

REED COLLEGE



Portland, Oregon 97202

REACTOR FACILITY
.....

September 29, 1994

To: Nuclear Regulatory Commission
Document Control Desk
Washington DC 20555
Marvin Mendonca, Senior Project Manager, NRC

From: Stephen Frantz, Director, Reed Reactor Facility

Re: Amendments to Emergency Plan and Emergency Implementing Procedures

This letter resubmits a revision to the Reed Reactor Facility Emergency Plan and Emergency Implementing Procedures. They were originally submitted on 9/16/94, but a discussion with you this week indicated that you may not have received them.

This revision was made necessary by construction activities at the facility, and several other revisions were made at this time. The revision does not decrease the effectiveness of the plan or procedures. The revision has been approved by the Reed Radiation Safety Committee and Reactor Operations Committee.

If there are any questions, please contact us.

Sincerely,

Stephen G. Frantz
Director, Reed Reactor Facility

060016

A045
11

Reed Reactor Facility

Emergency Plan

Docket 50 - 288

License R - 112

August 1994

Reed Reactor Facility
3203 S.E. Woodstock Boulevard
Portland, Oregon 97202
(503) 777-7222
[or (503) 777-8008--emergency only]

The Reed Institute dba
Reed College
3203 S.E. Woodstock Boulevard
Portland, Oregon 97202
(503) 771-1112

9409280341 30pp

RRF EMERGENCY PLAN

TABLE OF CONTENTS

1.0	INTRODUCTION	3
1.1	Application	3
1.2	Objective	3
1.3	Site Description	3
1.4	Reed Reactor Facility Description	3
1.5	Reactor Utilization and Operating Frequency	3
2.0	DEFINITIONS	7
3.0	ORGANIZATION AND RESPONSIBILITIES	9
3.1	Emergency Organization	9
3.2	Coordination with and Notification of Government Agencies	13
3.3	Termination of an Emergency	14
3.4	Authorization for Reentry	14
3.5	Authorization of Radiation Exposures in Excess of 10 CFR 20 Limits	14
4.0	EMERGENCY CLASSIFICATION SYSTEM	15
4.1	Non-Reactor Safety Related Events	15
4.2	Notification of Unusual Event	15
4.3	Alert	16
4.4	Site Area Emergency	16
4.5	General Emergency	16
5.0	EMERGENCY ACTION LEVELS (EAL)	18
6.0	EMERGENCY PLANNING ZONE (EPZ)	19
7.0	EMERGENCY RESPONSE	20
7.1	Activation of the RRF Emergency Organization	20
7.2	Protective Action Values	20
7.3	Health Physics Emergency Response Program	20
7.4	Reporting of Emergencies	20
7.5	Emergency Response for Non-Reactor Safety Related Events	21
7.6	Emergency Response for Notification of Unusual Events	22
7.7	Emergency Response for an Alert	23
8.0	EMERGENCY FACILITIES AND EQUIPMENT	25
8.1	Emergency Support Center (ESC)	25
8.2	Assessment Facilities	25
8.3	First Aid and Medical Facilities	25
8.4	Decontamination Facilities	26
8.5	Communications Systems	26
9.0	RECOVERY OPERATIONS	27
10.0	MAINTAINING EMERGENCY PREPAREDNESS	28
10.1	Training	28
10.2	Conduct of Drills and Exercises	28
10.3	Critiques of Drills and Exercises	28
10.4	Emergency Plan Review and Update	28
10.5	Emergency Equipment Maintenance Surveillance	28

RRF EMERGENCY PLAN

1.0 INTRODUCTION

1.1 Application

This emergency plan applies to The Reed Institute dba Reed College Reed Reactor Facility (RRF). The RRF is licensed pursuant to Title 10 Code of Federal Regulations, Chapter 1, Part 50, as a Research and Utilization Reactor, Facility Operating License No. R-112 (Docket No. 50-288). This plan specifies the objectives and implementing procedures to be followed for emergency situations occurring at RRF.

1.2 Objective

The objective of the RRF Emergency Plan is to establish guidelines and designate areas of responsibility for the RRF staff should an emergency occur at RRF that might affect the public health and safety. The RRF Emergency Plan identifies the Offsite Support Organizations that may be activated if required.

1.3 Site Description

The RRF is located on the Reed College Campus in the city of Portland, Multnomah County, Oregon. The 90-acre campus property, owned by The Reed Institute, is in the southeastern section of Portland known as Eastmoreland. The location of the College campus relative to the city of Portland and some of the neighboring communities is shown in Figure 1. Detailed access to RRF is shown in the map of the Reed College Campus - Figure 2. RRF is entirely contained within the reactor building. The reactor bay and control room comprise the restricted area.

