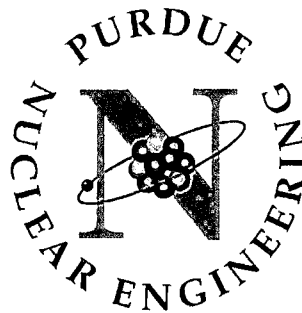


**EMERGENCY PLAN**  
for the  
**PURDUE UNIVERSITY REACTOR**  
**PUR-1**

**30 June 2008**



**West Lafayette, Indiana 47907**

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# **1. INTRODUCTION**

## **1.1 Application**

This emergency plan applies to the Purdue University Reactor (PUR-1) facility. The PUR-1 is licensed pursuant to title 10 Code of Federal Regulations, Chapter 1, Part 50, as a pool-type nuclear reactor, Facility Operating License No. R-87, (Docket No. 50-182). The PUR-1 reactor is owned and operated by Purdue University through the School of Nuclear Engineering.

Purdue University has a campus-wide emergency plan which is intended to integrate radiological emergency planning at all campus facilities using radioactive materials or radiation producing devices. The PUR-1 Emergency Plan is an integral part of the Purdue University campus wide emergency plan and specifies the objectives and implementing procedures to be followed for emergency situations occurring at the reactor facility.

## **1.2 Objective**

The objective of this emergency plan is to establish guidelines and designate areas of responsibility for the PUR-1 staff should an accident or incident occur at the reactor that may affect the public health and safety. Additionally, the plan identifies the offsite support organizations that may be activated if required.

## **1.3 Site Description**

The PUR-1 facility is located in the basement of the Duncan Annex of the Electrical Engineering Building (EE in Figure 1) on the West Lafayette, Indiana campus of Purdue University. Access is gained by either entering at the southeastern entrance of the Duncan Annex and taking the stairs to the Nuclear Laboratories, or entering from the ground floor of the Electrical Engineering Building. A signal device at each entrance will alert site personnel if the doors are locked.

## **1.4 Reactor Facility Description**

The Purdue University Reactor is a pool-type reactor using 19.75% enriched  $^{235}\text{U}$  in MTR type parallel plate fuel assemblies. The core measures one foot square by two feet high with a layer of graphite reflector assemblies. The maximum licensed steady state power is 10 kilowatts.

The reactor facility is located in the Nuclear Engineering Laboratories which consists of the reactor room; laboratory-classroom, laboratory rooms, and offices (Figure 2).

## **1.5 Reactor Utilization and Operation Frequency**

The PUR-1 provides nuclear research services and facilities for Purdue University users. The PUR-1 is operated on an as needed basis for laboratory classes, research, training, and outside irradiations. Approximate operation time of PUR-1 is

about 150 hours per year, producing about 1 Megawatt-minute per year (approximately 0.0007 Megawatt-day).

