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SCHOOL OF NUCLEAR ENGINEERING

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Document Control Desk
US Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

50-182

Attn: Ms. Cindy Montgomery, Research and Test Reactors

Subject: Explanation of Technical Specification Changes and Emergency Operator Action

Dear Ms. Montgomery,

This letter contains a brief summary of the changes that have been made to the PUR-1 Technical Specifications in support of the relicensing and power uprate of the facility as well as a note about proposed actions during a radioactive release. The relicensing and power uprate will allow the PUR-1 facility to expand its research space through a tenfold increase in neutron flux and enhance its teaching mission through the demonstration of more reactor principles.

All changes in the first section are to align the definitions with those provided in ANSI/ANI-15.1-2007. Some definitions are omitted or altered to provide a set of terms which are both facility specific, non-redundant, and are used within the body of the document. An example of this change is the defined Power Level. Similarly, the body of the document contains editorial changes intended to improve readability.

Throughout the document, some text has been repositioned in an effort to be more clear as to the purpose or role of certain text. An example of this re-alignment is in Section 2.1 which has placed the discussion of Safety Limit in the Basis rather than as an opening paragraph.

Throughout the document, the change of power is also noted and associated changes in related parameters included. The requested power level scram is at 12.0 kW rather than the old power level.

Specification 3.2.d has been added to require the capability of the pool top radiation monitor to notify off-site personnel of a potential radiation alarm when the facility is unattended. This Technical Specification ensures the dose given to a member of the public remains below the limits as set forth in 10 CFR Part 20.

Table I changes are to indicate the value at which a Scram, setback, or interlock shall happen. The change includes the range of values at which the action should occur such as a period of "7 seconds or greater". This change ensures uniform interpretation by the regulator and licensee. Table I also indicates those setpoints previously not credited for in the Safety Analysis Report. Table II has added a note which indicates and references the change in 3.2.d.

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Specification 3.3.d has been edited for several purposes. The first is to remove the requirement of monitoring the pH of the primary coolant. Analysis has shown that monitoring the conductivity of the coolant will indicate abnormal pH levels. A requirement for the water coolant height has been clarified to be while the reactor is operating or, alternatively, to be at a height to keep radiation levels low enough to ensure compliance with 10 CFR Part 20. A water coolant temperature limit has been added to align with the safety analysis. Finally, a clarification has been added which states that the coolant radiation levels shall not exceed those in Appendix B of 10 CFR 20.

Specification 3.4.d places a limit on the concentration of Argon-41 being exhausted to the environment. This ensures 10 CFR Part 20 compliance. Specification 3.4 contains statements of "shall" which have been changed from "will". Similar changes exist throughout the document to indicate compulsory action compared to those which are optional. Specification 3.4 also contains some minor clarification statements bringing the language to modern usage standards.

Specification 3.5 has removed the limit on temperature of an experiment as that specification can be administratively covered by the facility or would fall under other requirements. Additionally, former language was unclear as to the radioactive content of experiments which could be used. This language has been cleaned and re-written as Specifications 3.5.e and 3.5.f respectively.

Specification 3.6 has been added and contains specifications which were formerly located in other portions of the document.

Specification 4.1 has been amended to have surveillance periods commensurate with intervals suggested to the facility. Additionally, the requirement to measure worth of rods in the first start-up following a core change has been clarified.

Specification 4.2 has been changed to clarify when calibrations must be performed as well as to bring the periodicity to industry standards. Similar changes to intervals were made throughout the document. 4.2.e has been added to give surveillance to requirements in Specification 3.

Specification 4.3 has included a requirement for the coolant temperature to be recorded in the log book at no interval to exceed four hours when any shim-safety is higher than 6 cm in order to provide surveillance to Specification 3.

Specification 4.4 has removed the requirement to inspect representative fuel assemblies as this requirement is located in Section 4.6.