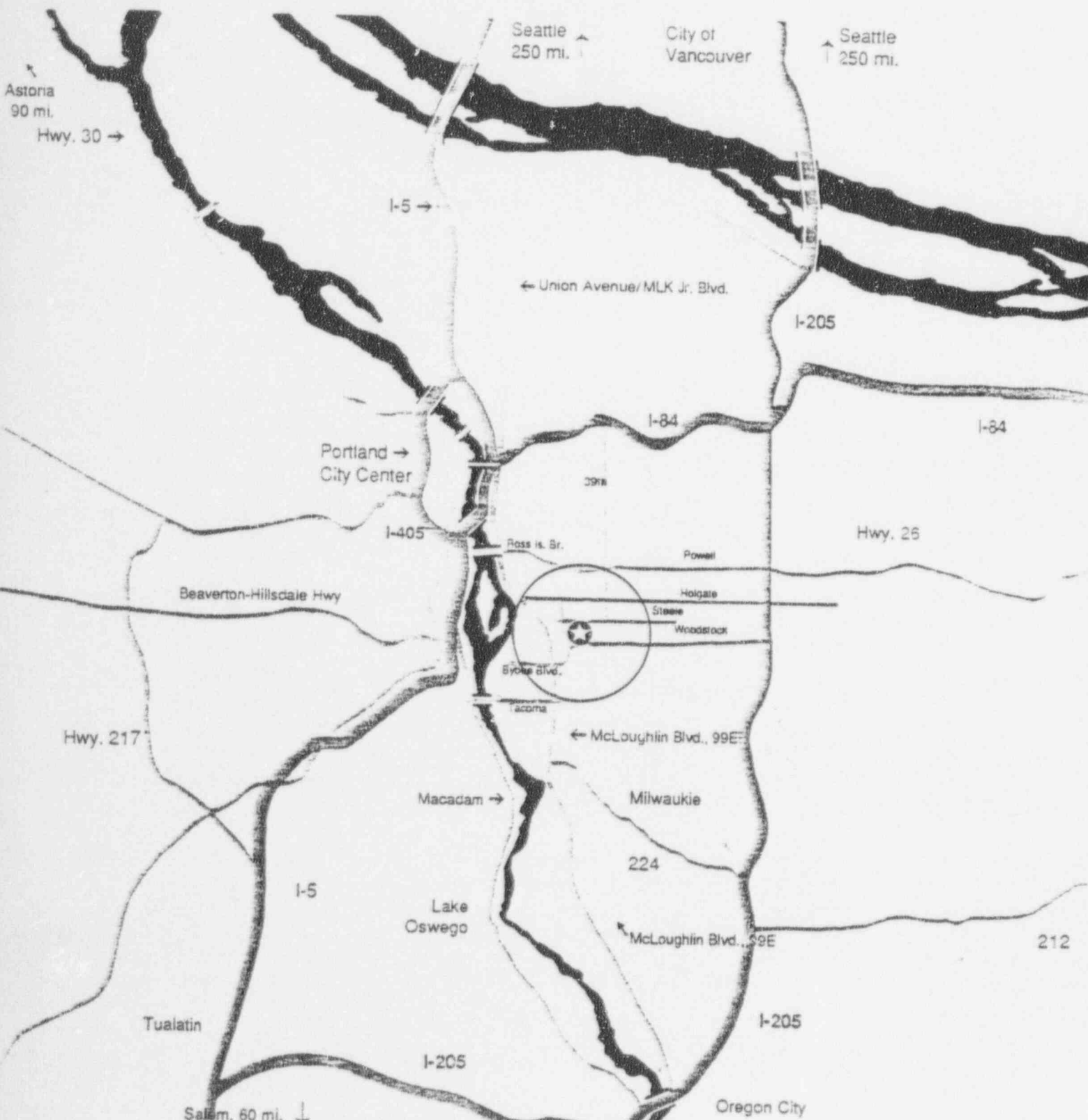
1.4 Reed Reactor Facility Description

The RRF reactor is a General Atomics TRIGA Mark I reactor licensed to operate at a maximum power level of 250 kilowatt thermal (250 KW_{th}). The RRF reactor can be operated using either aluminum-clad or stainless-steel-clad standard TRIGA fuel elements enriched to a nominal concentration of 20% Uranium-235. The reactor core support structure is permanently mounted at the bottom of a 25-foot "swimming pool" tank. The pool structure is located below grade in the reactor bay. The RRF consists of the reactor bay, mechanical room, control room, ventilation loft, and exit corridor. The reactor building is attached to the southeast corner of the Psychology Building. There is access to the radiochemistry laboratory and counting rooms from the exit corridor. Figure 3 is a floor plan of RRF.

1.5 Reactor Utilization and Operating Frequency

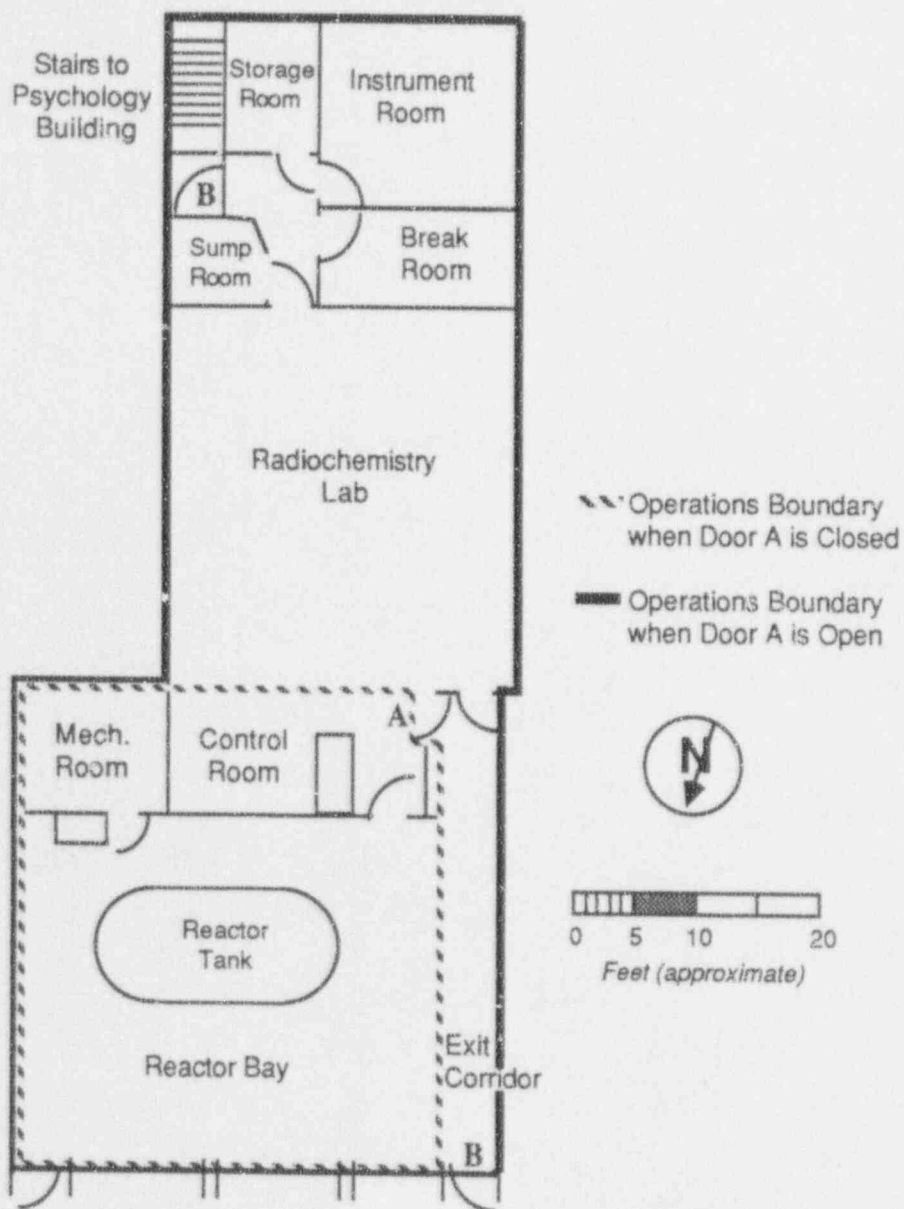
The RRF provides services and facilities for nuclear science education and research by the members of the Nuclear Science Consortium of the Willamette Valley. The RRF also provides services to industrial and consulting clients and government agencies. The RRF operates on an intermittent schedule averaging 4 hours per week for an average annual output of 50 MWH (2.2 MW Days).

