Dr. John C. Lee, Interim Director
Phoenix Memorial Laboratory
Ford Nuclear Reactor
University of Michigan
2301 Bonisteel Blvd.
Ann Arbor, Michigan 48109-2100

Dear Dr. Lee:

SUBJECT: INITIAL EXAMINATION REPORT NO. 50-002/OL-00-01

During the week of February 14, 2000, the NRC administered an initial examination to an employee of your facility who had applied for a license to operate your University of Michigan Reactor. The examination was conducted in accordance with NUREG-1478, "Non-Power Reactor Operator Licensing Examiner Standards," Revision 1. At the conclusion of the examination, the examination questions and preliminary findings were discussed with those members of your staff identified in the enclosed report.

In accordance with 10 CFR 2.790 of the Commission's regulations, a copy of this letter and the enclosures will be placed in the NRC Public Document Room. 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 me at (301) 415-1168.

Sincerely,

Ledyard B. Marsh, Chief
Events Assessment, Generic Communications
and Non-Power Reactors Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-002

Enclosures:
1. Initial Examination Report No. 50-002/OL-00-01
2. Examination and answer key (RO)

cc w/encls:
Please see next page

cc:

Special Assistant to the Governor
Office of the Governor
Room 1 - State Capitol
Lansing, MI 48909

Mr. Christopher Becker
Phoenix Memorial Laboratory
University of Michigan - North Campus
Ann Arbor, MI 48109

Michigan Department of Environmental Quality
Drinking Water & Radiological
Protection Division
P.O. Box 30630
Lansing, MI 48909-8130

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DATE	02/ /2000		02/ /2000		02/ /2000	

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

REPORT NO.: 50-002/OL-0-01

FACILITY DOCKET NO.: 50-002

FACILITY LICENSE NO.: R-28

FACILITY: University of Michigan

EXAMINATION DATES: February 15, 2000

EXAMINER: Patrick Isaac, Chief Examiner

SUBMITTED BY: _____ 02/23/2000
Patrick Isaac, Chief Examiner Date

SUMMARY:

During the week of February 14, 2000, NRC administered a retake of Section B (Normal and Emergency Operating Procedures and Radiological Controls) of the written portion of the Operator Licensing Examinations to one 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**

3. Exit Meeting: N/A

ENCLOSURE 1

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

FACILITY: University of Michigan

REACTOR TYPE: Pool

DATE ADMINISTERED: 2000/02/15

REGION: III

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. Examination will be picked up one (1) hour after the examination starts.

CATEGORY VALUE	% OF TOTAL	CANDIDATE'S SCORE	% OF CATEGORY VALUE	CATEGORY
20.00	100.0	_____	____	B. NORMAL AND EMERGENCY OPERATING PROCEDURES AND RADIOLOGICAL CONTROLS
20.00		_____ FINAL GRADE	____%	TOTALS

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

_____
Candidate's Signature

ENCLOSURE 2

B. NORMAL/EMERG PROCEDURES & RAD CON

ANSWER SHEET

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 ___ e ___

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 ___

(********** 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 one (1) hour for completion of the examination.

*QUESTION (B.1) [1.0]
You are working in an area with a dose rate of 10 mrem/hr. How many hours may you work in that area, during normal conditions, without exceeding the weekly staff exposure guidelines of the FNR?

a. 5 hours

b. 10 hours

c. 20 hours

d. 25 hours

*QUESTION (B.2) [1.0]
Which of the following is the responsibility of the control room operator during a building evacuation, per EP-101, Reactor Building Emergency?

a. Verify that all personnel have evacuated the beamport floor.

b. Close the stack 2 exhaust damper.

c. Assume the duties of the Emergency Director.

d. Check the status of the fuel vault criticality radiation monitors,

*QUESTION (B.3) [1.0]
During normal startups (other than experiments or rod calibrations) the maximum distance that shim-safety rod positions may differ from each other, as indicated by the position indicators is

a. 1.2 inches

b. 2.0 inches

c. 2.5 inches

d. 3.6 inches

*QUESTION (B.4) [2.0]
Match the requirements for maintaining an active operator license in column A with the correct time period from column B.

