods to increase.

d. As Reactor power increases rod worth increases.

QUESTION: 013 (1.00)

The Reactor is shutdown by 5% delta-K/K with a count rate of 100 cps on the start up channel. Rods are withdrawn until the count rate is 1000 cps. Which ONE of the following is the condition of the reactor after the rods are withdrawn?

a. Critical with Keff = 1.0

b. Subcritical with Keff = 0.995

c. Subcritical with Keff = 0.950

d. Supercritical with Keff = 1.005

QUESTION: 014 (1.00)
Assume the following rod worths: Safety $4.25, Shim $4.05, Reg. $1.75, and Core excess is $2.5 . Calculate the Shutdown Reactivity to satisfy the T.S. Minimum Shutdown Margin.

a. $3.3

b. $3.5

c. $6.1

d. $7.5

QUESTION: 015 (1.00)
The Reed College Triga Reactor is slightly undermoderated. Which one of the following statements correctly describes the reactor operating characteristic of "Undermoderated"?

a. A decrease in core water temperature will cause a negative reactivity response.

b. Reducing the amount of moderation will cause a positive reactivity response.

c. An increase in core water temperature will cause a positive reactivity response.

d. A decrease in core water density will cause a negative reactivity response.

QUESTION: 016 (1.00)
In a just critical reactor, removing one dollar worth of positive reactivity will cause:

a. The resultant period to be a function of the prompt neutron lifetime.

b. The prompt neutron term to become unimportant

c. The reactor period to be equal to $\frac{(\beta-\rho)}{\lambda\rho}$

d. A sudden drop in neutron flux.

QUESTION: 017 (1.00)
Which statement illustrates a characteristic of Subcritical Multiplication?

a. As Keff approaches unity (1), for the same increase in Keff, a greater increase in neutron population occurs.

b. The number of neutrons gained per generation gets larger for each succeeding generation.

c. The number of fission neutrons remain constant for each generation.

d. The number of source neutrons decreases for each generation.

QUESTION: 018 (1.00)
Which statement best describes the heat transfer mechanism at the Reed College Reactor?

a. From the fuel center line, heat is transferred to the surface of the fuel rod by convection and is carried into the coolant by conduction.

b. Heat is transmitted to the fuel rod surface by thermal radiation and carried to the coolant bt conduction.

c. Heat conducted to the surface of a fuel rod is carried into the coolant and out of the system by convection.

d. The temperature distribution from the fuel center line to the coolant is linear.

QUESTION: 019 (1.00)
Which statement best describes Xe-135 behavior following a Reactor Scram?

a. Xenon concentration decreases due to production rate from fission stops.

b. Xenon concentration decreases due to production rate from I-135 decay increasing.

c. Xenon concentration increases due to production rate from Pm-149 increasing.

d. Xenon concentration increases due to I-135 decay exceeding Xe-135 decay.

QUESTION: 020 (1.00)
The reactor was shutdown after an extended two week, high power, run at 200 kw to irradiate a specimen. How long will it take for the MAXIMUM Xenon poison effect to occur?

a. 30 minutes.

b. 8 to 12 hours.

c. 35 to 45 hours.

d. 1 to 3 hours.

(***** END OF SECTION A *****)

Question (B.1) [1.0]
A small radioactive source is to be stored in the reactor building. The source is estimated to contain ½ curies and emit a 1.33 Mev gamma. Assuming no shielding was to be used, a Radiation Area barrier would have to be erected from the source at a distance of approximately:

a. 28 feet

b. 22 feet

c. 17 feet

d. 2 feet

QUESTION (B.2) [1.0]
A room contains a source which, when exposed, results in a general area dose rate of 175 millirem per hour. This source is scheduled to be exposed continuously for 35 days. Select an acceptable method for controlling radiation exposure from the source within this room.

a. Post the area with the words "Danger-Radiation Area".

b. Equip the room with a device to visually display the current dose rate within the room.

c. Equip the room with a motion detector that will alarm in the control room.

d. Lock the room to prevent inadvertent entry into the room.

Question (B.3) [1.0]
Which of the following does NOT require NRC approval for changes?

a. License

b. Requalification plan

c. Emergency Implementation Procedures

d. Emergency Plan

Question (B.4) [1.0]
Consider two point sources, each having the same curie strength. Source A's gammas have an energy of 1 MEV whereas Source B's gamma have an energy of 2 MEV. You obtain a reading from the same Geiger counter 10 feet from each source. Concerning the two readings, which one of the following statements is correct?

a. The reading from Source B is four times that of Source A.

b. The reading from Source B is twice that of Source A.

c. Both readings are the same.

d. The reading from Source B is half that of Source A.