FIGURE 1
Location of Reed College



RRF-EP-4

FIGURE 3
Reed Reactor Facility Floor Plan



2.0 DEFINITIONS

EMERGENCY. An emergency is a condition which calls for immediate action, beyond the scope of standard 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 actions should be taken or considered.

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 offsite 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.

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

HEALTH PHYSICS PERSONNEL. In the context of the Emergency Plan: the Reactor Health Physicist, RRF personnel performing radiological assessment under the direction of the Reactor Health Physicist, and any Offsite Support Organization personnel activated to perform radiological assessment. State of Oregon Department of Energy Emergency Response Personnel may act as a qualified alternate to the Reactor Health Physicist if necessary.

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 as shown in the RRF floor plan (Figure 3) is the operations boundary. When door 'A' is closed, it consists of the area outlined in black. When door 'A' is open, it includes the area outlined in hatched lines. Within the operations boundary the Reactor Director has direct authority over all activities. The area within this boundary shall have prearranged evacuation procedures known to personnel frequenting the area.

PROTECTIVE ACTION GUIDES (PAG). Projected radiological dose or dose commitment values to individuals that warrant taking protective actions would be warranted provided the reduction in individual dose expected to be achieved by carrying out the protection 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.

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 nonfissile radioisotopes.

RRF MANAGEMENT. The President and Dean of the Faculty of Reed College. The Director of RRF is the highest level of operational management, the Associate Director (if assigned) is next, and the reactor supervisor is usually a student Senior Reactor Operator.

SITE BOUNDARY. The site boundary is that boundary, not necessarily having restrictive barriers, including the adjoining Psychology Building and extending 250 feet in every direction from the operations boundary. Within this area the Emergency Coordinator may directly initiate emergency activities. The area within the site boundary may be frequented by persons unacquainted with reactor operations.

SHALL, SHOULD AND MAY. The word "shall" is 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.

3.0 ORGANIZATION AND RESPONSIBILITIES

The RRF staff as established by the Director is involved with routine reactor operations, technical support and administration activities, and through training and operating experience is capable of handling any foreseeable emergency at the RRF. The Director and Associate Director (if assigned) are the only salaried positions at RRF, all other positions are staffed by student licensed operators, off-campus licensed operators, or professionals in appropriate fields such as Health Physics.

3.1 Emergency Organization

Several offsite organizations are available to augment the RRF emergency organization for emergency event response. The assistance and support services provided by these organizations include fire fighting, ambulance and emergency medical services, hospital facilities, radiological monitoring and assessment, and police protection. Written agreements with these organizations are renewed biannually (in odd-numbered years) and are included in Appendix A to this plan. The RRF staff with augmentation from offsite agencies forms the RRF emergency organization. Figure 4 shows the interface between the elements of the emergency organization.

3.1.1 Emergency Notification Call List (ENCL)

The Director shall establish the Emergency Notification Call List (ENCL) and determine the personnel order. There shall be a minimum of five (5) licensed operators on the ENCL which shall include the following: Director, Associate Director (if assigned), Reactor Supervisor, and Health Physicist.

