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DEPARTMENT OF MECHANICAL,
AEROSPACE, AND NUCLEAR ENGINEERING

RCF 11-2
May 9, 2011

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Re: Response to Request for Additional Information – reactor operator's requalification program

Dear Sir:

In response to Request for Additional Information dated May 28, 2008, RPI agreed to revise the operator requalification program to include reactor operators and senior reactor operators at a later date. RPI intends to use the same requalification plan for the reactor operators (RO) and senior reactor operators (SRO). This letter transmits the revised requalification program.

The Nuclear Safety Review Board has reviewed and approved the revised Requalification Plan

Sincerely,

Dr. Sastry R. Sreepada, Director
L. David Walthousen Laboratory
RPI Reactor Critical Facility

I declare under penalty of perjury that the foregoing is true and correct.

5/9/11
Date

Dr. David V. Rosowsky, Dean of Engineering

CC:
Dr. Yaron Danon, Chairman
RPI NSRB

Dr. Tim Wei, Chairman
MANE

Dr. Peter Caracappa
RPI Radiation Safety Officer
Environmental Health and Safety Office

Mr. Jason Thompson, Operations Supervisor
RPI RCF

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NRR

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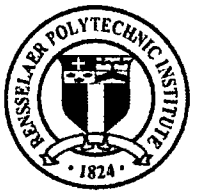

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REACTOR CRITICAL FACILITY

REQUALIFICATION PROGRAM

License No. CX-22

Docket No. 50-225

1. DESCRIPTION

The RCF Requalification program is required by the NRC in accordance with 10 CFR 55, Operators' Licenses. In this requalification program document the word SRO includes RO and SRO. All persons holding an SRO license for the RPI Reactor Critical Facility shall maintain watch proficiency in accordance with 10 CFR 55.53(e) and (f). All SROs shall also undergo continuous training for 24 months, including oral checkouts, an annual operating test and a biannual written comprehensive requalification examination. Upon successful completion of the 24-month requalification program, the licensee begins the requalification anew and repeats it for as long as he or she holds an SRO license at the RPI RCF. All operators in training shall complete the training program prior to taking the NRC SRO exam.

2. PROFICIENCY

All SRO licensed personnel shall actively perform the functions of an operator or senior operator for a minimum of four hours per calendar quarter (10 CFR 55.53(e)). If the minimum proficiency requirement is not met, before resumption of functions authorized by an SRO license, the facility supervisor shall certify the following:

1. That the qualifications and status of the licensee are current and valid; and
2. That the licensee has completed a minimum of six hours of reactor operation under the direction of a senior reactor operator (10 CFR 55.53 (f)).

3. REQUALIFICATION

SRO requalification is carried out in accordance with 10 CFR 55.59 and ANSI/ANS-15.4-1988 section 6. Each licensee shall:

1. Successfully complete the RCF requalification program. This program consists of continuous training and evaluation as well as proficiency watches over a 24-month period.

   (a) All senior reactor operators will maintain proficiency in accordance with 10 CFR 55.53(e). Any licensee who fails to meet the requirements of 10 CFR 55.53(e) must met the requirements of 10 CFR 55.53(f) before being allowed to carry out the duties of an SRO at the RCF (see Proficiency description above). The Facility Supervisor shall record all proficiency watches and watches under instruction stood by the licensee on the Proficiency Watch/Watch Under Instruction Sign-Off Sheet.

   (b) All senior reactor operators will receive oral checkouts on topics covered in the Self Study Question Sheets. Checkouts will be administered by the Facility Supervisor. The Facility Supervisor verifies by his signature on the Requalification Sign-Off Sheet and his

initials in the individual topic initial spaces that the licensee has demonstrated a level of knowledge satisfactory for requalification in the initialed topic area.

2. Pass a comprehensive requalification written examination and an annual operating test.

(a) The written examination will be administered to all SROs at the end of their 24-month requalification, not to exceed 24 months from the date of their license issue or their last requalification examination. The examination consists of questions taken from the NRC SRO Exam Bank. The licensee must receive a grade of 70% or greater on each section of the examination in order to pass. Failure to score 70% on any portion of the requalification examination results in failure and removal from all SRO duties. The licensee may resume the duties of SRO after retaking and scoring greater than 70% on the portions of the requalification examination previously failed.