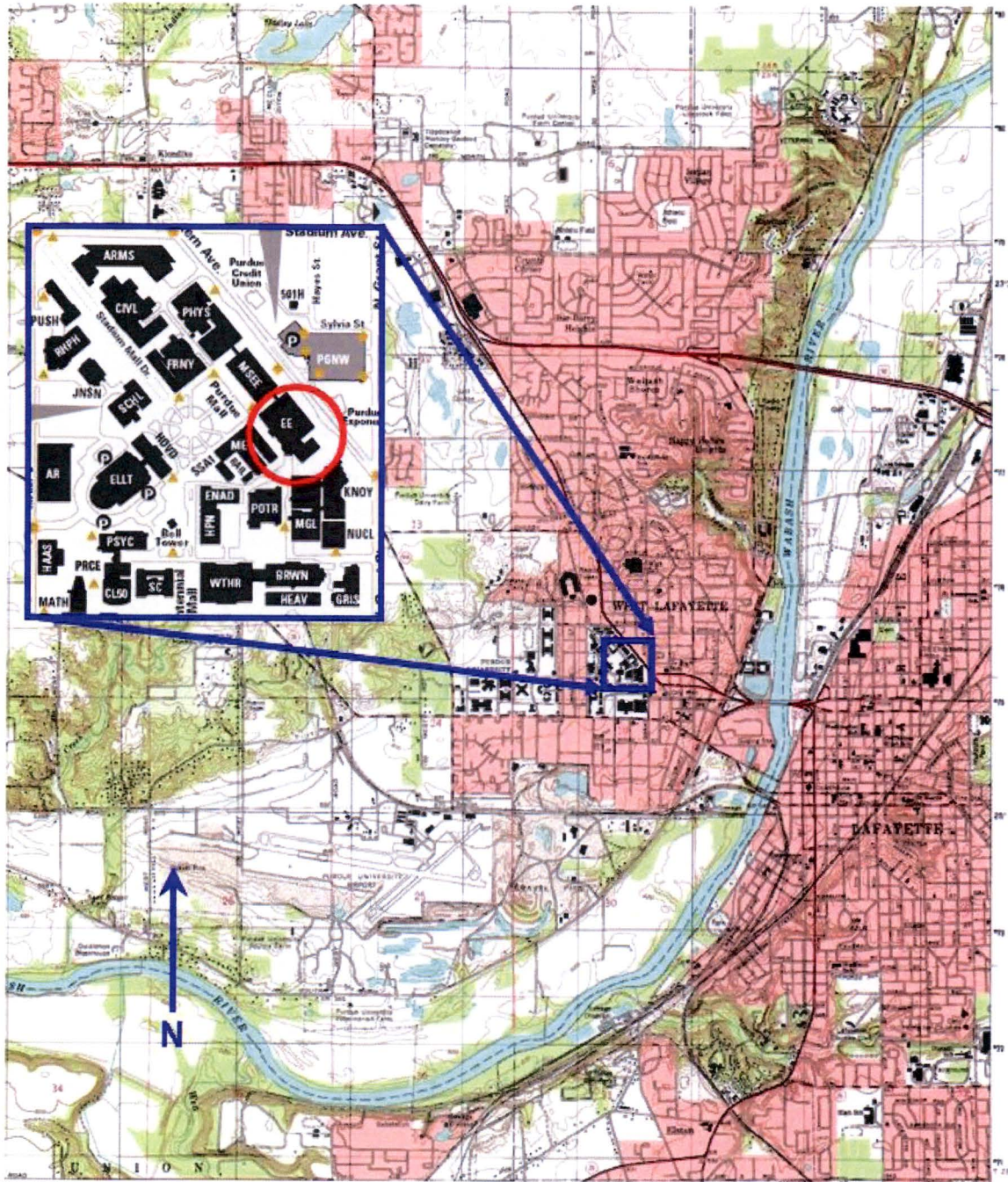


Figure 1: The Purdue University Reactor (PUR-1) is located in the southern corner of the basement in the Duncan Annex of the Electrical Engineering Building.

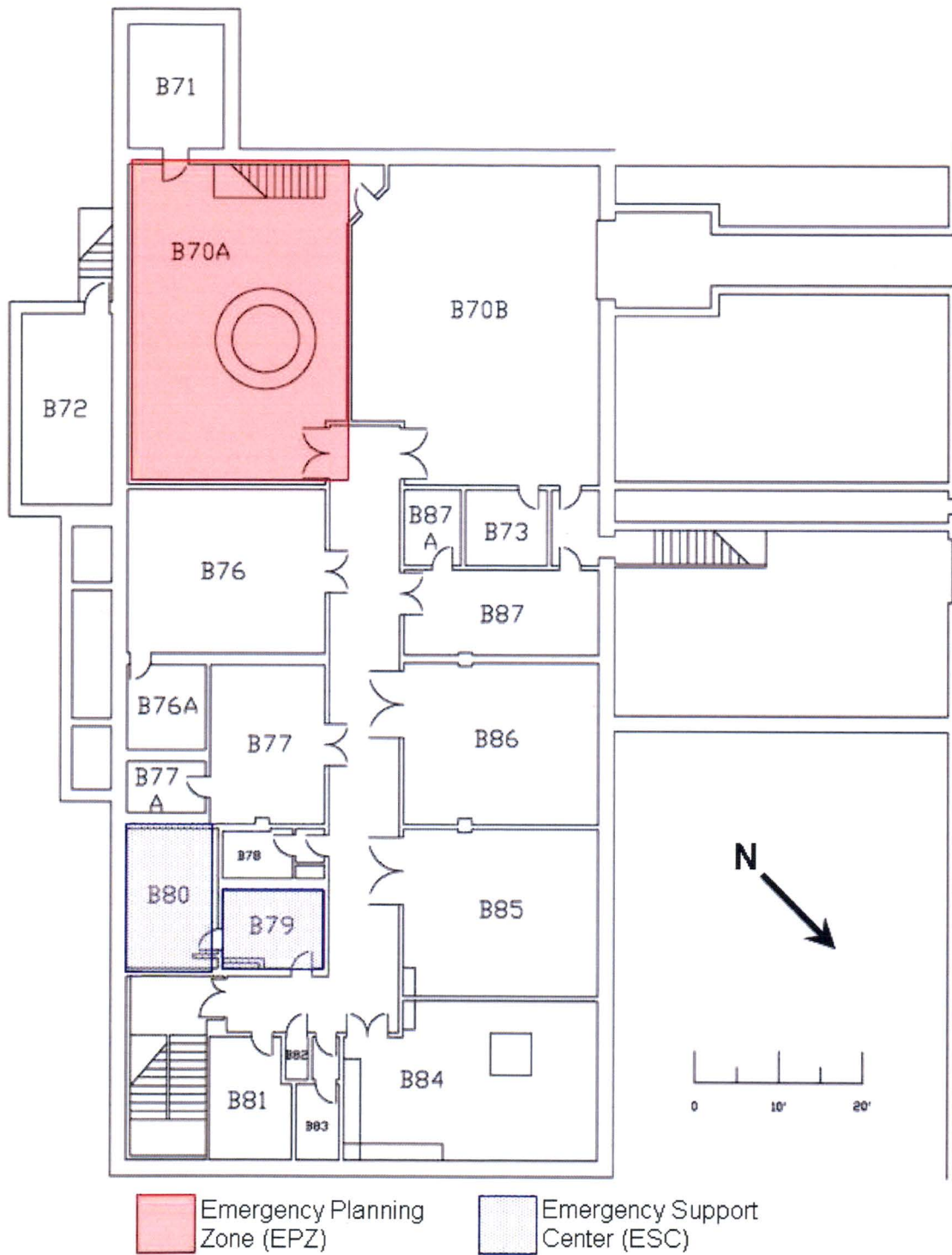


Figure 2: Floor plan of the Nuclear Engineering Laboratories depicting the EPZ and ESC.

## 2. DEFINITIONS

**Assessment Actions.** Those actions taken during or after an accident to obtain and process information which is necessary to make decisions to implement specific emergency procedures.

**Corrective Actions.** Those measures taken to correct and terminate an emergency.

**Emergency.** An emergency is a condition which calls for immediate action, beyond the scope of normal operating procedures, to avoid an accident or to mitigate the consequences of one.

**Emergency Action Levels.** Specific instrument readings, or observations; radiological dose or dose rates; or specific contamination levels of airborne, waterborne, or surface deposited radioactive materials that may be used as thresholds for establishing emergency classes and initiating appropriate emergency measures.

**Emergency Classes.** Emergency classes are classes of accidents grouped by severity level for which predetermined emergency measures should be taken or considered.