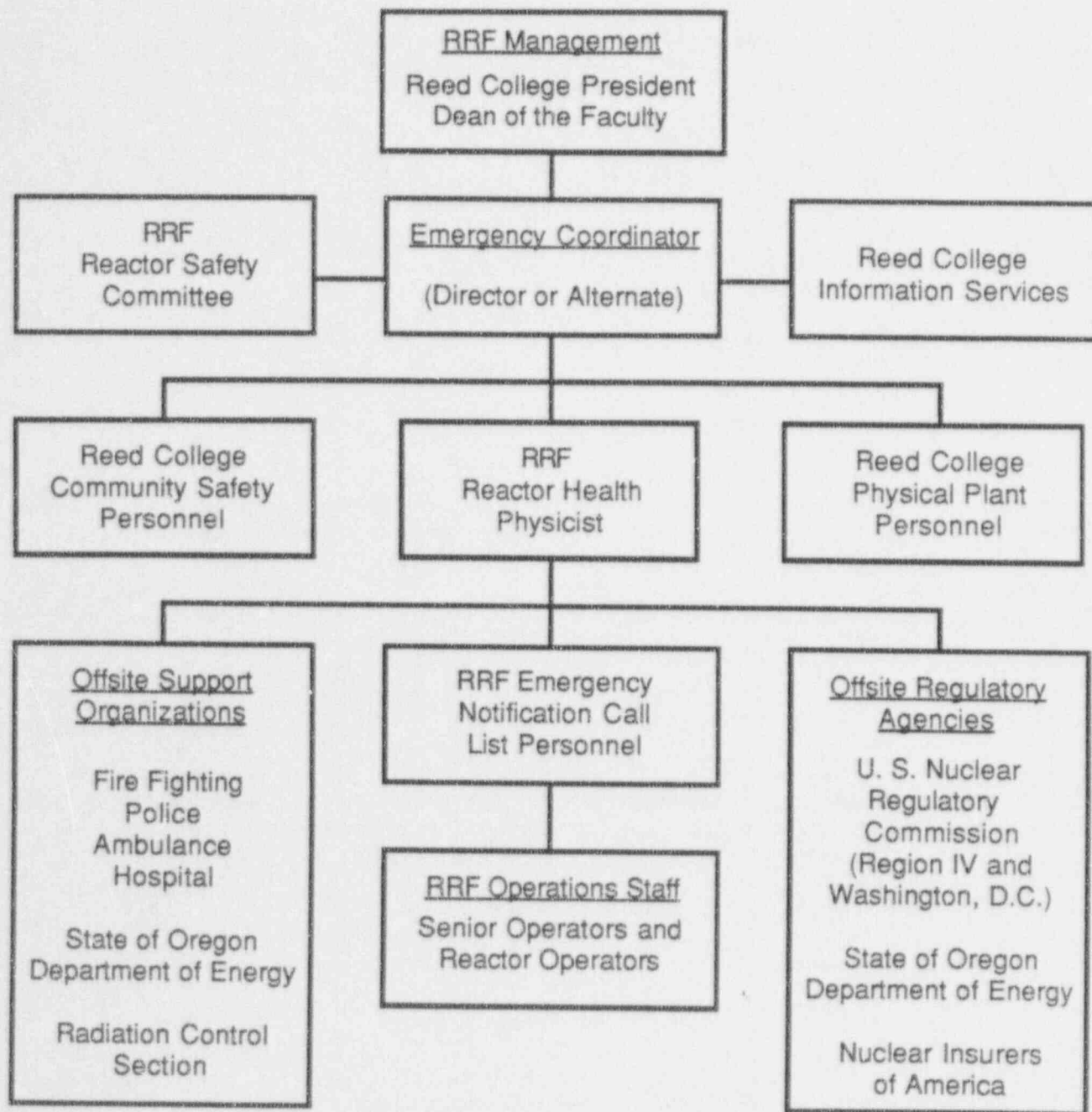
3.1.2 Emergency Coordinator

Any Reactor Operator (RO) or Senior Reactor Operator (SRO) may initiate emergency action. The SRO on duty shall be the Emergency Coordinator. At that time the Emergency Coordinator has ultimate authority over on-site activities and personnel. The Emergency Coordinator is responsible for:

- 1) placing RRF in a safe shutdown condition,
- 2) terminating or minimizing releases of radioactive materials,
- 3) protecting RRF personnel and visitors,
- 4) assessing severity of the emergency event, and
- 5) notifying the first available person on the ENCL.

To fulfill these responsibilities the Emergency Coordinator shall exercise judgment and summon medical, ambulance, fire, and police assistance as necessary. If the SRO on duty cannot respond, the Director's office shall be notified, and the Director shall assume the role of Emergency Coordinator. If the Director is not available, then the first available SRO shall assume the duties of Emergency Coordinator. If an SRO is not able to respond, an RO shall assume the duties of the Emergency Coordinator and immediately ask for assistance from ENCL Personnel, RRF Management, and, if necessary, State of Oregon Department of Energy Emergency Response Personnel.

FIGURE 4
RRF Emergency Organization



The Emergency Coordinator shall direct all emergency actions until relieved by a member of the ENCL. The ENCL is based upon fast response; it is ordered by experience and proximity to the RRF. The Organizational Hierarchy of RRF personnel shall be:

- Director
- Associate Director (if assigned)
- Health Physicist
- Reactor Supervisor
- Senior Reactor Operator(s)

An Emergency Coordinator on this list shall surrender the position to a person higher on the Organizational Hierarchy list.

3.1.3 Reactor Supervisor

The Reactor Supervisor shall be responsible for reviewing and updating emergency plans and procedures. The Reactor Supervisor is also responsible for emergency training and for conducting emergency drills and reporting critiques to the Director and Reactor Safety Committee. The Reactor Supervisor shall be a licensed Senior Reactor Operator.

3.1.4 RRF Management

The RRF Management consists of the President and Dean of the Faculty of Reed College. The Director is the highest level of operational management, and an SRO is Reactor Supervisor. The Director (or highest person on the RRF Organizational Hierarchy in the absence of the Director) will assume responsibility, as Emergency Coordinator, for directing emergency control measures for any incident posing a radiological threat to the health and safety of individuals or the public. The Director will provide news releases when warranted to the Reed College Information Services Office which in turn controls all official news releases.

3.1.5 RRF Health Physics

The Director serves as the onsite Health Physicist during non-emergency periods. The Reactor Health Physicist will be available during emergencies as needed. Additional Health Physics expertise and support are available from State of Oregon Department of Energy Emergency Response Personnel as necessary. RRF personnel will provide support as requested by the Reactor Health Physicist.

3.1.6 Facility Support

Individuals on the RRF staff may be assigned duties and responsibilities during the course of an emergency event. All RRF personnel receive basic instruction in radiation safety and emergency procedures on an annual basis.

3.1.7 RRF Reactor Safety Committee

The Reactor Safety Committee is the Review, Audit, and Approval organization for RRF. It is composed of two subcommittees with expertise in Safety and Operations respectively. It provides a source of expertise available to RRF during emergencies. It will review and audit emergency preparedness under this plan.

3.1.8 Communications

Reed College maintains 24-hour telephone communications. RRF has a direct dial-in line through the college switchboard (503-777-7222), and a special phone separate from the college switchboard (503-777-8008). The special phone is operational any time the Pacific Northwest Bell system is operating and the lines are intact. The college electronic switching system is 110 Volt A.C., but has a backup generator. There is an extension of 503-777-8008 in the Director's Office which serves as the Emergency Support Center (ESC). Reed Community Safety patrols are in radio contact with this base, and have the capability of handling phone communications on their radio equipment. During periods when RRF is unattended, Reed Community Safety patrols RRF, and notice of any alarm condition is communicated to the first available person on the ENCL.

3.1.9 Reed College Information Services Office

The Reed College Information Services Office, 212 Eliot Hall, will handle all official news releases concerning emergency events at RRF.

3.1.10 Reed College Community Safety

Reed College Community Safety personnel may be called to provide RRF security assistance, emergency radio communications, and traffic control as necessary. Reed Community Safety personnel shall be trained annually in their role in RRF emergency procedures.

3.1.11 Reed Physical Plant Personnel

Reed Physical Plant Personnel may be called to provide assistance with electrical, plumbing, or structural problems encountered during an emergency.

3.1.12 Portland Fire Bureau

The City of Portland Fire Bureau will serve as the primary firefighting agency. The firemen are trained annually in their role in RRF emergency procedures.

3.1.13 Portland Ambulance Service

The City of Portland operates a coordinated Emergency Dispatching System through the 911-all emergency number, and will provide emergency medical assistance and ambulance service for RRF as required. Because of the presence of a major nuclear plant near Portland, the emergency medical technicians have been trained to handle contaminated personnel.

3.1.14 Good Samaritan Hospital

Good Samaritan Hospital will provide medical facilities and care for contaminated injured individuals and for individuals suffering from acute radiation exposure. Good Samaritan Hospital is the primary receiving hospital for contaminated injured personnel from a major nuclear generating station. Full-scale exercises are held at frequent intervals to train and requalify personnel in the radiological emergency unit. Good Samaritan Hospital has 50% of its emergency facilities completely isolable to handle such emergencies. Good Samaritan Hospital produces videotapes and other materials as training aids for medical personnel involved in response to radiological accidents and injuries.

