

Docket No. 50-225

July 30, 1984

DISTRIBUTION:

Docket File

Dr. Donald R. Harris, Director
Critical Facility
Department of Nuclear Engineering
and Science
Rensselaer Polytechnic Institute
Troy, New York 12181

NRC PDR
PRC System
SSPB R/f
PAnderson
HBernard
HBerkow
OELD

Dear Dr. Harris:

The staff has completed its initial review of the proposed Rensselaer Polytechnic Institute research reactor revised emergency plan submitted on February 6, 1984. The plan was reviewed against the requirements of Appendix E to 10 CFR Part 50, the guidance criteria set forth in Revision 1 to Regulatory Guide 2.6 and ANSI/ANS-15.16-1982, "Emergency Planning for Research Reactors." Non-power reactor licensees were requested by generic letter dated June 16, 1982 to use these documents to meet the requirements of the amended emergency planning regulations.

Based on its review, the staff has concluded that the proposed Rensselaer Polytechnic Institute emergency plan does not yet fully satisfy the requirements of the guidelines of the above-mentioned documents. Accordingly, we request that you revise the plan to include the additional information identified in the enclosed staff Emergency Plan Review within 60 days of the date of this letter. Following receipt of your revisions, the staff will continue its review. If you have any questions, please contact Harold Bernard, our Project Manager for your facility, at (301) 492-9799.

The reporting and/or recordkeeping requirements contained in this letter affect fewer than ten respondents; therefore, OMB clearance is not required under P.L. 96-511.

Sincerely,

Original signed by
Cecil O. Thomas, Chief
Standardization & Special
Projects Branch
Division of Licensing

Enclosure:
As stated

cc: See next page

SSPB:DL
PAnderson:kab
7/27/84

SSPB:DL
HBernard
7/30/84

SSPB:DL
HBerkow
7/30/84

SSPB:DL
COT
7/30/84

8408070097 840730
PDR ADDCK 03000225
F PDR



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

July 30, 1984

Docket No. 50-225

Dr. Donald R. Harris, Director
Critical Facility
Department of Nuclear Engineering
and Science
Rensselaer Polytechnic Institute
Troy, New York 12181

Dear Dr. Harris:

The staff has completed its initial review of the proposed Rensselaer Polytechnic Institute research reactor revised emergency plan submitted on February 6, 1984. The plan was reviewed against the requirements of Appendix E to 10 CFR Part 50, the guidance criteria set forth in Revision 1 to Regulatory Guide 2.6 and ANSI/ANS-15.16-1982, "Emergency Planning for Research Reactors." Non-power reactor licensees were requested by generic letter dated June 16, 1982 to use these documents to meet the requirements of the amended emergency planning regulations.

Based on its review, the staff has concluded that the proposed Rensselaer Polytechnic Institute emergency plan does not yet fully satisfy the requirements of the guidelines of the above-mentioned documents. Accordingly, we request that you revise the plan to include the additional information identified in the enclosed staff Emergency Plan Review within 60 days of the date of this letter. Following receipt of your revisions, the staff will continue its review. If you have any questions, please contact Harold Bernard, our Project Manager for your facility, at (301) 492-9799.

The reporting and/or recordkeeping requirements contained in this letter affect fewer than ten respondents; therefore, OMB clearance is not required under P.L. 96-511.

Sincerely,

Cecil O. Thomas

Cecil O. Thomas, Chief
Standardization & Special
Projects Branch
Division of Licensing

Enclosure:
As stated

cc: See next page

Rensselaer Polytechnic Institute

50-225

cc w/enclosure(s):

Mayor of the City of Schenectady
Schenectady, New York 12305

New York State Department of
Environmental Conservation
ATTN: Director, Office of
Environmental Analysis
Albany, New York 12223

New York City Department of Health
ATTN: Public Health Library
125 Worth Street
New York, New York 10013

Mr. Frank Wicks
Department of Nuclear Engineering
and Science
Rensselaer Polytechnic Institute
Troy, New York 12181

Attorney General
Department of Law
State Capitol
Albany, New York 12224

Director, Technical Development Programs
State of New York Energy Office
Agency Building 2
Empire State Plaza
Albany, New York 12223

RENSSELAER POLYTECHNIC INSTITUTE

DOCKET NO. 50-225

REQUEST FOR ADDITIONAL INFORMATION

JULY 1984

REQUEST FOR ADDITIONAL INFORMATION

INTRODUCTION

Rensselaer Polytechnic Institute filed with the Nuclear Regulatory Commission a revised emergency plan, dated February 1984, for a facility licensed pursuant to Title 10, Code of Federal Regulations, Part 50. This report provides an evaluation of the revised emergency plan for the research reactor, License No. CX-22, at Rensselaer Polytechnic Institute.