**Emergency Director.** The emergency director is the individual designated to take charge of an emergency and implement emergency control procedures. The emergency director has ultimate authority over all onsite activities and personnel.

**Emergency Operations Center.** The Purdue University emergency operations center (EOC) can be activated if necessary for offsite command and control support. The primary location of the EOC is housed in the Purdue Police Department (TERY) with a backup in the Telephone Office Building (TEL). Additionally a trailer can be located wherever necessary, equipped with redundant communication systems, and resources for planning and directing responses to emergency situations.

**Emergency Plan.** An emergency plan is a document that provides the basis for actions to cope with an emergency. It outlines the objectives to be met by the emergency procedures and defines the authority and responsibilities to achieve such objectives.

**Emergency Planning Zone (EPZ).** Area for which emergency planning is performed to assure that prompt and effective actions can be taken to protect the public in the event of an accident. The EPZ size depends on the distance beyond the site boundary at which the Protective Action Guide (PAG) could be exceeded. The reactor room, which is defined as the operations boundary, is designated as the EPZ for PUR-1 (Figure 2).

**Emergency Procedures.** Emergency procedures are documented instructions that detail the implementation actions and methods required to achieve the objectives of the emergency plan.

**Emergency Support Center.** The Emergency Support Center (ESC) is an area within the site boundary that can serve as a communications and control center in an emergency. The office area would serve as the ESC in an emergency (Figure 2).

**Facility.** The PUR-1 facility includes only the reactor room.

**Off-campus.** The geographical area that is beyond the boundaries of the West Lafayette campus of Purdue University.

**On-campus.** The geographical area that is within the boundaries of the West Lafayette campus of Purdue University and over which the University exercises control. Within this area is included such organizations as a police department, and a fire department.

**Offsite.** The geographical area that is beyond the site boundary.

**Onsite.** The geographical area that is within the site boundary.

**Operations Boundary.** The area within the site boundary where the Emergency Director has direct authority over all activities. For the purposes of this document, the operations boundary is defined as the Reactor Room B-70A in Figure 3. The area within this boundary shall have pre-arranged evacuation procedures known to personnel frequenting the area.

**Protective Action Guides (PAG).** Projected radiological dose or dose commitment values to individuals that warrant protective action following a release of radioactive material. Protective actions would be warranted provided the reduction in individual dose expected to be achieved by carrying out the protective action is not offset by excessive risks to individual safety in taking the protective action. The projected dose does not include the dose that has unavoidably occurred prior to the assessment.

**Protective Actions.** Those measures taken in anticipation of or after an emergency has occurred to protect health and safety of individuals and to prevent damage to property.

**Radiation Safety Committee.** The Radiation Safety Committee was first established by the President of the University on February 19, 1951, by Executive Memorandum Number A-50 as the Radiological Safety Committee. In February 1957 the committee's name was changed to its present form. It is the duty of the Radiation Safety Committee to assume responsibility, from the standpoint of radiological safety, for all University programs involving radioactivity or radiation producing devices according to Executive Memorandum Number B-14 (dated August 1, 2001).

**Radiological and Environmental Management (REM).** REM is the university department that assists in monitoring regulatory compliance with various federal, state, and university regulations involving radiological, environmental, health and safety issues, and their services include training, consultation, emergency response, and waste removal.

**Reactor Room.** The Reactor Room is room B-70A in the Duncan Annex of the Electrical Engineering Building which houses the reactor (Figure 2).

**Recovery.** Those actions taken after the emergency to restore the facility to its pre-emergency condition.

**Research Reactor.** A device designed to support a self-sustaining neutron chain reaction for research, developmental, educational, training, or experimental purposes, and which may have provisions for production of non-fissile radioisotopes.

**Shall, Will, Should, and May.** The words "shall" and "will" are used to denote a requirement; the word "should" to denote a recommendation; and the word "may" to denote permission, neither a requirement nor a recommendation.

**Site.** The PUR-1 site includes all areas bounded by the limits of the Nuclear Engineering Laboratories, which provides restriction of access to the site.

**Site Boundary.** The site boundary is that boundary, surrounding the operations boundary wherein the Emergency Director may directly initiate emergency activities. The area within the site boundary may be frequented by people unacquainted with the reactor operations. For this plan the site boundary will be the limits of the Nuclear Engineering Laboratories (Figure 3).