QUESTION (B.5) [1.0]
Which one of the following is the definition for “Annual Limit on Intake” (ALI)?

a. The concentration of a radionuclide in air which, if inhaled by an adult worker for a year, results in a total effective dose equivalent of 100 millirem.

b. 10 CFR 20 derived limit, based on a Committed Effective Dose Equivalent of 5 rems whole body or 50 rems to any individual organ, for the amount of radioactive material inhaled or ingested in a year by an adult worker.

c. The effluent concentration of a radionuclide in air which, if inhaled continuously over a year, would result in a total effective dose equivalent of 50 millirem for noble gases.

d. Projected dose commitment values to individuals, that warrant protective action following a release of radioactive material.

QUESTION (B.6) [1.0]
In order to ensure the health and safety of the public, 10CFR50 allows the operator to deviate from Technical Specifications. What is the minimum level of authorization needed to deviate from Tech. Specs?

a. USNRC

b. Reactor Supervisor

c. Licensed Senior Reactor Operator.

d. Licensed Reactor Operator.

Question (B.7) [1.0]
In the event of a pool level alarm and visual indication of abnormal loss of pool water, which ONE of the following actions is the reactor operator NOT allowed to perform if he is the Emergency Coordinator.

a. Shutdown the reactor

b. Isolate the Pool

c. Notify a member of the ENCL

d. Terminate the emergency

Question (B.8) [1.0]
In accordance with Technical Specifications, which ONE of the following statements is TRUE?

a. Each fuel experiment shall be controlled such that the total inventory of Iodine isotopes 131 thru 135 in the experiment is no greater than 1.5 curies.

b. The reactivity worth of any individual in-core experiment shall not exceed $1.25.

c. Experiments containing materials corrosive to Rx components shall not be irradiated in the

Rx.

d. Explosive experiments shall be doubly encapsulated.

Question (B.9) [1.0]
Which ONE of the following conditions is a violation of Technical Specifications, Rx Pool?

a. Conductivity of the pool water is 2 mhos per centimeter averaged over one month.

b. Radioactivity in the pool water is 0.2 micro Ci/ml.

c. Pool water ph is 5.7

d. Bulk temperature of the coolant is 45 degrees C during reactor operation.

Question (B.10) [1.0]
A point source of gamma radiation measures 50 mr/hr at a distance of 5 ft. What is the exposure rate (mr/hr) at a distance of 10 ft.

a. 25 mr/hr

b. 12.5 mr/hr

c. 6.25 mr/hr

d. 17.5 mr/hr

Question (B.11) [1.0]
You are the RO on duty during an experiment. You discover that the Core Excess Reactivity Worth is 2.30% delta-K/K.

What actions should be taken?

a. Scram the Rx / Notify the Rx Supervisor.

b. Shutdown the Rx / Notify the Senior Health Physicist.

c. Shutdown the Rx / Record the time of the shutdown in the Purpose Stamp.

d. No action required. Technical Specifications have not been violated.

Question (B.12) [1.0]
Per Reed's Emergency Implementation Procedures, where do facility personnel assemble when the Reactor Facility must be evacuated due to a fire?

a. Chemistry Laboratory

b. Reactor parking area

c. Director's Office, Chem 102

d. Chemistry building hallway

Question (B.13) [1.0]
Which ONE of the following scrams is NOT required by Technical Specifications?

a. Linear channel

b. % power channel

c. Manual

d. Log channel

Question (B.14) [1.0]
While performing SOP 01, The Start-up Checklist, the operator places the Count Rate Channel switch to one of the calibrate positions and attempts to raise a control rod. The Source light illuminates and you note rod motion. Which one of the following describes what was just observed?

The operator checked the:

a. Source Interlock is inoperable.

b. Source Interlock is operable.

c. Rod Raising Interlock is inoperable.

d. Rod Raising Interlock is operable.