Specification 4.5 has been clarified and combined from other sections in the former Technical Specifications to provide uniform interpretation.

Specification 4.7 clarifies dosimetry locations to ensure 10 CFR Part 20 limits are met.

The entirety of the Section 5 changes are to better match the facility as currently designed and under which the Safety Analysis Report has been prepared. This section also contains numerous clarifications of compulsory actions by stating the Specifications as "shall" statements.

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Section 6 was completely re-written to align with the guidance in ANSI/ANS-15.1-2007 and ensure that the administrative controls over the facility ensure safety, are clear in their requirements, and that the line management is well specified.

Finally, thorough analysis, it was determined that the dose from an accident to a member of the public would be minimized by leaving the reactor room fan on and venting contaminated reactor room air to the atmosphere where it can disperse to safe levels. This proposal has been changed in the internal Reactor Operator Emergency Procedure guide sheet which is attached to this submission as an example.

Should you have any questions or require further information, please don't hesitate to call me at 765-494-5764, or email me at clive@purdue.edu.

I hereby certify under penalty of perjury with my signature below that the information contained in this submission is true and correct to the best of my knowledge.

Clive Townsend
PUR1, Reactor Supervisor
Purdue University

Attachments:

PUR-1 Emergency Procedure Guide

cc: Leah Jamieson, Dean, Purdue University College of Engineering
Jim Schweitzer, Purdue University Radiation Safety Officer, CORO Chair
Klod Kokini, Interim Head, Purdue School of Nuclear Engineering

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EMERGENCY PROCEDURE (911, Cell 765-494-8221)

EMERGENCY DIRECTOR

As the Reactor operator (RO) you are by definition the Emergency Director (ED). As you are required to call backup in the form of the 'SRO on call', assistant LD, and the LD. They become the ED as they arrive on the scene and relieve the former ED. The ED has ultimate authority over all onsite (Nuclear Engineering basement lab area) activities and personnel. ED will activate that portion of the organization necessary to respond to the emergency situation. The ED shall brief arriving responders (other Reactor operations staff, the next or arriving ED, PUPD, PUFD, REM, and etc.). The action to be taken next depends on the nature of the emergency. No procedure can cover all possible situations. 1.) Protect personnel 2.) Protect property and equipment.

COMMUNICATION

Communication will be by telephone, short wave radio, public address system or word of mouth, as appropriate. The communication signal for facility evacuation is one blast of an evacuation horn.

SETBACK BY INSTRUMENTATION

If there is an automatic 'setback' by the Reactor instrumentation and the operator recovers without a Scram. The operator will log the event into the log book. Unless standing orders or procedures require otherwise the operator may recover and continue to operate as with a normal run.

SCRAM BY INSTRUMENTATION

The Reactor will Scram automatically (Trip) when one of the preset safety parameters is exceeded (see 'Setpoint' Table 1 Tech. Spec.). Follow with a manual scram. The annunciator board will indicate the source of the Scram. The time and reason for the Scram must be recorded in the Reactor Log Book. Normal shutdown procedure should be followed after the scram. The operator should make an effort to 'Secure' the Reactor as usual. The SRO on call must be notified. The Reactor may not be restarted after a Scram unless an SRO is present. Consult the flow chart 'Operational Procedure Following a Scram' for guidance in assessment and restarting the Reactor.

'NON – REACTOR SAFETY RELATED EVENT' and SHUTDOWN

If there is a 'Non-Reactor Safety Related Event', CIVIL DISTURBANCE, non-Reactor specific BOMB THREAT, INJURY with or without contamination, minor non-Reactor related FIRE, minor non-Reactor related EXPLOSION, or facility or individual CONTAMINATION, the Reactor may be shutdown using 'Gang lower' or Scram to reallocate personnel or due to injuries to a key individual or event escalation.

