April 9, 2009

Dr. Mohamad Al-Sheikly, Director
Department of Materials and Nuclear Engineering
The University of Maryland
College Park, MD 20742

SUBJECT: RETAKE EXAMINATION REPORT NO. 50-166/OL-09-02, UNIVERSITY OF MARYLAND

Dear Dr. Mohamad Al-Shiekly:

On March 27, 2009, the U.S. Nuclear Regulatory Commission (NRC) administered a retake operator licensing examination at your Maryland University Training Reactor (MUTR). The examination was conducted according to NUREG-1478, "Operator Licensing Examiner Standards for Research and Test Reactors," Revision 2, published in June 2007. Examination questions and preliminary findings were discussed at the conclusion of the examination with those members of your staff identified in the enclosed report.

In accordance with Title 10, Section 2.390 of the Code of Federal 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 http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room). The NRC is forwarding the individual grades to you in a separate letter which will not be released publicly. If you have any questions concerning this examination, please contact Patrick Isaac at 301-415-1019 or via email at patrick.isaac@nrc.gov.

Sincerely,

/RA/

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

Docket No. 50-166

Enclosures:
1. Examination Report No. 50-166/OL-09-02
2. Written Examination

cc: Mr. Vincent G. Adams
Facility Coordinator
Chemical and Nuclear Engineering Building 090
University of Maryland
College Park, MD 20742
cc: w/o enclosures: see next page

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DISTRIBUTION w/ encls.:
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OFFICE	**PRTB:CE**		**IOLB:LA**		**PRTB:BC**	
NAME	**PIsaac**		**CRevelle**		**JEads**	
DATE	**4/08/2009**		**4/08/2009**		**4/09/2009**	

OFFICIAL RECORD COPY

cc:

Director, Dept. of Natural Resources
Power Plant Siting Program
Energy & Coastal Zone Administration
Tawes State Office Building
Annapolis, MD 21401

Mr. Roland Fletcher, Director
Center for Radiological Health
Maryland Department of Environment
201 West Preston Street
7th Floor Mail Room
Baltimore, MD 21201

Maureen M. Kotlas, Director
Department of Environmental Safety
3115 Chesapeake Building 338
University of Maryland
College Park, MD 20742

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

EXAMINATION REPORT NO: 50-166/OL-09-02

FACILITY: Maryland University Training Reactor

FACILITY DOCKET NO.: 50-166

FACILITY LICENSE NO.: R-70

SUBMITTED BY: **/RA/** 4/06/09
Patrick J. Isaac, Chief Examiner Date

SUMMARY:

On March 27, 2009, the NRC administered a retake of Section B, Normal and Emergency Operating Procedures and Radiological Controls, of the operator licensing written examination to one Reactor Operator (RO) candidate. The candidate passed the examination.

REPORT DETAILS

1. Examiner: Patrick J. 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	1/0
Overall	1/0	N/A	1/0

3. Exit Meeting:

Vince Adams, Facility Coordinator, MUTR
Patrick Isaac, NRC, Examiner

The NRC Examiner thanked Mr. Adams for his support in the administration of the examination.

ENCLOSURE 1

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

FACILITY: University of Maryland

REACTOR TYPE: TRIGA

DATE ADMINISTERED: March 27, 2009

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

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

Candidate's Signature

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 ___

006 a b c d ___

007 a b c d ___

008 a b c d ___

009 1 ___ 2 ___ 3 ___ 4 ___

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 ___

(***** END OF CATEGORY 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 <u>only</u> 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 in each category.