3.1.15 State of Oregon Department of Energy

The State of Oregon Department of Energy has statutory responsibility for the coordination of all State and Local Emergency Response to an accident at RRF. This responsibility has placed RRF in the category of a Research Reactor included as an appendix to the State's Trojan Nuclear Power Plant Emergency Response Plan. Radiological monitoring and assessment, and Health Physics expertise are deployed as part of the response upon being notified of an event at RRF. Full-scale exercises at Trojan have been used to train the components of the State Emergency Response Organization. State personnel write the State's RRF Response Plan with input from RRF.

3.1.16 Offsite Law Enforcement Agencies

The Portland Police Bureau is the primary offsite agency for facility security assistance, emergency radio communications, traffic control, and riot control as necessary. PPB officers and personnel are trained annually in Emergency Response to RRF alarms. The PPB is notified in all cases involving RRF security, and any other requests for assistance may be made by the ENCL person acting as Emergency Coordinator or by Reed Community Safety. Additional offsite assistance is available from the Multnomah County Sheriff's Office and the Oregon State Police as requested by the Portland Police Bureau.

3.2 Coordination with and Notification of Government Agencies

The postulated credible accidents associated with the operation of RRF's Triga Mark I Nuclear Reactor will not result in a radiological hazard affecting the public health and safety. These emergency events will not require the direct involvement of local, state, and federal agencies.

3.2.1 U.S. Nuclear Regulatory Commission

Notification of an incident to the U.S. Nuclear Regulatory Commission shall be in accordance with the requirements of 10 CFR 20 and other applicable regulations. Additionally, RRF will transmit to the NRC all information specified in the Technical Specifications to Reactor License R-112. Notification of the NRC shall be an RRF Management responsibility. If the Director is not available, an Emergency Coordinator who is also a member of the ENCL shall assume this responsibility and notify the Dean of the Faculty of this action.

3.2.2 State of Oregon Department of Energy (ODOE)

ODOE shall be notified any time an Offsite Support Organization is activated for a radiological incident. Notification of an incident to the ODOE, Salem, Oregon, shall be in accordance with the regulations specified in Oregon Regulations for the Control of Radiation and other applicable State Regulations. Notification of the ODOE shall be an RRF management responsibility. If the Director is not available, an Emergency Coordinator who is also a member of the ENCL shall assume this responsibility and notify the Dean of the Faculty of this action.

3.2.3 Local Government Agencies

The City of Portland and Multnomah County shall be notified of any incidents which may have caused or threaten to cause an uncontrolled release of radioactive materials that results in a projected offsite dose of 1 Rem deep dose equivalent (DDE or whole body) or 5 Rem thyroid committed dose equivalent (CDE). Notification of local government agencies shall be an RRF Management responsibility. If the Director is not available, an Emergency Coordinator who is also a member of the ENCL shall assume this responsibility and notify the Dean of the Faculty of this action. This notification may be under the responsibilities of the State of Oregon Emergency Response Personnel in which case RRF personnel will respond to State instructions.

3.2.4 American Nuclear Insurers (ANI)

ANI shall be notified as soon as possible after declaration of a nuclear Alert, Site Area Emergency, or General Emergency as required by their contract. Notification of ANI shall be an RRF Management responsibility. If the Director is not available, an Emergency Coordinator who is also a member of the ENCL shall assume this responsibility and notify the Dean of the Faculty of this action.

3.3 Termination of an Emergency

The Emergency Coordinator who is a member of the ENCL shall be responsible for the termination of an emergency. Prior to termination of an emergency the Emergency Coordinator shall conclude that there exist no foreseeable subsequent events that could cause damage to the reactor or render its operation unsafe. He shall verify that all areas to be reopened to personnel or the general public meet the requirements of 10 CFR 20 for occupancy. He shall also confirm that areas restricted to entry or that require controlled access are clearly posted.

3.4 Authorization for Reentry

The Emergency Coordinator who is a member of the ENCL shall authorize any reentry into the reactor building or portions thereof previously evacuated during the course of an emergency. It shall be the responsibility of the Health Physicist to establish reentry requirements, provide personnel monitoring, and insure that protective clothing and proper respiratory protection is utilized when required.

3.5 Authorization of Radiation Exposures in Excess of 10 CFR 20 Limits

An Emergency Coordinator who is also a member of the ENCL with the concurrence of the Health Physicist, or a qualified alternate Health Physicist such as a State of Oregon Emergency Response Team Member, may authorize exposures to emergency team members and radiation workers in excess of normal occupational limits as specified in 10 CFR 20. The exposure limit is 25 Rem deep dose equivalent (DDE or whole body) for life saving or corrective action that mitigates the consequences or reduces the severity of the emergency event. The exposure is authorized on a once-in-a-lifetime basis with preference given to the eldest able-bodied volunteers.

4.0 EMERGENCY CLASSIFICATION SYSTEM

The emergency classes described for the RRF 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 claims. An Emergency Classification Guide is presented in Table I. Implementing Procedures for the emergency classes of credible accidents are listed in Appendix B.

4.1 Non-Reactor Safety Related Events

These events are separate from reactor operations and do not necessarily indicate changing of the reactor status. Advisories to Reed Community Safety or Portland Police may be warranted, and conditions may require such local services as ambulance and medical. There may be a need to shut down the reactor to reallocate personnel or because of injuries to a key individual.

The following action levels shall be used to initiate emergency measures associated with this emergency class.

1. Civil disturbances or receipt of a bomb threat non-specific to the reactor or adjoining Psychology Building.
2. Personnel injury with or without radiological complications.
3. Minor fire or explosion non-specific to the reactor, its control system, or facility power lines in the Psychology Building.
4. Facility or individual contamination.

4.2 Notification of Unusual Event

This class of emergency may be initiated by either manmade 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 accident 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 damages to the reactor, it may warrant an immediate shutdown of the reactor.

The following action levels shall be used to initiate emergency measures associated with this emergency class:

1. Receipt of a bomb threat with possible radiological release implication.
2. Pool level alarm and visual observation indicating abnormal loss of water or abnormal increase in water level.
3. An explosion, or a fire in the Psychology Building lasting more than 10 minutes.