Question (B.15) [1.0]
For training purposes, reactor power was increased from 400 watts to an equilibrium power 98% of the license limit in accordance with SOP 03, Reactor Operations. Which one of the following describes this power increase?

a. The power increase is within all prescribed procedures and Tech. Specs.

b. The power increase is within all prescribed procedures and Tech. Specs. but violates good practice.

c. It violates SOP 03, but not Tech. Specs.

d. It violates SOP 03 and Tech. Specs.

Question (B.16) [1.0]
When inspecting the control rods, how many (minimum) and from where should fuel elements be removed from the core and stored in the storage racks?

a. 2 from the innermost ring.

b. 6 from the innermost ring.

c. 2 from the outermost ring.

d. 6 from the outer most ring.

Question (B.17) [1.0]
In accordance with the Reed Emergency Implementation procedures, which one of the following is the minimum number and type of portable survey meters required for reactor operation?

a. 1 GM and 1 Scintillation.

b. 1 GM and 1 Ion chamber.

c. 2 GM and 1 Scintillation.

d. 2 GM and 1 Ion chamber.

Question (B.18) [1.0]
The following paragraph is a Reed Facility Emergency Plan definition:

> ...that boundary, not necessarily having restrictive barriers, including the adjoining Chemistry Building and extending 250 feet in every direction from the operations boundary.

Which one of the following terms matches the above definition?

a. Restricted Area.

b. Site Boundary.

c. Emergency Planning Zone (EPZ).

d. Offsite Geographical Area.

Question (B.19) [1.0]
Which ONE of the following facilities is the one you send a contaminated injured person to?

a. Eastmoreland Hospital

b. Doernbecher Memorial Hospital

c. Portland Adventist Medical Center

d. Good Samaritan Hospital & Medical Center

Question (B.20) [1.0]
Reed's Technical Specifications and operating procedures require the reactor to be shutdown if the reactor pool temperature exceeds a specified limit.

Which one of the following is the LOWEST temperature that EXCEEDS the Tech. Spec. limit?

a. 50 degrees F

b. 45 degrees C

c. 50 degrees C

d. 120 degrees F

ANSWER: 001 (1.00)
d
REFERENCE
Burn, R., *Introduction to Nuclear Reactor Operations,* © 1982, § 4.9, pp. 4-23 — 4-26..

ANSWER: 002 (1.00)
a
REFERENCE:
Glasstone, S. and Sesonske, A, *Nuclear Reactor Engineering,* Kreiger Publishing, Malabar, Florida, 1991, § 5.98, p. 94.

ANSWER: 003 (1.00)
c
REFERENCE:
Glasstone, S. and Sesonske, A, *Nuclear Reactor Engineering,* Kreiger Publishing, Malabar, Florida, 1991, § 5.20, p. 236.

ANSWER: 004 (1.00)
d
REFERENCE:
Lamarsh, J.R., *Introduction to Nuclear Engineering,* Addison-Wesley Publishing, Reading, Massachusetts, 1983. § 7.2, p. 300
Burn, R., *Introduction to Nuclear Reactor Operations,* © 1982, § 3.3, pp. 3-13 — 3-18.

ANSWER: 005 (1.00)
a
REFERENCE:
Glasstone, S. and Sesonske, A, *Nuclear Reactor Engineering,* Kreiger Publishing, Malabar, Florida, 1991, § 5.18, p. 234.

ANSWER: 006 (1.00)
b
REFERENCE:
Glasstone, S. and Sesonske, A, *Nuclear Reactor Engineering,* Kreiger Publishing, Malabar, Florida, 1991, § 5.18, p. 234.

ANSWER: 007 (1.00)
a
REFERENCE:
Glasstone, S. and Sesonske, A, *Nuclear Reactor Engineering,* Kreiger Publishing, Malabar, Florida, 1991, §§ 3.161 — 3,163, pp. 190 & 191

ANSWER: 008 (1.00)
c
REFERENCE:
Glasstone, S. and Sesonske, A, *Nuclear Reactor Engineering,* Kreiger Publishing, Malabar, Florida, 1991, § 5.47, p. 246.

ANSWER: 009 (1.00)
a
REFERENCE:
Glasstone, S. and Sesonske, A, *Nuclear Reactor Engineering,* Kreiger Publishing, Malabar, Florida, 1991, § 5.31, p. 240.

ANSWER: 010 (1.00)
c
REFERENCE:
Glasstone, S. and Sesonske, A, *Nuclear Reactor Engineering,* Kreiger Publishing, Malabar, Florida, 1991, § 3.44, p. 149 & § 5.9, p. 231.