The revised plan was reviewed against the requirements of Appendix E to 10 CFR Part 50. In addition, the staff review extended to ascertaining the degree of conformance with the guidance criteria set forth in Revision 1 to Regulatory Guide 2.6 and American National Standard ANSI/ANS-15.16 as a method acceptable to the NRC staff for compliance with specific parts of the Commission's regulations.

CONCLUSIONS

Based on our review, the staff concludes that the revised emergency plan does not completely address the previously identified improvement items (letter from C. Thomas: November 7, 1983). The licensee is directed to a recent Information Notice, No. 83-66, Supplement 1 for a discussion of the type of emergency which can be experienced at a critical facility. Proper planning for radiological emergencies can create a high order of preparedness and ensure an orderly and timely decisionmaking process at the time of an emergency.

Section 3.5, Emergency Action Levels

1. Provide sufficient information to allow the reactor operator to classify an emergency. For example, the first statement in Section 7 constitutes an acceptable EAL.

Section 3.6, Emergency Planning Zones

1. Use the guidance provided in Table 2, of ANSI/ANS-15.16-1982 to define an emergency planning zone.

Section 3.7, Emergency Response

1. Include a description of the conditions for either partial or complete onsite evacuation, evacuation routes, assembly areas, and the methods to assure personnel accountability and the segregation of potentially contaminated personnel.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, DC 20555

May 25, 1984

IE INFORMATION NOTICE NO. 83-66, SUPPLEMENT 1: FATALITY AT ARGENTINE CRITICAL FACILITY

Addressees:

All nuclear power reactor facilities holding an operating license (OL) or construction permit (CP) and nonpower reactor, critical facility, and fuel cycle licensees.

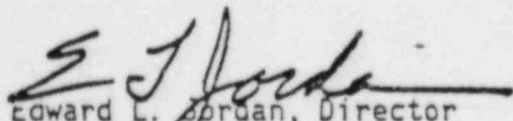
Purpose:

This information notice is a supplement to IE Information Notice No. 83-66, issued on October 7, 1983. It is expected that nonpower reactor, critical facility, and fuel cycle licensees will review the information for applicability to their facilities. No specific action or response is required.

Description of Circumstances:

The Argentine National Atomic Energy Commission [Comision Nacional de Energie Atomica, (CNEA)] provided the NRC Office of International Programs with the written report documenting the results of the Commissions investigation and evaluation of the September 23, 1983 RA-2 accident near Buenos Aries. A translated copy of the CNEA report is attached.

No response to this information notice is required. If you have any questions regarding this matter, please contact the Regional Administrator of the appropriate NRC Regional Office or this office.


Edward L. Jordan, Director
Division of Emergency Preparedness
and Engineering Response
Office of Inspection and Enforcement

Technical Contact: J. E. Wigginton
(301) 492-4967

Attachments:

1. CNEA Report
2. Figure 1 Fuel Element
3. Figure 2 RA-2 reactor facility
4. Figure 3B Modified core configuration
5. List of Recently Issued IE Information Notices

~~8405240317~~

REPORT OF THE ACCIDENT THAT OCCURRED TO THE
CRITICAL ASSEMBLY RA-2 REACTOR ON SEPTEMBER 23, 1984

1. Description of the Installation

The RA-2 is a critical assembly reactor operating at 0.1 watt of rated power. It has been in operation since 1966 and is used to conduct experiments with various core configurations. For experiments, the core assembly can be relocated and/or modified. The core consists of MTR-type fuel elements and control rods. The fuel elements are MTR-type, 90% enriched uranium and consist of 19 fuel plates (see Figure 1). The control rods consist of fuel elements in which four of the fuel plates are replaced with two cadmium plates. Demineralized water is the moderator; and demineralized water and graphite constitute the reflector.

The installation is shown in Figure 2.

2. The Accident

On Friday afternoon September 23, 1983, a modification of the core configuration had been scheduled so that an experiment using the pulsed source technique could be conducted. Figure 3A shows the initial core configuration and Figure 3B shows the configuration as it was to be modified. The operating procedure requires the complete removal of the moderator. However, this was only partially done. A short time afterwards, when the exchange operations were being carried out, a criticality excursion occurred.

The operator, who was the only person present in the containment, was fatally exposed; other persons, who were in the control room and other adjacent premises were exposed, but to a much lesser degree.