12. There is a time limit of one (1) hour for completion of the examination.

EQUATION SHEET

$\dot{Q} = \dot{m}\, c_p\, \Delta T$

$\dot{Q} = \dot{m}\, \Delta h$

$\dot{Q} = UA\, \Delta T$

$P_{max} = \dfrac{(\rho - \beta)^2}{2\alpha(k)\ell}$

$SCR = S/(1\text{-}Keff)$

$CR_1\,(1\text{-}Keff)_1 = CR_2\,(1\text{-}Keff)_2$

$SUR = \dfrac{26.06\,(\lambda_{eff}\rho)}{(\beta - \rho)}$

$M = \dfrac{(1\text{-}Keff)_0}{(1\text{-}Keff)_1}$

$SUR = 26.06/\tau$

$M = 1/(1\text{-}Keff) = CR_1/CR_0$

$P = P_0\, 10^{SUR(t)}$

$SDM = (1\text{-}Keff)/Keff$

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

$Pwr = W_f\, \dot{m}$

$P = \dfrac{\beta(1-\rho)}{\beta-\rho} P_o$

$\ell^* = 1 \times 10^{-5}$ seconds

$\tau = (\ell^*/\rho) + [(\beta-\rho)/\lambda_{eff}\rho]$

$\tau = \ell^*/(\rho-\beta)$

$\rho = (Keff-1)/Keff$

$\lambda_{eff} = 0.1$ seconds^{-1}

$\rho = \Delta Keff/Keff$

$T_{1/2} = \dfrac{0.693}{\lambda}$

$\bar{\beta} = 0.0070$

$DR_1 D_1^2 = DR_2 D_2^2$

$DR = DR_o e^{-\lambda t}$

$DR = \dfrac{6CiE(n)}{R^2}$

DR ≡ R/hr, Ci ≡ Curies, E ≡ Mev, R ≡ feet

1 Curie = 3.7×10^{10} dps

1 kg = 2.21 lbm

1 hp = 2.54×10^3 BTU/hr

1 Mw = 3.41×10^6 BTU/hr

1 BTU = 778 ft-lbf

°F = 9/5°C + 32

1 gal H_2O ≈ 8 lbm

°C = 5/9 (°F - 32)

Question B.1 [1.0 point]

SAFETY LIMITS, as defined by MUTR Technical Specifications, are:

a. Settings for automatic protective devices related to those variables having significant safety functions

b. Administratively established constraints on equipment and operational characteristics which shall be adhered to during operation of the facility

c. Limits on important process variables which are found to be necessary to reasonably protect the integrity of certain physical barriers which guard against the uncontrolled release of radioactivity

d. Systems which are designed to initiate automatic reactor protection or to provide information for initiation of manual protective action.

Question B.2 [1.0 point]

The reactor is in a SHUTDOWN condition, as defined by MUTR Technical Specifications, when:

a. All rods are inserted and the reactor console is secured

b. The reactor is subcritical by at least $1.00, with fuel and moderator at ambient temperature

c. The reactor console is secured and no work is in progress involving core fuel, core structure, installed control rods or control rod drives

d. The reactor is subcritical by at least $1.00 of reactivity and the reactor console is secured

Question B.3 [1.0 point]

The SHUTDOWN MARGIN of the MUTR shall not be less than:

a. $0.25

b. $0.50

c. $0.75

d. $1.00

Question B.4 [1.0 point]

The Thermal Column is being used for an experiment which has been performed previously. The experiment should be classified as a:

a. Routine Experiment

b. Thermal Column-Routine Experiment

c. Special Experiment

d. Modified Routine Experiment

Question B.5 [1.0 point]

How would an accessible area be posted if the radiation level in the area is 65 mR/hr?

a. RADIATION AREA

b. HIGH RADIATION AREA

c. AIRBORNE RADIOACTIVITY AREA

d. RESTRICTED AREA

Question B.6 [1.0 point]

Which one of the following is a “Reportable Occurrence”?

a. An experiment is inserted in a beamport which results in an unexpected addition of $0.80 of reactivity.

b. A power calibration is performed at an indicated power of 210 KW. The power calibration reveals that actual reactor power is 245 KW.

c. While operating at 220 KW, the reactor operator notices that the Fuel Element Temperature monitor is pegged at 300 ºC. After evaluation, the operator declares the instrument inoperable and he scrams the reactor.

d. While performing OP 101, Initial Reactor Startup Checklist, the operator declares the Exhaust Monitor inoperable.

Question B.7 [1.0 point]

Which one of the following is NOT a precaution or requirement for the reactor fuel at the MUTR?

a. A Senior Reactor Operator shall supervise the fuel handling from the Reactor Bridge.

b. Upon completion of fuel movements, the configuration of the bundles in the reactor core must not be altered.

c. Prior to removing a fuel bundle, all control rods must be fully inserted.

d. The Technical Specifications require that a visual inspection of the fuel bundles shall be made biennially.