ANSWER: 011 (1.00)
b
REFERENCE:
Glasstone, S. and Sesonske, A, *Nuclear Reactor Engineering,* Kreiger Publishing, Malabar, Florida, 1991, § 5.198, p. 300.

ANSWER: 012 (1.00)
c
REFERENCE:
Glasstone, S. and Sesonske, A, *Nuclear Reactor Engineering,* Kreiger Publishing, Malabar, Florida, 1991, §§ 5.224 — 5.229, pp. 306 — 307.

ANSWER: 013 (1.00)
b
REFERENCE:
Glasstone, S. and Sesonske, A, *Nuclear Reactor Engineering,* Kreiger Publishing, Malabar, Florida, 1991, § 3.161 — 3.163, pp. 190 — 191.

ANSWER: 014 (1.00)
a
REFERENCE:
T.S. Section F.3
Reed Requal. Exam 88-89

ANSWER: 015 (1.00)
d
REFERENCE:
Glasstone, S. and Sesonske, A, *Nuclear Reactor Engineering,* Kreiger Publishing, Malabar, Florida, 1991, §§ 7.131 — 7.155, pp. 465 — 472.

ANSWER: 016 (1.00)
a
REFERENCE:
Glasstone, S. and Sesonske, A, *Nuclear Reactor Engineering,* Kreiger Publishing, Malabar, Florida, 1991, § 5.51, p. 248.

ANSWER: 017 (1.00)
a
REFERENCE:
Glasstone, S. and Sesonske, A, *Nuclear Reactor Engineering,* Kreiger Publishing, Malabar, Florida, 1991, §§ 3.161 — 3.163, pp. 190 — 191.

ANSWER: 018 (1.00)
c
REFERENCE:
Reed Requal Exam 1990

ANSWER: 019 (1.00)
d
REFERENCE:
Glasstone, S. and Sesonske, A, *Nuclear Reactor Engineering,* Kreiger Publishing, Malabar, Florida, 1991, §§ 5.56 — 5.80, pp. 250 — 260.

ANSWER: 020 (1.00)
b
REFERENCE:
Glasstone, S. and Sesonske, A, *Nuclear Reactor Engineering,* Kreiger Publishing, Malabar, Florida, 1991, §§ 5.56 — 5.80, pp. 250 — 260.

*ANSWER (B.1)
a
REFERENCE
DR= $6CE/x^2 = 0.005 = 6(½)(1.33)/x^2$, $x^2 = 798$, x = 28.25 feet

*ANSWER (B.2)
d
REFERENCE
10CFR20.1601(a)(3)

*ANSWER (B.3)
c
*REFERENCE
RRF 1990 RO Requal Exam

ANSWER (B.04) [1.0]
c
REFERENCE
GM is not sensitive to energy.

ANSWER (B.05) [1.0]
b
REFERENCE
10CFR20.1003

ANSWER (B.06) [1.0]
c
REFERENCE
10CFR50.54(y)

*ANSWER (B.7)
d
*REFERENCE
Emergency Implementation Procedures

*ANSWER (B.8)
a
*REFERENCE
RRF Tech Specs

*ANSWER (B.9)
a
*REFERENCE
RRF Tech Spec

*ANSWER (B.10)
b
*REFERENCE
RRF Training Manual ch. 2

*ANSWER (B.11)
a
*REFERENCE
SOP-02; 2.7.2

*ANSWER (B.12)
c
*REFERENCE
Emergency Implementation Procedures, EIP-7

*ANSWER (B.13)
d
*REFERENCE
Tech Specs

*ANSWER (B.14)
a
*REFERENCE
Reed, SOP 01, Step 1.7.6.7

*ANSWER (B.15)
c
*REFERENCE
Reed, SOP 03, Precaution 3.5.4, page 1.

*ANSWER (B.16)
a
*REFERENCE
SOP 41, Control Rod Inspection

*ANSWER (B.17)
b
*REFERENCE
Reed EIPs, Attachment B

*ANSWER (B.18)
b
*REFERENCE
Reed Emergency Plan, Section 2.14, page 8.

*ANSWER (B.19)
d
*REFERENCE
RRF Emergency Plan § 8.3 pp. 25 & 26

*ANSWER (B.20)
c
*REFERENCE
Reed, Technical Specifications, D.1.