	Column A		**Column B**
a.	Renewal of license	1.	1 year
b.	Medical Examination	2.	2 years
c.	Requalification Written examination	3.	4 years
d.	Requalification Operating Test	4.	6 years

*QUESTION (B.5) [2.0]
Match the items listed with the Technical Specification limit provided.

1. 0.0012 ΔK/K
2. 0.0060 ΔK/K
3. 0.0120 ΔK/K
4. 0.0250 ΔK/K
5. 0.0436 ΔK/K

a. Minimum core shutdown margin with three shim-safety rods inserted.

b. Maximum regulating rod reactivity.

c. Maximum core excess reactivity.

d. Maximum moveable experiment reactivity.

e. Maximum reactivity of all in-core experiments

*QUESTION (B.6) [1.0]
The maximum exposure rate 30 cm from the surface of a radioactive waste can should not exceed _____.

a. 5 mrem/hr.

b. 50 mrem/hr.

c. 100 mrem/hr.

d. 1 rem/hr.

*QUESTION (B.7) [1.0]

The following conditions exist:

Delta T equals 13.7°F - Channel A equals 93% - Channel B equals 95%
2 Mw heatup rate is 17.3 °F/hr - Calorimeter measured heatup rate is 22.5°F/hr,

Which one of the following is the actual reactor power?

a. 1.9 Mw

b. 2.3 Mw

c. 2.6 Mw

d. 3.2 Mw

*QUESTION (B.8) [1.0]
The reactor is in steady-state power at 90% when you, the operator, notice that the Reactor Bridge area radiation monitor is inoperable. Which one of the following describes the correct action you should take?

a. Shutdown the reactor. Technical Specifications (T.S.) do not allow operations of the reactor without a fully operating Reactor Bridge radiation monitor.

b. Continue operation. T.S. allow the unit to be out of service for up to 7 days.

c. Continue operation. Within 24 hours of recognition of failure, replace the unit with a portable gamma-sensitive instrument with alarm.

d. Continue operation as long as a minimum of three other area radiation monitors are operating.

*QUESTION (B.9) [1.0]
A 10 curie radioactive source emits a 2.5 MeV gamma and an .01 MeV beta. What is the dose at 5 feet?

a. 60 mrem/hr

b. 1.5 rem/hr

c. 6.0 rem/hr

d. 14.2 rem/hr

*QUESTION (B.10) [1.0]
The primary coolant conductivity has increased to 12 micromhos/cm. How much longer may operation continue?

a. 24 hours

b. 48 hours

c. 3 days

d. 7 days

*QUESTION (B.11) [1.0]
The T.S. require a minimum Shutdown Margin (SDM) of 0.0045 ΔK/K for a specific core and control rods configuration. Assuming Xenon free conditions and the following worths, which one of the following is the calculated SDM?

	worth %ΔK/K
Shim-Safety rod #1:	2.35
Shim-Safety rod #2:	2.38
Shim-Safety rod #3:	2.50
Control rod (Reg.)	0.092
Excess Reactivity:	1.45
Experiments (Max Worth)	0.62

a. 7.91%

b. 5.23%

c 5.15%

d. 2.66%

*QUESTION (B.12) [1.0]
In accordance with EP-101, “Reactor Building Emergency”, which one of the following conditions warrant evacuating the reactor building?

a. One area radiation monitor unexpectedly alarms due to high airborne radioactivity in the atmosphere.

b. A minor fire is in progress. However, it is being handled by operations personnel.

c. Washtenaw County has been placed under a tornado watch.

d. Unauthorized intrusion (Duress),.

*QUESTION (B.13) [1.0]
A suspected radioactive spill has been observed. Which one of the following is the immediate action of the person who has observed the spill?

a. Stand by the spill area and warn others,

b. Clean up the spill with mops and “Radiacwash”.

c. Take a smear of the area to determine the contamination level.

d. Post the area with the appropriate signs

*QUESTION (B.14) [1.0]
It is April 1, 2000. You have stood watch for the following hours during the last quarter:
Jan. 11, 2000 0.5 hours
Feb. 24, 2000 1.5 hours
Mar. 16, 2000 1.0 hours

What requirements must you meet in order to stand an RO watch today?

a. None. You've met the minimum requirements of 10 CFR 55.

b. You must perform 4 hours of shift functions under the direction of a licensed operator or licensed senior operator as appropriate.

c. You must perform 6 hours of shift functions under the direction of a licensed operator or licensed senior operator as appropriate.

d. You must submit a new application form to the NRC requesting a waiver to reactivate your license.