(b) The operating test will require the senior reactor operator to demonstrate an understanding of and the ability to perform the actions required of a senior reactor operator at the RPI RCF. Failure to pass the operating exam will result in removal from all SRO duties. The licensee may retake the operational test after standing "watches under instruction at the discretion of the facility supervisor. The operating test will be administered by the facility supervisor. The operating test will be administered to all SROs within 12 months of their license issue or last operation test.

4. TRAINING

The SRO training program is specific for the RCF. It also covers RPI Rad Con requirements. The SRO exam covers six areas including basic reactor concepts as well as basic engineering and radiation protection principals. It is assumed that the information in areas other than those specific to the RCF and RPI have been obtained elsewhere. The practice exam will cover all areas and be similar in content and format to the NRC SRO exam.

The program is in two parts. One is a self study program with questions that can be answered from information in the RCF Facility Manual and other references. The study sheets with questions to be answered are included in the enclosures. The second part involves a practical application of skills to the actual operation of the reactor in accordance with all requirements and a walk through to test familiarity with the facility and all its auxiliary equipment.

Attachment 4 provides for documentation of progress toward qualification for taking the NRC SRO exam. The outline of the program is as follows.

1. Self Study Topics

a) Technical Specifications
b) Interlocks and SCRAM Signals
c) Pre-startup Procedures

d) Operating Procedures
e) Emergency Plan and Procedures
f) Administrative Requirements
g) Safety Analysis Report
h) Piping Flow Diagram
i) Personal Safety and Radiation Protection
j) Core Characteristics
k) Building Information

2. Practical Items

a) Orientation Lecture
b) Perform 3 pre-startup checks
c) Perform an exact critical measurement
d) Perform 3 period measurements
e) Simulate dumping water and refilling tank
f) Perform a fine adjustment for the rod position indicators
g) Simulate adjusting the coarse position indicators
h) Perform a walk-through

5. ADMINISTRATION

The administration of the requalification and training program is the responsibility of the Facility Supervisor. The Facility Supervisor conducts all operational tests, oral checkouts and walk-throughs, performs all evaluations and makes up all requalification and training examinations from the NRC SRO Exam Bank.

The facility supervisor shall keep all training and requalification records. Each licensee in the requalification or training program shall have an individual folder for his or her records kept at the RCF or at RPI by the Facility Supervisor.

6. REFERENCES

1. RCF Facility Manuals, Vols I and 2
2. RPI Radiation Safety Regulations and Procedures Part I: Ionizing Radiation
3. Start-Up Test Report for the RPI Critical Facility by Neil Patrou, August 1990.
4. SRO Exam Questions and Answers (SRO Exam Bank)
5. ANSI/ANS-15.4-1988 Selection and Training of Personnel for Research Reactors
6. 10 CFR 55, Operators' Licenses, Paragraphs 53 (Conditions of licenses) and 59 (Requalification).

7. ENCLOSURES

1. Self Study Question Sheets
2. Requalification Sign-Off Sheet
   a) Proficiency Watch/Watch Under Instruction Sign-Off Sheet
   b) SRO Training Sign-Off Sheet

TECHNICAL SPECIFICATIONS

1. What is the definition of the reactor shutdown condition and the reactor secured condition? How do they differ?
2. What is meant by "Readily Available on call?"
3. What are the eight reportable occurrences as defined in the Technical Specifications?
4. How are the surveillance intervals and frequencies defined?
5. What is the safety it on fuel and what is its basis?
6. What is the maximum power level permitted by the license? By the Tech Spec? What is its basis? What is the limit by administrative decree?
7. What is the minimum flux level permitted by the Tech Spec? By administrative decree? What is its basis?
8. What is the minimum period by Tech Spec and what is its basis?
9. What are the nine reactor control and safety system tech specs?
10. What are the minimum safety system channel requirements?
11. What are the minimum number of operable control rods and what is the basis?
12. What is the auxiliary reactor scram and what requirements are placed on it? What is its basis?
13. What are the reactor parameter Tech Specs and what are the bases for them?
14. What are the radiation monitoring Tech Specs and what are their bases?
15. What are the nine Technical Specifications for experiments and what are their bases?
16. What are the surveillance requirements? What are the bases?
17. How much fuel may be stored in each tube in the vault?
18. If a fuel loading for a new core is interrupted for more than four days, what action must be taken?
19. What restrictions apply to fuel removal or replacement for a known system?
20. What are the minimum staffing levels?
21. What events require the direction of the Operations Supervisor
22. Who is responsible for the safe operation of the facility?
23. Who should be on the phone list and where should it be available?
24. What items must be reviewed and approved before Implementation?
25. What actions must be taken if a safety limit is violated?
26. What actions should be taken in the event of a reportable occurrence?