3. Analysis of the Accident

The President of the Comision Nacional de Energia Atomica (CNEA) (National Atomic Energy Commission, Argentine) appointed an ad hoc commission to investigate the accident. The conclusions of this commission indicate that the basic causes of the accident were as follows:

- (a) The moderator was not completely removed from the core before the core configuration was modified.
- (b) Two fuel elements, which should have been removed, were left inside the reactor in contact with the graphite reflector.

- (c) Sequences were performed to change the positions of fuel elements; this decreased the subcriticality of the system.
- (d) Two fuel elements of 15 plates were inserted without the corresponding cadmium control plates. The second fuel element was found to be only partially inserted, wherefore it is deemed that its insertion caused the accident.
- (e) All of the operations were performed without the concurrence or presence of a safety official or the operations supervisor.

The evolution of the power and the magnitude of the released energy are still being investigated. Notwithstanding, it is estimated that the excursion was about 10 megajoules, which is equivalent to approximately 3×10^{17} fissions, which occurred during a few tens of milliseconds.

Also, the ad hoc commission identified shortcomings in the installation and operational procedures, as well as in the way approval was obtained and supervision of the experiments was carried out. Because the reactor had been operating for so many years without incident, an excessive degree of confidence had been fostered in regard to minor operations. In addition, other more urgent requirements of the nuclear program took precedence.

4. Dosimetric and Medical Evaluation

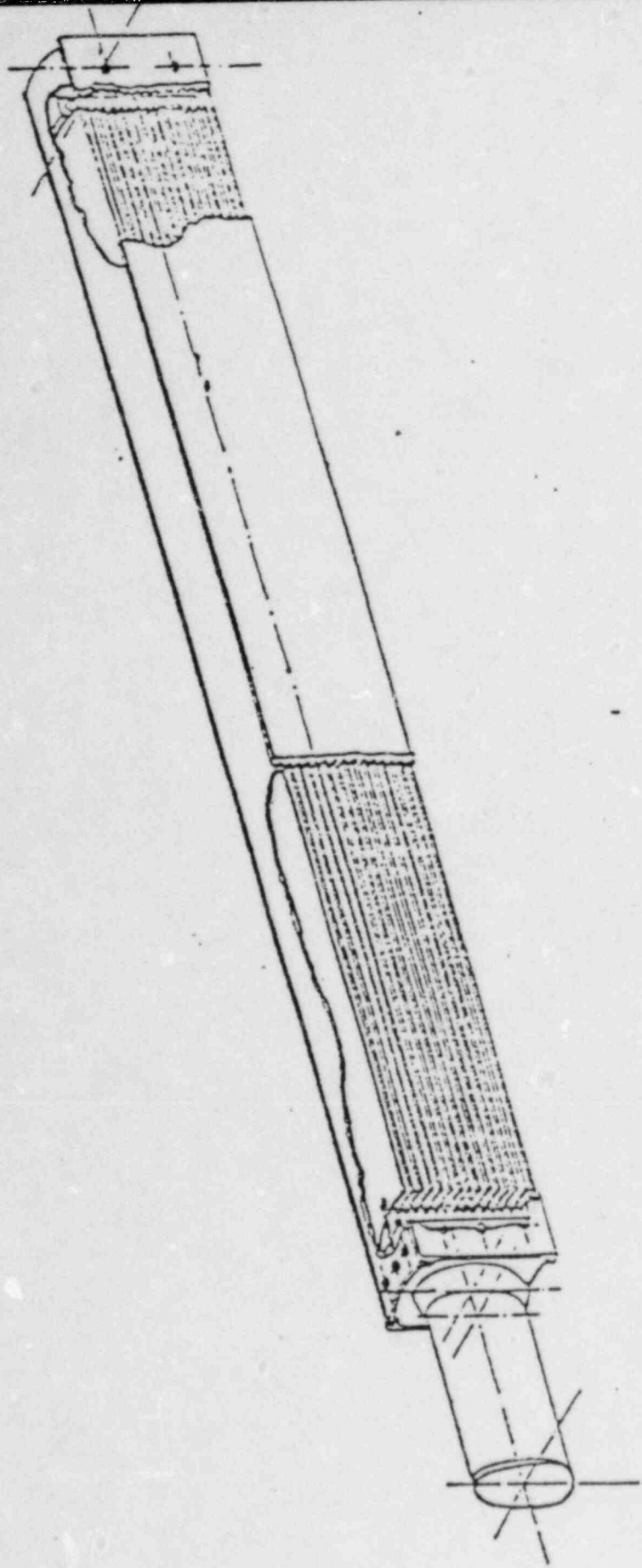
The dosimetric evaluations were based on (1) measurements of Na-24 to determine whole-body dose and of P-32 from samples of hair, (2) the gamma spectrometry analysis of the activated metal elements carried by the affected persons, and (3) the readings of the radiothermoluminescent and criticality dosimeters installed in the building.