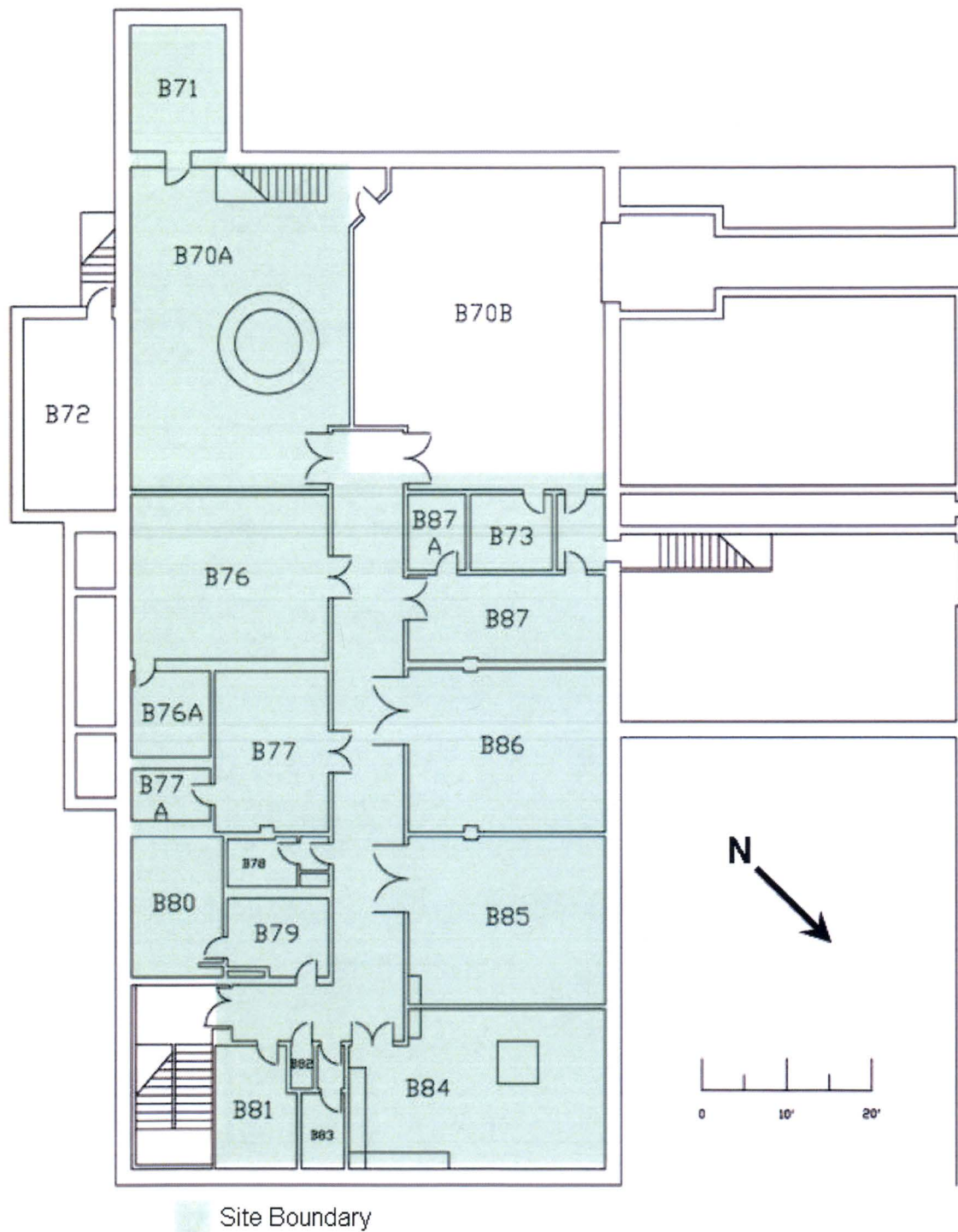


Figure 3: Floor plan of the Nuclear Engineering Laboratories depicting the site boundary.

### **3. ORGANIZATION AND RESPONSIBILITY**

The PUR-1 staff as established by the Laboratory Director is involved daily with reactor operations, technical support, and administrative activities, and through training and operating experience is capable of handling any foreseeable emergency at the reactor facility.

#### **3.1 Emergency Organization**

Assistance and support services provided to PUR-1 staff by other on-campus organizations include radiation monitoring and assessment, fire-fighting, ambulance and emergency medical services, hospital facilities, and police protection. Figure 4 shows the interface between the elements of the emergency organization.

**3.1.1 Emergency Director.** The Laboratory Director of the Nuclear Engineering Laboratories will serve as the Emergency Director during any emergency. If the Laboratory Director is unavailable, the following will serve as interim Emergency Director in order:

1. Assistant Laboratory Director
2. Senior Reactor Operator (SRO), on call
3. Reactor Operator.

As soon as the Laboratory Director is on site, that person will assume the duties and responsibilities as the Emergency Director. The Emergency Director is responsible for placing the facility in a safe shutdown condition, for terminating or minimizing releases of radioactive materials, for protecting facility personnel and visitors, and for assessing severity of the emergency event. To fulfill these responsibilities, the Emergency Director shall exercise judgment and summon medical, ambulance, fire, and police assistance as necessary.

If the reactor operator cannot respond to an emergency due to a reason such as an injury, the second person on the operating staff shall immediately contact the PUPD and ask for assistance.

**3.1.2 Emergency Coordinator.** The Assistant Laboratory Director, shall serve as emergency coordinator and is responsible for reviewing and updating emergency plans and procedures. The emergency coordinator is also responsible for emergency training, tests, and drills.

**3.1.3 Reactor Operator (RO).** The reactor operator is responsible for the safe shutdown and securing of the reactor in emergency situations. The RO shall make the SRO on call aware of observed action levels and shall take immediate action in case of possible reactor damage or an uncontrolled radioactivity release. The RO shall perform the duties of reactor operator as specified in the procedure for the emergency evacuation of the reactor room if necessary.

**3.1.4 Nuclear Engineering Radiation Laboratory Organization.** The organization consists of the Director and Assistant Director, appointed by the Head of the School of Nuclear Engineering. In the event of an emergency, the Director or Assistant Director will relieve the SRO and assume responsibility for directing emergency control measures for any incident posing a radiological threat to the health and safety of individuals or the public.

**3.1.5 Facility Support.** Other individuals on PUR-1 staff may be assigned duties and responsibilities during the course of an emergency. All PUR-1 personnel receive basic instructions in radiation safety and emergency procedures.

**3.1.6 Radiological and Environmental Management (REM).** Personnel from REM are available to provide additional support. The radiation safety operations of the Radiological and Environmental Management are directed by the University Radiation Safety Officer under policies determined by the Radiation Safety Committee.

**3.1.7 Communications Center.** The PUPD maintains a communications center which is manned 24 hours each day. During times when PUR-1 is unattended and an emergency condition is received in the Communication Center, the radio operator will contact the appropriate PUR-1 staff and emergency organizations as per the notification roster.

**3.1.8 University News Service.** All official news releases concerning emergency conditions at PUR-1 are provided to the Purdue University News Service via the Emergency Director or designee.

**3.1.9 Purdue University Police Department (PUPD).** The PUPD may be called to provide facility security assistance, ambulance escort service, emergency radio communications, traffic control, and riot control as necessary.