INTERLOCKS AND SCRAM SIGNALS

1. Draw a block diagram of the interlocks controlling rod drive motion.
2. Draw a block diagram of the control instrumentation. Draw a block diagram of the signals that will cause the solenoid interrupt circuit to activate a scram signal.
3. What is the function of the solenoid interrupt circuit?
4. How does a failure of the manual scrams differ from one for the instrument scrams?
5. What actions occur when a scram signal is received?
6. How are these actions affected by by-pass conditions?

PRE-STARTUP PROCEDURES

1. What does the 'Reactor On" switch do?
2. Why is the "Power On" section early in the procedure?
3. How can you tell if the counts taken on the start-up channels are acceptable?
4. What actions are necessary in order to get the dump valve to close?
5. What happens when you turn the water control switch to the "Fill" position?
6. What must be done with the recorders?
7. What are the nominal values for the following in the solenoid interrupt circuit: AC Voltage, DC Voltage, Dump valve current, rod currents?
8. What are the trip points for log power, linear power, and period?
9. What are the nominal readings for the 400 Hz generator i.e. volts, amps, and Hz?
10. What is the minimum water level for performing the interlock check?
11. How far are the rods raised for the scram functional check? What should you observe on this check?
12. What are the settings for the area radiation monitors?
13. What should you observe when the source is moved?
14. How close should the position indicators read?

OPERATING PROCEDURES

1. What must be done after the pre -startup check is completed and before the rods are withdrawn?
2. What should be done as you pull the rods?
3. Under what conditions should the SRO on duty be contacted?
4. How fast do the rods move? How long does it take to completely withdraw a rod?
5. Under what conditions is withdrawal of all rods in a bank permitted?
6. What is the normal operating period?
7. Under what conditions should the rods be inserted?
8. What precautions are taken for accurate exact critical measurements?
9. If a period results from inserting a sample, what is the minimum period allowed?
10. What actions must be taken to shut down the reactor?
11. What actions are taken to secure the reactor?
12. What actions are required when a scram occurs?
13. What are the by-passes and when can they be used?
14. What are the requirements for handling fuel?
15. What special rules apply to control rods?
16. What has to be done before water can be dumped?
17. How do we dispose of water?
18. If we wish to clean the storage pit, what must we do?
19. How many gallons are required to fill the storage tank?
20. What actions should be taken if abnormal reactivity changes are observed?
21. Briefly describe the water dump surveillance procedure.
22. Briefly describe the procedure for rod drop timing. What are the three cables used for?
23. Briefly describe the power calibration.
24. How many SPERT fuel pins may be placed in a storage tube in the vault?

25. What limits apply to the movement or addition of fuel?
26. How is a "known core" defined?
27. Briefly describe the method used for the initial approach to criticality.

EMERGENCY PLAN AND PROCEDURES

1. What are the two classes of emergencies?
2. What is the Emergency Planning Zone?
3. What facilities and equipment are available for emergency response?
4. How is an emergency defined?
5. How are the use of the words "shall", "should", and "may" differentiated in the procedures?
6. What positions are included in the emergency organization for the RCF?
7. What emergency situations constitute each of the two classes of emergencies?
8. The Safety Evaluation Report defines the worst case transient that would release ____ kw of energy and give rise to a fuel temperature rise of _____ degrees C.
9. Power transients from what activating mechanisms were considered?
10. What size fission product release is expected from the worst case transient?
11. Who can declare an emergency and on what basis would it be declared?
12. What action should the reactor operator take if the emergency alarm is sounded?
13. What are the assembly points for an emergency? When is the secondary assembly point used?
14. What steps are generally taken for an emergency?
15. What emergency rules apply to emergency exposures?
16. What are the decontamination procedures?
17. Where should injured personnel be taken? Give the exact location.
18. What is the emergency signal?
19. Where will the emergency control point be setup?
20. What approvals are required before the RCF may be restored to an operating status?
21. What actions are to be taken in each of the following emergencies: a. Power Failure, b. Smoke or Fire, c. Bomb Threat, d. Civil disorder, e. Water Leak, f. Human Injury?
22. What constitutes a radiological emergency?
23. Who must be notified in a radiological emergency?
24. Briefly describe the emergency procedures for each of the following radiological emergencies?
    a. Scram
    b. Spill
    c. Contaminated Moderator
    d. Clad rupture
    e. Radiation Emergency

25. What emergency equipment is available and where is it located?
26. How often are emergency drills required?
27. What are the reporting requirements for each of the four categories of emergencies? Give the time limitations.
28. What emergencies fall in each of the four categories?