Question B.8 [1.0 point]

A point source measures 80 mR/hr at one meter. At what distance from the source will the radiation be reduced to 20 mR/hr?

a. 2 meters

b. 3 meters

c. 4 meters

d. 8 meters

Question B.9 [2.0 points, 0.5 each]

Match the requirements from the MUTR Requalification Program or 10 CFR 55 to maintain your NRC operator license active. (NOTE: Some of the time period from column B may be used more than once or not at all.)

Column A	Column B
1. Renewal of license	a. 4 months
2. Medical examination	b. 1 year
3. Console manipulation evaluation	c. 2 years
4. Requalification exam (written)	d. 6 years

Question B.10 [1.0 point]

MUTR Technical Specifications require that control rod drop times, from the fully withdrawn to the fully inserted position:

a. Shall not exceed 1 second and shall be measured annually

b. Shall not exceed 1 second and shall be measured semiannually

c. Shall not exceed 2 seconds and shall be measured annually

d. Shall not exceed 2 seconds and shall be measured semiannually

Question B.11 [1.0 point]

Which one of the following statements defines the basis for the Safety Limit applicable to fuel temperature?

a. Excessive gas pressure may result in loss of fuel cladding integrity

b. High fuel temperature combined with lack of adequate cooling could result in fuel melt

c. Excessive hydrogen produced as a result of the zirconium-water reaction is potentially explosive

d. High fuel temperature could result in clad melt

Question B.12 [1.0 point]

With the primary coolant pump operating and the secondary cooling off, how many times must the makeup water timer be turned on to add 6 inches of water to the reactor pool tank?

a. Once

b. Twice

c. Three times

d. Six times

Question B.13 [1.0 point]

Who has the authority to allow reentry into the Reactor Building following the initiation of *building evacuation alarm*?

a. The operator who initiated the alarm

b. The Duty SRO

c. The Radiation Safety Officer

d. The Emergency Director

Question B.14 [1.0 point]

"A licensee may take reasonable action that departs from a license condition or a technical specification (contained in a license issued under this part) in an emergency when this action is immediately needed to protect the public health and safety and no action consistent with license conditions and technical specifications that can provide adequate or equivalent protection is immediately apparent." In accordance with the regulations, which one of the following is the minimum level of management which may authorize this action?

a. any Reactor Operator licensed at facility

b. any Senior Reactor Operator licensed at facility

c. Facility Manager (or equivalent at facility).

d. USNRC

Question B.15 [1.0 point]

The MUTR licensed Reactor Operator is required to perform a minimum of _____ reactor startups during the two year requalification cycle.

a. 3

b. 5

c. 10

d. 20

Question B.16 [1.0 point]

Which one of the following evolutions could be performed without being supervised by a senior reactor operator?

a. While performing SP 201, Control Rod Poison Section Inspection.

b. Resumption of operation following an unscheduled scram due to incorrect action by a student.

c. An experiment with an estimated reactivity worth of $0.90 is being manipulated in the core.

d. Resumption of operation following an unscheduled shutdown due to interruption of electrical power.

Question B.17 [1.0 point]

Routine Experiments may be performed at the discretion of:

a. a licensed Reactor Operator

b. the duty Senior Reactor Operator

c. the Reactor Director

d. the Reactor Safety Committee

(***** END OF CATEGORY B *****)
(********** END OF EXAMINATION **********)

B.1 c
REF: Technical Specifications Section 1.0

B.2 b
REF: Technical Specifications Section 1.0

B.3 b
REF: Technical Specifications Section 3.1

B.4 c
REF: OP 105, Section 3.0

B.5 a
REF: ENNU 320 MANUAL Vol.1

B.6 c
REF: TS 1.27; EP 403

B.7 d
REF: MP 303

B.8 a
REF: Dose Rate proportional to 1/distance squared; ENNU 320 MANUAL Vol. 1

B.9 1 d 2 c 3 b 4 b
REF: MUTR Requalification Plan; 10CFR55

B.10 a
REF: Technical Specifications Section 3.2; Section 4.2

B.11 a
REF: Technical Specifications Section 2.1

B.12 c
REF: MP 305

B.13 d
REF: EP 401

B.14 b
REF: 10CFR50.54(y)

B.15 c
REF: MUTR Requalification Program

B.16 d
REF: Technical Specification 6.1.3

B.17 b
REF: OP 105

(*** End of Section B ***)
(***** End of Examination *****)