**3.1.10 Purdue University Fire Department (PUFD).** The PUFD will serve as the primary firefighting agency. The firefighters are provided training in the basic principles of radiation protection and PUR-1 emergency procedures. The PUFD is also responsible for bomb searches.

**3.1.11 Ambulance Service.** The PUFD will provide ambulance service and emergency medical assistance for PUR-1 staff as required. The emergency medical personnel are trained in the basic principles of radiation safety, contamination control, and PUR-1 emergency procedures.

**3.1.12 St. Elizabeth Medical Center** will provide medical facilities and care for contaminated injured individuals and for individuals suffering from acute radiation exposure. Involved hospital staff have received training in the principles of radiation safety and contamination control.

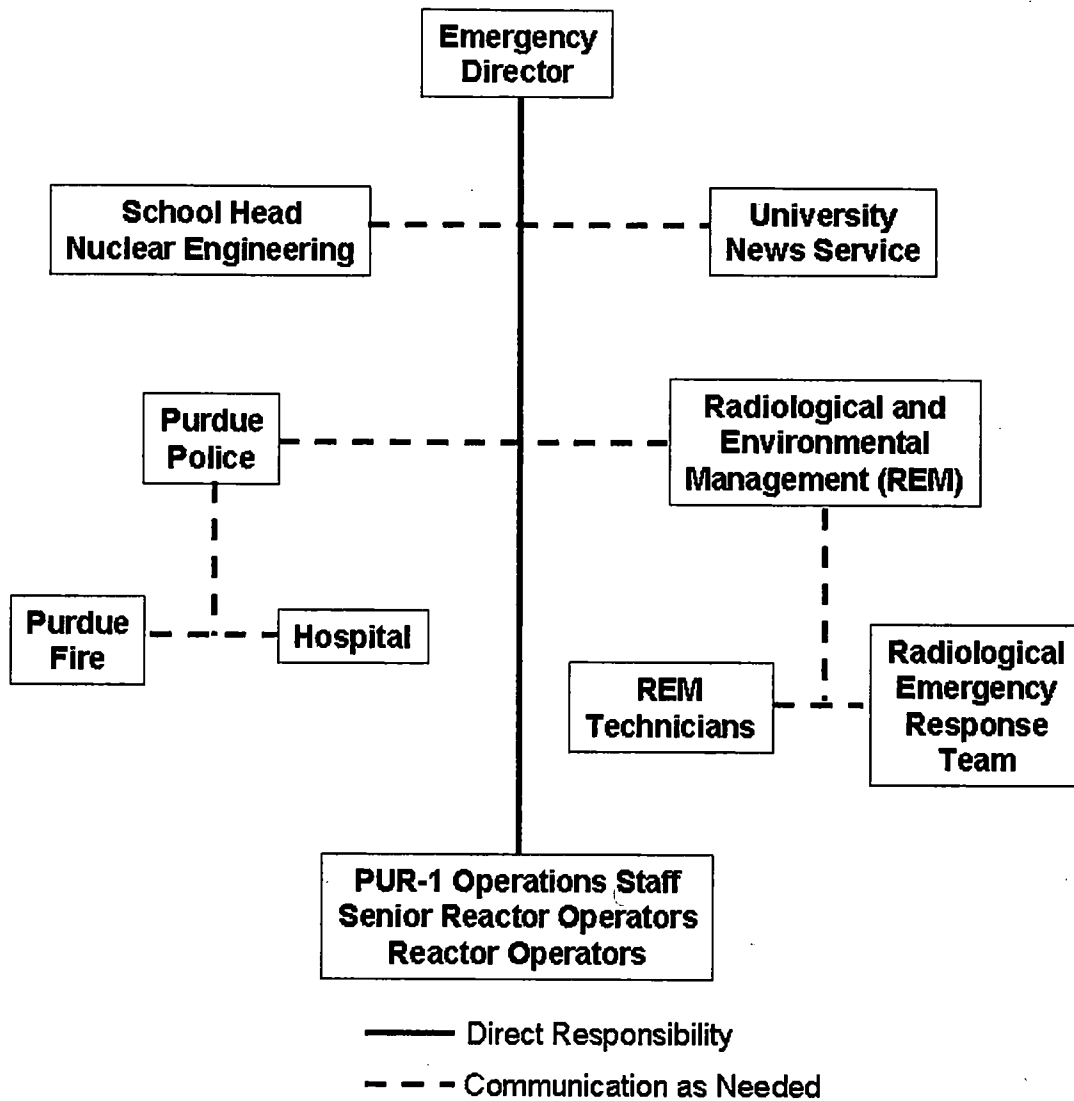


Figure 4: The PUR-1 Emergency Organization.

### 3.2 Coordination With and Notification of Government Agencies

The postulated credible accidents associated with the operation of the Purdue University Reactor will not result in a radiological hazard affecting the public health and safety. These postulated emergency events will not require the direct involvement of Local, State, and Federal agencies.

U.S. Nuclear Regulatory Commission (NRC). The Emergency Director or designee will notify NRC of an incident in accordance with the requirements of 10CFR20. Additionally, PUR-1 staff will transmit to NRC all information specified in the Technical Specifications to Reactor License R-87.

### **3.3 Termination of an Emergency**

The Emergency Director is responsible for the termination of an emergency. Prior to termination of an emergency, the Emergency Director shall conclude that there exist no foreseeable subsequent events that could cause damage to the reactor or render its operation unsafe. The Emergency Director will verify that all areas to be reopened to personnel or the general public meet the requirements of 10CFR20 for occupancy, and will also confirm that areas restricted to entry or requiring controlled access are clearly posted.