ADMINISTRATIVE REQUIREMENTS

1. What is the NSRB?
2. What are the duties of the NSRB?
3. What are the responsibilities of the Reactor Supervisor?
4. What are the duties of the Facility Director?
5. Give the organization chart for the RCF.
6. What are the responsibilities of the Director, Radiation and Nuclear Safety?
7. Who is responsible for training?

SAFETY EVALUATION REPORT

1. What are the prevailing wind directions at the site?
2. What is the elevation of the site?
3. What is the maximum flood level observed since 1939?
4. For the reactor operating at 200 watts and an insertion of $0.60 as a step, what is the prompt jump power and the peak power?
5. What was the fuel temperature rise for the above transient?
6. What was the increase for the moderator temperature for the above transient?
7. What is the effective neutron lifetime for the LEU core?
8. What is the % uncertainty in the power calibration for the LEU core?
9. Explain why normal operations can be performed safely when a positive temperature coefficient of reactivity exists?
10. How much does the Doppler coefficient reduce the core reactivity between ambient and 100 degrees F?
11. Why is 2000 degrees C chosen for the limit on fuel temperature during accident transients?
12. Why is the loss of coolant accident unimportant for the RCF?
13. What accident scenario was assumed for the fuel element failure accident?
14. What is the extent of the I 131 release for the fuel element failure accident?
15. If all the noble gaseous fission products escaped for the fuel element failure accident, what would be the maximum total thyroid dose off -site?

PIPING FLOW DIAGRAM

1. Be able to draw the piping flow diagram.
2. What two methods may be used to open the dump valve?
3. Which valves are normally open?
4. Which valves are normally closed?
5. Which valves are normally locked?
6. Using your piping diagram, show what valve lineup would be used to add water to the storage tank.
7. Where is the city water supply valve located?
8. Using your piping diagram, show the valve lineup that would be used to send water to the river.
9. Where are the locked valves located?

10. Draw a diagram showing how the new tanks for the boron solution experiments will be connected.

PERSONNEL SAFETY AND RADIATION PROTECTION

1. Where is the hottest spot outside the high bay area while the reactor is operating?
2. Where is the hottest spot when the reactor is shutdown? Where are the hottest spots outside the building when the reactor is operating?
3. What is the A LARA concept and how is it used at the RCF?
4. What three methods are used to control radiation exposures?
5. What is the definition of the rad? The rem?
6. How does the rem relate to the rad?
7. What is the RBE?
8. Explain how a TLD is used to measure radiation exposures.
9. What is different about the LiF TLD's compared to the CaF2 TLD's?
10. What survey instruments are available at the RCF and when should each be used?
11. What precautions should be taken to avoid getting inaccurate dose rate readings?
12. What is the RPI maximum annual whole body exposure limit?
13. What exposure level must be reported to the Campus Radiation Safety Officer?
14. What is the function of the Office of Radiation and Nuclear Safety (ORNS)?
15. What RCF changes must be reported to ORNS?
16. What exposure levels require the wearing of a personnel monitoring device? How do these requirements apply to visitors?
17. What are the requirements for transporting radioactive materials between RPI buildings?]
18. What are the requirements for leak testing sealed sources? Who does this?
19. If we generated any radioactive waste, how would we dispose of it?
20. How frequently must a training course in radiation protection be taken?

CORE CHARACTERISTICS

For the installed core:

1. What is the pellet density?
2. What is the uranium enrichment?
3. What is the uranium content of each pin?
4. What is the active fuel length?
5. What is the overall length of a pin?
6. What is the outer diameter of a pin?
7. What is the inner diameter of a pin?
8. What is the pitch?
9. What is the core average void coefficient?
10. What is the 3 rod shutdown? 4 rod shutdown?
11. What is the worth of the center pin vs. water? Peripheral pin?
12. What is the temperature coefficient at 50F? 64F?
13. What is the reactivity effect of raising the temperature from 50 to 64F?
14. What is the maximum differential control rod worth for a single rod? For a bank of 4 rods?