4. Actual or projected radiological effluents at the site boundary exceeding 6 DAC-hours when averaged over 24 hours or 15 mRem DDE accumulated in 24 hours. Written procedures shall be in effect for estimating these doses based on measurements from the stack monitors.¹

4.3 Alert

Events leading to an alert would be of such radiological significance as to require notification of the emergency organization and response as appropriate for the specific emergency situation. During an alert it is unlikely that offsite response or monitoring would be necessary. However, substantial modification of the reactor operating status is a highly probable corrective action with shutdown (as described in the Technical Specifications to Reactor License R-112) the goal. Protective evacuations, or isolation of certain areas within the operations or site boundary may be necessary. The following action levels shall be used to initiate emergency measures associated with this emergency class.

1. Actual or projected radiological effluents at the site boundary exceeding 30 DAC-hours when averaged over 24 hours, or 75 mRem DDE accumulated in 24 hours.
2. Actual or projected radiation levels at the site boundary of 20 mRem/hr for 1 hour DDE or 100 mRem thyroid CDE.²

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.

¹The stack monitor will have alarmed, shut off the ventilation system, and closed the isolation dampers long before this level is reached. The stack monitor will however, continue to function and would be used to project effluent releases and direct radiation levels at the site boundary. Direct measurements with portable survey meters would also be used to evaluate radiation levels at the site boundary.

²Determination of airborne effluent concentrations will follow the same process as described for an Unusual Event

TABLE I: EMERGENCY CLASSIFICATION GUIDE

<u>Emergency Class</u>	<u>Action Level</u>	<u>Purpose</u>
Non-Reactor Safety Related Event	Civil disturbances or receipt of bomb threat non-specific to reactor	Alert staff to a possible escalation
	Personnel injury with or without radiological complications	Initiate assessment and provide treatment
	Minor fire or explosion non-specific to the reactor, its control system, or facility power lines in the Psychology Building.	
	Facility or individual contamination	
Notification of Unusual Event	Receipt of bomb threat with possible radiological release implications	Assure that emergency personnel are readily available to respond if the situation becomes more serious or to perform confirmatory radiation monitoring if required.
	Pool level alarm and visual observation indicating abnormal loss of water or abnormal increase in water level	
	An explosion or a fire in the Psychology Building lasting more than 10 minutes.	Provide offsite authorities current status information
	Actual or projected radiological effluents at the site boundary exceeding 6 DAC-hours when averaged over 24 hours or 15 mRem DDE accumulated in 24 hours. Written procedures shall be in effect for estimating these doses based on measurements from the stack monitors. ³	
Alert	Actual or projected radiological effluents at the site boundary exceeding 30 DAC-hours (derived air concentrations) when averaged over 24 hours, or 75 DDE accumulated in 24 hours.	
	Actual or projected radiation levels at the site boundary of 20 mRem/hr for 1 hour DDE or 100 mRem thyroid committed dose equivalent (CDE). ⁴	

³The stack monitor will have alarmed, shut off the ventilation system, and closed the isolation dampers long before this level is reached. The stack monitor will continue to function and would be used to project effluent releases and direct radiation levels at the site boundary. Direct measurements with portable survey meters would also be used to evaluate radiation levels at the site boundary.

⁴Determination of airborne effluent concentrations will follow the same process as described for an Unusual Event.

5.0 EMERGENCY ACTION LEVELS (EAL)

There are no postulated credible accidents associated with the operation of the RRF Reactor that lead to exposures exceeding the Protection Action Guides (PAGs) of 1 Rem DDE or 5 Rem thyroid CDE beyond the site boundary. The action levels specified in Table I "Emergency Classification Guide" and described in Sections 4.1, 4.2, and 4.3 are EALs for activating the Emergency Organization and initiating protective actions appropriate for the emergency event.

6.0 EMERGENCY PLANNING ZONE (EPZ)

The operations boundary for the RRF Reactor (defined as the reactor bay or reactor containment area) is established as the Emergency Planning Zone (EPZ) for the RRF. Areas within and adjacent to the EPZ are large enough to support emergency actions beyond the EPZ if necessary.

7.0 EMERGENCY RESPONSE

7.1 Activation of the RRF Emergency Organization

The Emergency Coordinator shall be responsible for initiating the emergency procedures and for notifying and mobilizing the emergency organization. During periods of time when RRF is unattended and an emergency is detected by Reed Community Safety, appropriate RRF staff will be contacted as per the Emergency Notification Call List (ENCL) by the Reed Operator. There is an operator on duty 24 hours per day insuring that in the event of an emergency RRF personnel on the ENCL will be notified. Additionally, the Offsite Support Organizations are available 24 hours per day. Communication during emergency situations may be by telephone, word of mouth, short wave radio, intercom, or public address system, as appropriate.

7.2 Protective Action Values

Every attempt shall be made to maintain radiation exposures to emergency personnel within the limits of 10 CFR 20 and/or the Protective Action Guides (PAGs) of 1 Rem DDE or 5 Rem thyroid CDE. However, an Emergency Coordinator who is also a member of the ENCL with the concurrence of the Reactor Health Physicist, or a qualified alternate Health Physicist such as a State of Oregon Emergency Response Team Member, may authorize exposures in excess of these values to facilitate rescue of injured personnel or take corrective actions which will mitigate the consequences of the emergency event. The exposure limit for life-saving and for corrective actions is 25 Rem DDE. The exposures shall be on a voluntary basis and restricted to a once-in-a-lifetime exposure.

7.3 Health Physics Emergency Response Program

The Reactor Health Physicist shall be responsible for determining radiation dose rates and contamination levels both onsite and offsite. The Reactor Health Physicist may request assistance from RRF personnel, State of Oregon Emergency Response Personnel, and other Offsite Support Organizations as necessary to carry out radiological assessment of the accident. This information will be relayed by face-to-face communication, telephone communication, intercom, or short wave radio to the individual responsible for accident assessment. In addition, these individuals shall provide for isolation and supervise access control to restricted areas to minimize personnel exposures and the spread of radioactive contamination.

7.4 Reporting of Emergencies

Copies of the ENCL are posted in the facility, the Emergency Support Center (ESC), and the Chemistry Secretary's Office. Telephone numbers are listed for RRF personnel. Copies of this plan with notification procedures for all offsite support agencies are located in the control room, emergency grab bag, ESC, and Chemistry Secretary's Office. Initial and follow-up emergency messages to the ODOE and the NRC and, if applicable, to other offsite government 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 Coordinator shall activate that portion of the Emergency Organization necessary to respond to the emergency event. In any case, RRF Management shall be notified and kept informed of the emergency status.