The doses received by the exposed persons are as follows:

- (a) The operator received a lethal, absorbed dose of about 2000 rads of gamma radiation and 1700 rads of neutrons, which precluded any effective therapeutic measures. The amount of P-32 (resulting from the sulfur activation) found in samples of body hair and the operator's woolen clothing, as well as the clinical manifestations, showed that the exposure had been very nonhomogeneous; the doses received on the upper right side of the body were higher than those elsewhere. Approximately 25 minutes after the accident, the operator showed signs and symptoms (vomiting, migraine headache, and diarrhea) of acute exposure over the entire body. His condition became worse the next day when he suffered gastrointestinal disorders. Then early on September 25, neurological and respiratory disorders (radiopneumonitis in the right lung) and edema of the right hand and forearm manifested themselves. Death occurred at 16:45 on the same day.

- (b) Two persons in the control room at the time of the accident received doses of about 15 rads of neutrons and 20 rads of gamma. At present, they are under medical supervision and have not shown any clinical signs.
- (c) Five persons received a dose ranging from 4 to 8 rads of neutrons and 7 to 10 rads of gamma. They also are under medical supervision.
- (d) One person received a dose of about 1 rad of neutrons and 0.4 rad of gamma. Nine other persons received doses below 1 rad.
- (e) The doses received by the affected personnel also are being measured by biological dosimetry techniques.