### **3.4 Authorization for Reentry**

The Emergency Director, in consultation with REM, shall authorize reentry into the reactor room or portions of the Nuclear Laboratories previously evacuated during the course of an emergency. It shall be the responsibility of REM to establish reentry requirements, provide personnel monitoring, and insure that protective clothing and proper breathing equipment is utilized.

### **3.5 Authorization of Radiation Exposures in Excess of 10CFR20 Limits**

The Emergency Director with concurrence of the RSO or his designated alternate may prospectively authorize exposures to emergency team members and radiation workers in excess of normal occupational limits. The *Manual of Protective Action Guides and Protective Actions For Nuclear Incidents* (EPA 400-R-92-001) will be used when authorizing exposures exceeding occupational dose limits.

## **4. EMERGENCY CLASSIFICATION SYSTEM**

The emergency classes described for PUR-1 are based upon credible accidents associated with reactor operations and other emergency situations that are non-reactor related and have less severe radiological consequences than the least severe class. An Emergency Classification Guide is presented in Table I.

### **4.1 Non-Reactor Safety Related Events**

These are non-reactor safety related events which require notification of the Emergency Director. These events are separate from reactor operations and do not necessarily indicate changing of the reactor status. Advisories to PUPD may be warranted, and conditions may require services such as ambulance and medical. There may be a need to shutdown the reactor to reallocate personnel or because of injuries to a key individual. Emergency Action Levels used to initiate emergency measures associated with this emergency class are listed in Table I.

### **4.2 Notification of Unusual Events**

These are events which require notification of the Emergency Director. This class of emergency situation may be initiated by either man-made events or natural phenomena that can be recognized as creating a significant hazard potential that

was previously non-existent. There is usually time available to take precautionary and corrective steps to prevent the escalation of the event or to mitigate the consequences should it occur. No releases of radioactive material requiring offsite responses are expected. One or more elements of the emergency organization are likely to be activated or notified to increase the state of readiness as warranted by the circumstances. Although the situation may not have caused damage to the reactor, it may warrant an immediate shutdown of the reactor or interruption of routine functions. Emergency Action Levels used to initiate emergency measures associated with this emergency class are listed in Table I.

#### **4.3 Alert**

No credible accidents attributable to the reactor or its operation are postulated which can cause emergency conditions beyond the operations boundary; therefore, this emergency is not addressed in this plan.

#### **4.4 Site Area Emergency**

No credible accidents attributable to the reactor or its operation are postulated which can cause emergency conditions beyond the operations boundary; therefore, this emergency class is not addressed in this plan.

#### **4.5 General Emergency**

No credible accidents attributable to the reactor or its operation are postulated which can cause emergency conditions beyond the operations boundary; therefore, this emergency class is not addressed in this plan.

Table 1. Emergency Classification Guide.

Emergency Class	Action Level	Purpose
Non-Reactor Safety Related Event	Civil disturbances or receipt of bomb threat non-specific to the reactor.	Alert staff to a possible escalation. Initiate assessment.
	Personnel injury with or without radiological complications.	Provide treatment
	Minor fire or explosion, non-specific to the reactor or its control systems.	
	Facility or individual contamination.	
Notification of Unusual Event	Receipt of bomb threat with possible radiological release implication.	Assure that emergency personnel are readily available to respond if situation becomes more serious or to perform confirmatory radiation monitoring if required.
	Prolonged fire or explosion within the facility or the Electrical Engineering Building which might adversely affect the reactor or its safety systems.	
	Failure of an experiment with releases of radioactivity as determined by observing the continuous air or area monitors.	Provide offsite authorities current status information.
	Report of a tornado touchdown in the vicinity of the facility which may have adverse effects on the reactor safety systems.	

## 5. EMERGENCY ACTION LEVELS (EAL'S)

There are no postulated credible accidents associated with the operation of PUR-1 that lead to exposures exceeding the Protective Action Guides (PAG's) of 1 rem whole body or 5 rem thyroid beyond the site boundary. The action levels specified in Table I "Emergency Classification Guide" are EAL's for activating the Emergency Organization and initiating protective actions appropriate for the emergency event.

## 6. EMERGENCY PLANNING ZONE

The area within the operations boundary for PUR-1 (defined as the reactor room) is established as the Emergency Planning Zone (EPZ) for the PUR-1 facility. The

predetermined protective actions for the EPZ are described in Sections 7.5.4 and 7.6.4.

## **7. EMERGENCY RESPONSE**

### **7.1 Activation of the PUR-1 Emergency Organization**

The Emergency Director will be responsible for initiating the emergency plan and for notifying and mobilizing the emergency organization. If an emergency is detected at PUR-1 during unattended hours, the emergency organization will be activated by contacting the first available PUR-1 staff member on the emergency notification roster. The PUPD Communication Center is manned on a continuous basis insuring that in the event of an emergency PUR-1 personnel on the roster will be notified. In addition, emergency support organizations are available 24 hours per day. The PUR-1 emergency organization, including offsite support, is capable of functioning around the clock in the event of prolonged emergencies. Communications during emergency situations will be by telephone, portable radio, public address system, or word of mouth, as appropriate. The communication signal for facility evacuation is the sounding of a horn located inside the reactor room.

### **7.2 Protective Action Values**

Every attempt will be made to maintain radiation exposures to emergency personnel within the limits of 10CFR20 and/or the Protective Action Guides (PAG's) of 1 rem whole body or 5 rem thyroid; however, the Emergency Director with the concurrence of the Radiation Safety Officer or his delegate may authorize exposures in excess of these values to facilitate rescue of injured personnel or to take corrective actions which will mitigate the consequences of the emergency event. The exposure limit for life saving is 100 rem and 25 rem for corrective actions. In either case, these exposures will be on a voluntary basis and restricted to a once in a lifetime exposure.