7.5.2 Assessment Actions for Non-Reactor Safety Related Events

Civil disturbances or bomb threats shall be assessed by the Emergency Coordinator for validity and specificity using Portland Police Bureau experience, Reed Community Safety experience, and the information source.

For personnel injury the Emergency Coordinator shall assess the extent of the injury and with Health Physics assistance shall determine if radioactive contamination is present. Portable and fixed radiation monitoring devices are available for this assessment. In the absence of contamination, the assessment shall consider the nature of the injury, the appropriate first aid, and the need for ambulance transport.

The Emergency Coordinator shall insure the suitable monitoring of potentially contaminated individuals or facilities. The Health Physicist shall be notified in all cases of major personnel contamination (a positive survey after washing shall constitute major personnel contamination), and in the case of any contamination incident rendering any part of the facility a restricted area until decontaminated.

7.5.3 Corrective Actions for Non-Reactor Safety Related Events

In the event of a civil disturbance or receipt of a bomb threat non-specific to RRF, the Portland Police and Reed Community Safety shall be notified. The Portland Police will initiate the appropriate controls to insure the protection of personnel and property in accordance with their Emergency Plan. In addition the Emergency Coordinator shall notify a member of RRF Management and keep him informed of the emergency status.

For cases of personnel injury with or without radiological complications, the Emergency Coordinator shall be responsible for notifying RRF Management and a member of the ENCL. In addition, the Emergency Coordinator shall provide medical assistance including a request for ambulance transport. If the injured individual is contaminated, decontamination will be attempted only if it is judged that this will not further aggravate the injuries. The contaminated injured individual shall be transported using contamination control and reverse isolation methods to the extent possible.

7.5.4 Protective Actions for Non-Reactor Safety Related Events

Protective actions at this level of emergency are generally distinguishable from corrective actions. Some cases may necessitate the evacuation of the reactor bay in which case personnel shall assemble in the designated assembly area and be verified by roll call. Evacuation shall be initiated by sounding the evacuation alarm, and notifying all personnel by way of public address system and word of mouth. Should personnel evacuation be necessary, the Emergency Coordinator shall

control access to the Facility, and will be responsible with Health Physics support for the segregation of potentially contaminated personnel.

7.6 Emergency Response for Notification of Unusual Events

7.6.1 Activation of Emergency Organization for Notification of Unusual Events

The Emergency Coordinator shall activate that portion of the emergency organization necessary to respond to the emergency situation. In addition, RRF management shall be notified and kept informed of the emergency status.

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 bay or the release of effluents at the site boundary shall be immediately assessed by the Emergency Coordinator with assistance from the Reactor Health Physicist. Additional support is available from the Offsite Support Organizations.

The assessment will consist of an observation and evaluation of facility air and/or radiation monitors in the control room and the use of portable survey instruments. Excessive levels may require evacuation of the RRF and future assessment will be made from the ESC. Hand and foot monitors and pocket dosimeters can also be used for accident assessment. Collected filter paper and swipe samples can be counted in a laboratory removed from the RRF. Levels observed on the stack air monitors are used to assess release levels at the site boundary. Civil disturbances and bomb threats shall be assessed by the Emergency Coordinator for validity and specificity using Portland Police Bureau and Reed Community Safety experience and the information source.

Pool Level Alarms and visual observation indicating abnormal loss of water or abnormal increase in pool level shall immediately be assessed by the Emergency Coordinator and the source or sink of water identified.

Fire or explosion in the basement of the Psychology Building or RRF shall immediately be assessed by the Emergency Coordinator and magnitude of the event shall be determined. Appropriate Offsite Support Organizations (Fire, Police, Rescue, Ambulance, Health Physics) shall be summoned. The Emergency Coordinator shall remain in the designated assembly area to brief Offsite Support Units upon arrival. Health Physics personnel will monitor as necessary to determine if radioactivity is present.

Because of the physical location of RRF in relation to the rest of the Psychology Building, any major fire, explosion, or event requiring evacuation of any part of the Psychology Building may present a serious threat to the RRF (e.g. vapor, water, fire, chemical, electrical). When RRF is notified of such an event, the senior person on duty shall become the Emergency Coordinator and immediately assess the magnitude of the event and the nature of the threat to RRF. The Emergency Coordinator shall initiate appropriate protective actions (e.g. shutdown, evacuation, sandbagging) and shall brief responding units. The Emergency Coordinator shall activate that portion of the RRF Emergency Organization necessary to respond to and minimize potential or actual damage to the Facility.

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 facility may be evacuated pending an evaluation of the problem and identification of the probable source. The Emergency Coordinator shall confer with the Reactor Health Physicist and shall control access to the reactor facility until radiation and airborne activity levels have been

restored to normal. All personnel will be verified present at the designated assembly area and unnecessary personnel will assemble in the training classroom to be available for assistance.

For bomb threats with possible radiological release implications, RRF Management, the Portland Police Bureau, and Reed Community Safety shall be notified. The police will initiate appropriate procedures following their Emergency Plan to insure the protection of personnel and property. The reactor shall be shutdown and all personnel evacuated to the ESC.

In case of prolonged fire or explosion within the facility, the Portland Fire Bureau shall be summoned, the first available member of the ENCL and RRF Management shall be notified. The Reactor Health Physicist shall be notified of fire in areas where radioactive materials are located. In addition, the Emergency Coordinator shall shutdown the reactor and evacuate personnel from the RRF and the basement of the Psychology Building. Teams will be dispatched to check for injured personnel. The Emergency Coordinator will monitor the extent of the fire and brief fire bureau personnel upon their arrival.

In case of Pool Level Alarm and visual indication of abnormal loss or gain of pool water, the Emergency Coordinator shall shutdown the reactor, secure the primary and secondary water systems, and isolate the pool through appropriate valve changes. The Emergency Coordinator shall insure that a preliminary radiation survey is performed and appropriate personnel protective measures instituted (e.g. evacuation, radiation area warning, protective clothing required, electrical hazard). The Reactor Health Physicist, the first available member of the ENCL, and RRF Management shall be notified.