A. Non-Reactor Safety Related Event and Shutdown.
   The Reactor operator (ED):
   - a.) May 'Gang lower' or Scram the Reactor if necessary.
   - b.) Will log the event in the log book then follow the normal shutdown procedure.
   - c.) If evacuation is necessary, may sound the evacuation horn and/or use word of mouth to notify others. All contaminated articles should be left in the Reactor room.
   - d.) Will notify the SRO on call.
   - e.) Should: Call REM, PUFD, ambulance, and/or PUPD as the situation warrants (911, cell 494-8221). Use the Emergency Roster as necessary.
   - f.) Advise PUPD as necessary.
   - g.) Control access to any spill.

h.) Will monitor all personnel for contamination and determine the necessity of further restriction of movement. Segregate contaminated or potentially contaminated personnel. Record data (readings, dosimeters, make a map as necessary, etc.) as time permits.

i.) Will notify the LD.

j.) The nature and extent of the accident will be ascertained and necessary action taken. [Use the Emergency Procedure in the Purdue Radiation Safety Manual, or Chemical Hygiene Plan and Hazardous Materials Safety Manual for guidance.]

'NOTIFICATION of UNUSUAL EVENT' and EMERGENCY SHUTDOWN

If there is a 'Notification of Unusual Event', if the Reactor is not functioning in a safe manner, or in accordance with the procedure of the prescribed experiment, or in case of BOMB threat with possible RADIOLOGICAL RELEASE, FIRE or EXPLOSION in the building with possible REACTOR INVOLVMENT, AIRBORN CONTAMINATION, a RADIOACTIVE SPILL with Reactor involvement, EXPERIMENT FAILURE with Reactor involvement, TORNADO TOUCHDOWN with possible Reactor involvement, NUCLEAR INCIDENT, or other Reactor involved EMERGENCY, RAM alarm, or CAM alarm, the Reactor may be SCRAMMED.

Our E-plan states that: 'it (Notification of Unusual Event) may warrant an immediate shutdown of the Reactor or interruption of routine functions'. As a general rule for Notification of Unusual Event the Reactor would be shutdown. Specifically for Notification of UE: 'Bomb Threat', Fire, and/or Explosion 'the Reactor will be shutdown and all persons evacuated'. For Notification of UE: 'Tornado' the Reactor will be shutdown and secured, 'then report to a sheltered area'.

TO SCRAM THE REACTOR depress the large red Scram button on the annunciator panel or the Scram button just outside the door of the Reactor room.

IF THE REACTOR FAILS TO SCRAM or SHUTDOWN open the two containers of BORIC ACID and invert them over the Reactor pool. The boric acid is kept on top of the Reactor console and is plainly marked.

SCRAM and EVACUATION

B. If airborne contamination is eminent, suspected, or indicated (CAM or RAM alarm). The Reactor operator (ED) shall:

a.) Scram the Reactor.

b.) Sound the evacuation horn and use word of mouth to notify others.

c.) Evacuate the room through the exit involving the least exposure to the spill. All contaminated articles should be left in the Reactor room.

d.) Control access to the Reactor room.

e.) Verify that all personnel are present.

f.) Will monitor all personnel for contamination and determine the necessity of further restriction of movement. Segregate contaminated or potentially contaminated personnel. Record data (readings, dosimeters, make a map as necessary, etc.) as time permits.

g.) Notify the SRO on call, RSO, PUPD, and LD. Call PUFD, ambulance, and/or PUPD as the situation warrants (911, cell 494-8221). Use the Emergency Roster as necessary.

h.) The nature and extent of the accident will be ascertained and necessary action taken.

In all cases, it is up to the Reactor operator (RO)/Emergency Director (ED) to act as the emergency requires. The ED should take more drastic or less drastic action as his/her appraisal of the situation indicates is required. For emergencies not explicitly described here the ED will have to improvise a procedure. The ED should take precautionary and corrective steps to prevent the escalation of the event or to mitigate the consequences thereof. The ED should follow the general guidelines indicated in the procedures discussed here.