FUEL ELEMENT

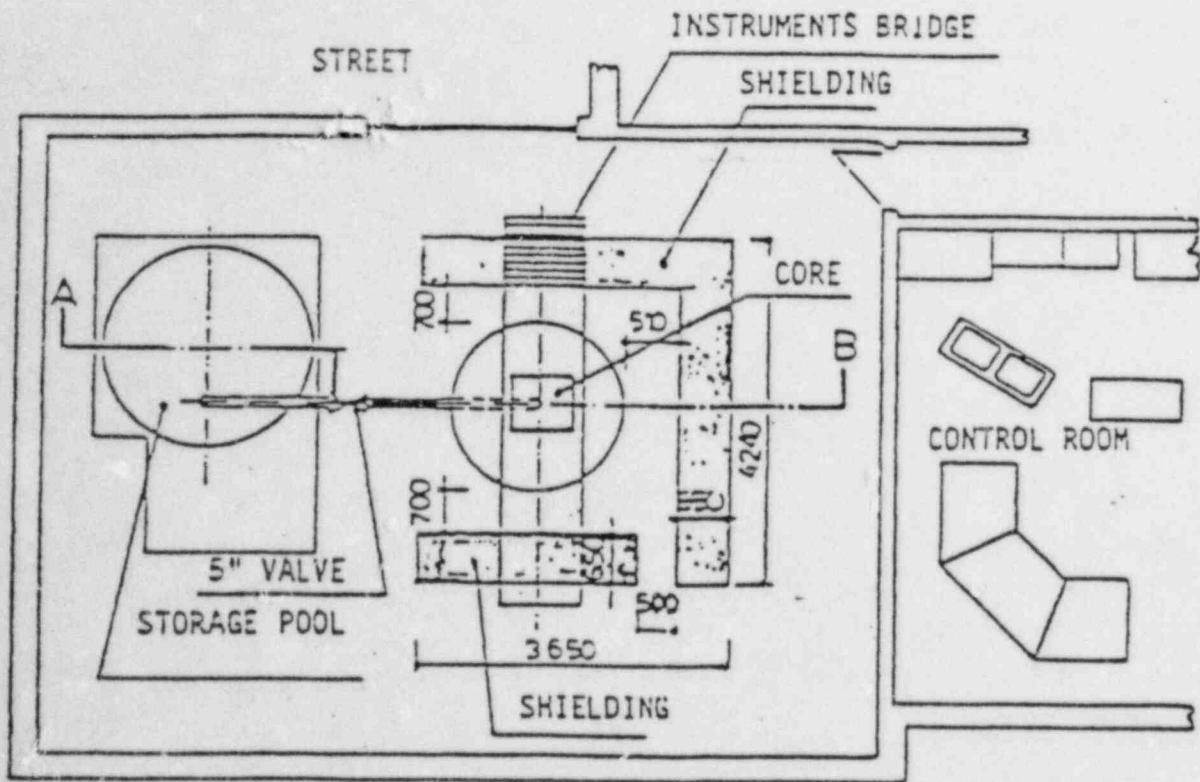


ESC. 1

Figure 1 Fuel element

Attachment 2
IN 83-66 Supp 1
May 25, 1984

DIAGRAM OF THE INSTALLATION



POWER PLANT

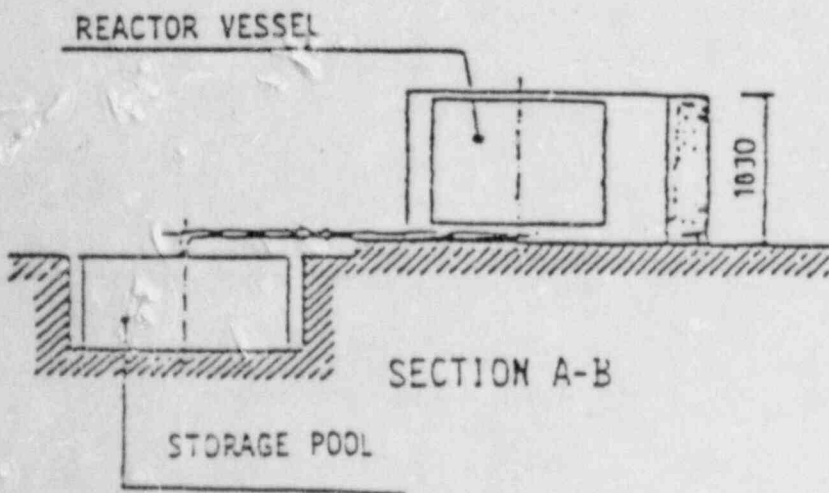
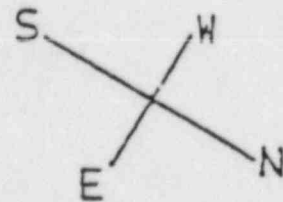


Figure 2 RA-2 reactor facility

CONFIGURATION A (Initial)

	G	G	G	G	G	G	G		
	G	C	C	BC	C	C	G		
	G	C	C	C	C	C	G		
	G	C	C	C	C	C	G		
	G	C	C	BC	C	C	G		
	G	G	G	G	G	G	G		

Figure 3A Initial core configuration

CONFIGURATION B (solicited)

	G	G	G	G	G	G	G		
	G	BC	C	C	C	BC	G		
	G	C	C	C	C	C	G		
	G	C	C	C	C	C	G		
	G	BC	C	C	C	BC	G		
	G	G	G	G	G	G	G		

- C FUEL ELEMENT
- G GRAPHITE
- BC FUEL ELEMENT WITH CONTROL PLATES

Figure 3B Modified core configuration

LIST OF RECENTLY ISSUED
 IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
84-39	Inadvertent Isolation of Spray Systems	05/25/84	All power reactor facilities holding an OL or CP
84-38	Problems With Design, Maintenance, and Operation of Offsite Power Systems	05/17/84	All power reactor facilities holding an OL or CP
84-37	Use of Lifted Leads and Jumpers During Maintenance or Surveillance Testing	05/10/84	All power reactor facilities holding an OL or CP
84-36	Loosening of Locking Nut on Limitorque Operator	05/01/84	All power reactor facilities holding an OL or CP
84-35	BWR Post Scram Drywell Pressurization	04/23/84	All power reactor facilities holding an OL or CP
84-34	Respirator Users Warning: Defective Self-Contained Breathing Apparatus Air Cylinders	04/23/84	All power reactor facilities holding an OL or CP; research and test; fuel cycle; and Priority 1
84-33	Main Steam Safety Valve Failures Caused By Failed Cotter Pins	04/20/84	All power reactor facilities holding an OL or CP
84-32	Auxiliary Feedwater Sparger Pipe Hanger Damage	04/18/82	All power reactor facilities holding an OL or CP. for
84-31	Increased Stroking Time of Bettis Actuators Because of Swollen Ethylene-Propylene Seals and Seal Set	04/18/84	All power reactor facilities holding an OL or CP
84-30	Discrepancies in Record Keeping and Material Defects in Bahnson Heating, Ventilation, and Air Conditioning Units	04/18/84	All power reactor facilities holding an OL or CP

OL = Operating License
 CP = Construction Permit