### **7.3 REM Emergency Response Program**

Radiological and Environmental Management personnel will be responsible for determining radiation dose rates and contamination levels both onsite and offsite and will relay this information by face to face communication, telephone communication, or portable radio to the individual responsible for accident assessment. In addition, these individuals will provide for isolation, and supervise access control to restricted areas to minimize exposures to radiation and the spread of radioactive contamination.

### **7.4 Reporting of Emergencies**

Notification rosters are posted throughout the facility. Telephone numbers are listed for PUR-1 personnel and Purdue University support agencies. Initial and follow-up emergency messages by the Emergency Director (or designee) to NRC and, if



applicable, to other offsite agencies should, to the extent known, include the following:

1. Name, title, and telephone number of caller, and the location of the incident.
2. Description of the emergency event and emergency class.
3. Date and time of incident initiation.
4. Type of expected or actual release (airborne, waterborne, surface spill) with estimated duration times.
5. The quantity of radionuclides released or expected to be released.
6. Projected or actual dose rates outside of the operations boundary.

## **7.5 Emergency Response for Non-Reactor Safety Related Events**

**7.5.1 Activation of the Emergency Organization for Non-Reactor Safety Related Events.** The complete activation of the emergency organization for this emergency class would not normally be required. The Emergency Director will activate that portion of the emergency organization necessary to respond to the emergency event. In any case, the Laboratory Director will be notified.

**7.5.2 Assessment Actions for Non-Reactor Safety Related Events.** Civil disturbances or bomb threats shall be assessed by the Emergency Director for validity and specificity using campus police experience and the information source.

For personnel injury the Emergency Director shall assess the extent of the injury and with REM assistance shall determine if radioactive contamination is present. Radiation monitoring devices are available for this assessment. In the absence of contamination, the assessment will consider the nature of the injury, the appropriate first aid, and the need for ambulance transport.

Fires and explosions shall be assessed by the Emergency Director. He shall determine the magnitude of the event, the likelihood of escalation versus prompt control, and the need for support from outside agencies. The REM personnel will monitor the area to determine if radioactive contamination is present.

**7.5.3 Corrective Actions for Non-Reactor Safety Related Events.** In the event of a civil disturbance or receipt of a bomb threat, PUPD will be notified and will initiate the appropriate controls to insure the protection of personnel and property.

For minor fires or explosions non-specific to the reactor or its control system, PUPD will be contacted. The REM support staff will be notified of fire in areas where radioactive materials are located.

For cases of serious personnel injury, the Emergency Director (or designee) will be responsible for summoning emergency medical assistance including a request for ambulance transport if necessary. If the injured individual is contaminated, decontamination will be attempted only if it is judged that this will not further

aggravate the injury. The contaminated injured individual will be transported using contamination control and isolation methods.

**7.5.4 Protective Actions for Non-Reactor Safety Related Events.** Protective actions at this level of emergency are generally not distinguishable from corrective actions. Some cases may necessitate the evacuation of the reactor room in which case personnel will assemble in the hallway immediately outside the reactor room (B-76 A) unless it is unsafe to do so. The evacuation will be initiated by sounding an evacuation horn and word of mouth. Should personnel evacuation be necessary the Emergency Director shall control access to the reactor room and will be responsible with REM support for the segregation of potentially contaminated personnel.

## **7.6 Emergency Response for Notification of Unusual Events**

**7.6.1 Activation of the Emergency Organization for Notification of Unusual Events.** The Emergency Director will activate that portion of the emergency organization necessary to respond to the emergency situation.

**7.6.2 Assessment Actions for Notification of Unusual Events.** Minor fuel damage, experiment failure, or any event manifested by unusual radiation or radioactivity levels within the reactor room or the possible release of effluents at the site boundary shall be immediately assessed by the Emergency Director with assistance from PUR-1 operations staff. Additional support is available from REM.

The assessment will consist of an observation and evaluation of facility air and/or area radiation monitors in the reactor room and the use of portable survey instruments. Excessive levels may require evacuation of the reactor room, and future assessment will be made from the ESC. Air samplers are available from REM and collected filter papers and swipe samples can be counted in a laboratory in B-76 or at one of the other counting facilities located on campus. Pocket dosimeters can also be used for accident assessment.

The Emergency Director, in collaboration with PUPD shall assess any civil disturbances and bomb threats for validity and specificity using campus police experience and the information source.

Explosions and prolonged fires which might adversely affect the reactor or its control systems shall be assessed by the Emergency Director through observation of the affected area. The magnitude of the event shall be determined. The PUPD will be summoned and upon arrival will be briefed by the Emergency Director on the status of the emergency. Radiological and Environment Management personnel will monitor the area to determine radiation levels and possible facility contamination.

Tornado damage will be assessed by the Emergency Director based on verbal reports or visual observations.

**7.6.3 Corrective Actions for Notification of Unusual Events.** In the event that a Notification of Unusual Event is dictated by assessment of radiological levels, the reactor room may be evacuated pending an evaluation of the problem and

identification of the probable source. The Emergency Director shall confer with REM support staff and shall control access to the reactor room until radiation and airborne activity levels have been restored to normal.

For bomb threats with possible radiological release implications PUPD and REM will be notified. The PUPD will initiate appropriate controls as per the University Emergency Plan to insure the protection of personnel and property. The reactor will be shutdown and all personnel evacuated.

In case of fire or explosion within the facility, PUPD will be summoned. The REM support staff will be notified of fire in areas where radioactive materials are located. In addition, the Emergency Director will ensure that the reactor is shut down and personnel evacuated from the reactor room. Teams may be dispatched to check for injured personnel. The Emergency Director will monitor the extent of the fire and brief fire department personnel upon their arrival.

For a reported tornado that could strike the facility, the Emergency Director will ensure that the reactor is shutdown and secured. If it appears likely that the tornado will strike the facility all personnel will then report to the designated shelter-in-place area.