*QUESTION (B.15) [1.0]
Which one of the following is the basis for maintaining the pool level within Technical Specification Safety Limits?

a. To maintain the maximum cladding temperature in the hot channel in the core below the boiling point of the coolant.

b. To maintain the dose rate in the pool area as low as reasonably achievable.

c. To “Scrub out” radionuclides that are released from the reactor core.

d. To provide adequate reactor core moderation.

*QUESTION (B.16) [1.0]
Which one of the following is NOT a prerequisite for fuel movement?

a. Establish communications between the control room and the bridge.

b. Verify that the Linear Level system is operating.

c. Establish a count rate of 100 cps on an operating Log Count Rate channel.

d. Tag out the operating Log Count Rate channel fission chamber positioning switch

*QUESTION (B.17) [1.0]
Which one of the following does NOT require specific permission from the console operator during fuel movements?

a. Unlock the fuel tool.

b. Remove fuel elements from the core.

c. Insert fuel elements into the core,

d. Unlatch the fuel tool from elements inserted into the core,

*QUESTION (B.18) [1.0]
Which one of the following is an unauthorized Secondary System condition?

a. Operating the cooling tower fans in reverse to de-ice the cooling tower.

b. Operating the Secondary System with a pH of 9.2.

c. Adding Sodium hypochlorite to the Secondary System to control microbiological material.

d. Adding Sulfuric acid to the Secondary System to control pH.

(********** END OF EXAMINATION **********)

*ANSWER (B.1)
b
REFERENCE
OP-103 Section 11.2.4

*ANSWER (B.2)
d
REFERENCE
EP-101 Section 4.4

*ANSWER (B.3)
c
REFERENCE
OP-101 Step 5.19

*ANSWER (B.4)
a. 4 - b. 2 - c. 2 - d. 1
REFERENCE
10 CFR 55

*ANSWER (B.5)
a. 4 - b. 2 - c. 5 - d. 1 - e. 3
REFERENCE
Technical Specifications 3.1

*ANSWER (B.6)
c
REFERENCE
Health Physics Manual, Section 4.1.3.1

*ANSWER (B.7)
c
REFERENCE
Power = 2Mw x 22.5/17.3 = 2.6 Mw
OP-106; Power Level Determination

*ANSWER (B.8)
a
REFERENCE
T.S. Table 3.2, pg. 13

*ANSWER (B.9)
c
REFERENCE
Beta dose at 5 ft is essentially zero.
$D = 6CE/r^2$
$D = 6(10)(2.5)/(5)^2 = 6.0$ rem/hr

ANSWER (B.10)
d
REFERENCE
T.S. 3.4

*ANSWER (B.11)
d
*REFERENCE
OP-105 Core Excess, SDM and Control Rod Reactivity
Burn, R., *Introduction to Nuclear Reactor Operations,* © 1988, § 6.2.3 p. 6-4.

SDM (cold/clean) = Total Rod worth - K_{excess} - Most reactive rod - Reg Rod - Experiments worth
SDM = (2.35 + 2.38 + 2.50 + 0.092) - 1.45 - 2.50 - 0.092 - 0.62 = 2.66%

*ANSWER (B.12)
d
REFERENCE
EP-101 - Reactor Building Emergency

*ANSWER (B.13)
a
REFERENCE
Health Physics Manual Section 8

*ANSWER (B.14)
c
REFERENCE
10CFR55.53(e) & (f)

*ANSWER (B.15)
a
REFERENCE
T.S. 2.1.1 and 2.1.2

*ANSWER (B.16)
b
REFERENCE
AP-301, Section 6

*ANSWER (B.17)
a
REFERENCE
AP-301 Section 6.11.2

*ANSWER (B.18)
b
REFERENCE
OP-103, Reactor Operation, Maintenance, Systems and Components; Section 10.11
FNR Supplied Question Bank Section B

(********** END OF EXAMINATION **********)