BUILDING AND CORE MECHANICAL INFORMATION

1. Describe the core support structure.
2. Describe the fuel storage structure inside the vault.
3. What are the shape and dimensions of the control rods?
4. What is the composition of the control rods?
5. How thick are the concrete walls of the reactor room?
6. What is the roof construction?
7. What is the capacity of the storage tank?
8. What is the diameter of the dump line?
9. Describe the construction of the fuel pins.
10. Approximately what thickness of water surrounds the core and acts as a biological shield?
11. What is the maximum k-effective for the vault when fully loaded and under water?
12. What means are provided to remove particulate activity from the reactor room? What is its capacity and where is it located?
13. How are the control rod drives supported?
14. How soon does the moderator dump add negative reactivity?
15. What is the composition and strength of the source?
16. How thick is the paraffin surrounding the source when it is stored?
17. Describe briefly the electrical power system.
18. Describe briefly the ventilation system.
19. How are the doors into the reactor room sealed?
20. Where is the Nuclear Accident Dosimeter located?
21. What instrument serves as the criticality monitor? What is its function?
22. Who is the building coordinator for the Walthousen Lab?

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REACTOR CRITICAL FACILITY
REQUALIFICATION PROGRAM
REQUALIFICATION SIGN-OFF SHEET

FACILITY SUPERVISOR'S VERIFICATION:

My initials in the initial space next to the individual topic listings verify that _____ has demonstrated a level of knowledge satisfactory for requalification in the initialed topic area.

Requalification Start Date _____

Expected Requalification Completion Date (2 years from above) _____

RCF Supervisor

_____
Print name

_____ _____
Sign Date

Self Study Topics:	Initials	Date
Technical Specifications	_____	_____
Interlocks and Scram Signals	_____	_____
Pre-Startup Procedures	_____	_____
Operating Procedures	_____	_____
Emergency Plan and Procedures	_____	_____
Administrative Procedures	_____	_____
Safety Analysis Report	_____	_____
Piping Flow Diagram	_____	_____
Personal Safety and Radiation Protection	_____	_____
Core Characteristics	_____	_____
Building Information	_____	_____

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REACTOR CRITICAL FACILITY
REQUALIFICATION PROGRAM
PROFICIENCY WATCH/WATCH UNDER INSTRUCTION SIGN-OFF SHEET

PROFICIENCY REQUIREMENTS:

All SROs at the RPI RCF shall actively perform the duties of an SRO for a minimum of four hours per calendar quarter. If that requirement is not met, the Facility Supervisor must certify by his initials on this sign-off sheet the licensee's status and qualification at the RCF are current and valid, and that the licensee has completed at least six hours of watch under instruction.

Calendar quarters are as follows:

First quarter:	January	February	March
Second quarter:	April	May	June
Third quarter:	July	August	September
Forth quarter:	October	November	December

PROFICIENCY WATCH			WATCHUNDER INSTRUCTION		
Facility Supervisor's Initials	Length of Watch hours	Date	Facility Supervisor's Initials	Length of Watch hours	Date

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REACTOR CRITICAL FACILITY
SRO TRAINING SIGN-OFF SHEET

Self Study Topics:	Initials	Date
1. Technical Specifications	_____	_____
2. Interlocks and scram signals	_____	_____
3. Pre-startup procedures	_____	_____
4. Operating procedures	_____	_____
5. Emergency plan and procedures	_____	_____
6. Administrative requirements	_____	_____
7. Safety Analysis Report	_____	_____
8. Piping Flow Diagram	_____	_____
9. Personal Safety and Radiation Protection	_____	_____
10. Core Characteristics	_____	_____
11. Building Information	_____	_____
Practical Items:		
1. Orientation Lecture	_____	_____
2. Prestartup checks	_____	_____
a)	_____	_____
b)	_____	_____
c)	_____	_____
3. Exact critical measurement	_____	_____
4. Period measurements	_____	_____
a)	_____	_____
b)	_____	_____
c)	_____	_____
5. Water Replacement	_____	_____
6. Fine adjustment on position indicators	_____	_____
7. Coarse adjustment on position indicators	_____	_____
8. Walk Through	_____	_____