**7.6.4 Protective Actions for Notification of Unusual Events.** For this emergency class the reactor room may be evacuated to the hallway outside the reactor room. All personnel will be verified present, and those individuals who exited the reactor room will be surveyed for contamination using portable instruments if the possibility of contamination is present. Those who are contaminated will stay behind the chain barrier in the hallway or in another area designated at the time by the Emergency Director until decontamination procedures have cleared them. The Emergency Director is responsible for controlling access to the reactor room which shall be limited to rescue and emergency response operations.

Area, continuous air, and portable radiation monitors will be used to assess the radiological emergency. In addition to these, other sources of information are available as discussed in Section 7.6.2. The Emergency Director with support from REM personnel is responsible for minimizing personnel exposure and the spread of contamination. Emergency exposure levels for personnel shall be in accordance with Section 7.2.

## **8. EMERGENCY FACILITIES AND EQUIPMENT**

### **8.1 Emergency Support Center (ESC)**

Offices B-79 and B-80 shall serve as the Emergency Support Center for emergency actions. Telephone and facility intercom are available in the ESC.

## **8.2 Assessment Facilities**

The PUR-1 has area radiation monitors and a continuous air monitor with readouts and alarm indications in the reactor room. In addition, the Nuclear Engineering Laboratory maintains portable survey instruments in the reactor room and in the emergency supply cabinet in the hall. If necessary, counting equipment and survey instruments are available from REM and other University facilities. Other radiation counting laboratories with both counting and gamma spectroscopy systems are located on the Purdue Campus, including the REM facilities. In addition, portable air samplers for evaluating airborne particulate radioactivity are available from the REM support group.

## **8.3 First Aid and Medical Facilities**

A basic first aid kit is located in an emergency kit located within B-87. Extended first aid treatment is also available from PUFD.

Accidents resulting in personnel injury without contamination will be handled by administering first aid and summoning emergency medical personnel if needed. In the event of injury with contamination, the individual will be transported to a local hospital by the PUFD ambulance. Each ambulance is staffed with a minimum of one, but usually two, emergency medical staff and is capable of transporting contaminated victims.

## **8.4 Decontamination Facilities**

Decontamination of personnel at the Nuclear Engineering Laboratories can normally be handled using sinks or a deluge shower at the facility. The REM support staff shall be responsible for supervising the decontamination of all individuals involved in any emergency. A deluge shower is located in B-77 and sinks are located in B-77, B-87, and each rest room.

## **8.5 Communications Systems**

The telephone may be utilized during emergency conditions. In addition, word of mouth communications will provide a backup for internal communications. The PUPD can provide emergency radio communications. Direct telephone communication is available between PUR-1 and the PUPD communications center which is manned 24 hours each day.

## **8.6 Recovery Operations**

Restoring PUR-1 to a safe operating condition after an emergency shall be the responsibility of the Emergency Director. Operations necessary to restore the facility will be under direction of the Emergency Director. Operations necessary to restore the facility would normally include decontamination, and ascertaining that contamination and radiation levels within the affected areas are safe. The Emergency Director shall assess resultant damages, direct repairs, review the emergency, and authorize continued operation of the reactor.

## **9. MAINTAINING EMERGENCY PREPAREDNESS**

### **9.1 Training**

Individuals of the PUR-1 staff will participate in an initial training program to familiarize them with any changes in the revised Emergency Plan. The Emergency Plan is an integral part of the annual operator re-qualification training, and all PUR-1 staff members will be included when this section is reviewed.

### **9.2 Conduct of Drills and Exercises**

Onsite internal drills or tabletop exercises of the emergency plan will be conducted annually to test the adequacy of emergency procedures and to ensure that onsite emergency organization personnel are familiar with their duties. These drills will be executed as realistically as possible and will include the use of appropriate emergency equipment. Offsite units such as PUPD, PUF, REM and a local hospital will be invited to participate.

Accident scenarios shall be developed for conducting drills to include:

1. Medical emergency drills involving a simulated contaminated individual.
2. Radiological monitoring including contamination control methods, dose rate measurements, nonessential personnel evacuation, and record keeping.
3. Communication drills designed to ensure reliability of the system(s) and correct transmission and receipt of messages.

### **9.3 Critiques of Drills and Exercises**

At the conclusion of each drill, a critique to identify deficiencies shall be held by the participating PUR-1 staff and all drill observers and may include members of other support and emergency groups. Observer and participants' comments concerning areas needing improvement shall be evaluated, and consideration may be given to possible changes in the plan and procedures.

### **9.4 Emergency Plan Review and Update**

The Emergency Plan shall be reviewed biennially and updated as required based on drill results or changes in the facility. Changes to the plan must be approved by the Committee On Reactor Operations. Copies of the Emergency Plan shall be distributed to authorized agencies and support organizations, within 30 days after the CORO approvals are completed

### **9.5 Emergency Equipment Maintenance and Surveillance**

Surveillance of emergency supplies ensures availability and proper condition for immediate use. Emergency supplies at PUR-1 are verified to be operational and complete on an annual basis by PUR-1 staff, and fire extinguishers located

throughout the facility are maintained by PUF. Telephone maintenance is provided by the utility company.

**9.5.1 Inventory of Emergency Supplies and Equipment.** The PUR-1 staff maintains an emergency kit in the hallway outside B-87. This kit contains such items as portable survey instruments, protective clothing, survey maps, swipes, barrier ropes, and signs.

**9.5.2 Radiation Monitoring Equipment Checks and Calibration.** Portable survey instruments, including dosimeters will be checked and calibrated annually. Calibrations of the continuous air monitor, and the area radiation monitors are performed as specified in the Technical Specifications.

<b>REVIEW/REVISION HISTORY</b>		
<b>Rev. Num.</b>	<b>Date</b>	<b>Result/Info</b>
0	26 Jun 08	License Reapplication June 2008