7.6.4 Protective Actions for Notification of Unusual Events

For this emergency class the reactor facility may be evacuated and shall be done in accordance with facility Emergency Procedures. All personnel shall be verified present by roll call in the designated assembly area, and those individuals who exited the reactor bay will be surveyed for contamination using portable instruments from the Emergency Grab Bag or the ESC. Those who are contaminated shall be segregated. The Emergency Coordinator is responsible for controlling access to the reactor bay; such access shall be limited to rescue and emergency response operations.

Facility air and area radiation monitors shall be used to assess the radiological emergency. In addition to these, other sources of information are available from Offsite Support Organizations. The Emergency Coordinator with support from Health Physics personnel is responsible for minimizing personnel exposure and spread of contamination. Emergency exposure levels for personnel shall be in accordance with Section 7.2.

7.7 Emergency Response for an Alert

7.7.1 Activation of the Emergency Organization for an Alert

The Emergency Coordinator shall activate that portion of the emergency organization necessary to respond to the emergency situation. In addition, RRF management and ODOE shall be notified and kept informed of the emergency status.

7.7.2 Assessment Action for an Alert

Any severe fuel damage, experiment failure, or event manifested by excessive radiation or radioactivity levels within the reactor facility or the release of effluents at the site boundary shall require immediate evacuation of personnel from the reactor facility and assessment action will be made from the ESC using portable radiation monitors available there. Assessment will be made by

the Reactor Health Physicist with support from RRF personnel. Additional support is available as needed from Offsite Support Organizations. Further assessments can be made using portable survey meters, air samplers, and personnel dosimetry. Filter paper and swipe samples can be counted in a laboratory separate from the ESC. Release levels at the site boundary are levels observed on the stack air monitors.

7.7.3 Corrective Actions for an Alert

For an alert that has been dictated by assessment of radiological levels, the reactor facility shall be evacuated following Emergency Procedures pending an evaluation of the problem and identification of the probable source. The Emergency Coordinator shall control access to the reactor bay until radiation and airborne activity levels have been restored to normal. In addition, teams will be dispatched to seal doors to the facility which are non-essential to access for emergency control. The Emergency Coordinator shall notify the first available member of the ENCL and the Reactor Health Physicist. Additional assistance may be summoned from Offsite Support Organizations.

7.7.4 Protective Action for an Alert

Protective actions for alert emergencies will be in accordance with Section 7.6.4.

8.0 EMERGENCY FACILITIES AND EQUIPMENT

8.1 Emergency Support Center (ESC)

The RRF Director's Office (Room 102 Chemistry Building) shall be the Emergency Support Center for emergency actions. Because of its close proximity to the reactor building the ESC allows for timely evacuation of personnel and emergency action. Telephone and access to radio communications are available in the ESC.

8.2 Assessment Facilities

The RRF has area radiation monitors and facility air monitors with readouts and alarm indications in the reactor control room. In addition, RRF maintains counting laboratories and portable survey instruments in the reactor and laboratory buildings, and if necessary, additional counting equipment and survey instruments are available from Offsite Support Organizations. There is also available in Room 415 of the Chemistry Building a gamma ray spectrometer for radioisotope identification. In addition, the following alarms and indicators provide non-radiological information in the event of an emergency:

<u>Monitor</u>	<u>Alarm</u>
1) High-Low Water Alarm	Red light in evacuation corridor and outside the Reactor Building above the double doors, and buzzer in Console Room
2) Pool Temperature Alarm	Buzzer on console
3) Isolation cycle indicator	Red lights in reactor and Console Rooms. Both visible from evacuation corridor.
4) Secondary Water Low Pressure Alarm	High Pitched Howler in Reactor Bay; audible outside RRF
5) Fire Alarm Pull Station	Alarm bells throughout adjacent Psychology Building
6) Evacuation Alarm	Klaxon in Reactor Bay. Red light in radiochemistry lab.
7) Primary Water Conductivity	None
8) Secondary Water Pump Failure Alarm	Red light with audible alarm next to breaker box on east wall of the reactor bay

8.3 First Aid and Medical Facilities

Onsite first aid and medical supplies are located in the emergency grab bag located in the evacuation corridor. Additional first aid supplies are available in the cabinets in the corridors of the Chemistry Building.

Accidents resulting in personal injury without contamination will be handled by administering first aid and summoning an ambulance with paramedics if needed. In the event of injury with

contamination, the individual will be transported to Good Samaritan Hospital, Portland. Each ambulance is staffed with two emergency medical technicians and is capable of transporting contaminated victims. Good Samaritan Hospital has emergency procedures for this situation.

Written agreement letters with respect to arrangements made for hospital, medical, and other emergency services shall be filed and attached to this plan as Appendix A.

8.4 Decontamination Facilities

Decontamination of personnel at the RRF can normally be handled using sinks at the facility. The Reactor Health Physicist shall be responsible for decontamination of all individuals involved in any emergency.

8.5 Communications Systems

RRF telephones and the facility intercom system located throughout the facility, may be utilized during emergency conditions. In addition, word of mouth communications will provide a backup for internal communications to campus, and emergency radiotelephone communications. Also there is a semi-annual update and verification of the emergency notification call list.

9.0 RECOVERY OPERATIONS

Restoring RRF to a safe operating condition after an emergency shall be the responsibility of the Emergency Coordinator. In the event that recovery procedures are necessary, they shall be written by the Emergency Coordinator and reviewed by the Reactor Safety Committee. Any operations necessary to restore RRF to operational status shall be under the direction of the Emergency Coordinator. The Reactor Health Physicist shall survey, direct decontamination operations, and ascertain that contamination and radiation levels within the affected area are within appropriate limits. RRF management with the advice of the Reactor Safety Committee shall assess resultant damages, direct repairs, review the emergency, and authorize continued operation of the reactor.

10.0 MAINTAINING EMERGENCY PREPAREDNESS

10.1 Training

The RRF personnel with emergency response responsibilities shall complete an initial training program and an annual retraining program to include classroom training and practical drills. The training is designed to demonstrate an individual's ability to perform assigned functions such as accident assessment, decision-making, radiological monitoring, contamination control and first aid and rescue of personnel.

In addition, Reed Community Safety, Portland Police Bureau, Portland Fire Bureau, and Good Samaritan Hospital emergency room personnel are trained on an annual basis in radiation safety and RRF emergency procedures.

10.2 Conduct of Drills and Exercises

Onsite emergency drills shall be conducted annually to test the adequacy of emergency procedures and to ensure that emergency organization personnel are familiar with their duties. These drills shall be executed as realistically as possible and shall include the use of appropriate emergency equipment. At least every two years the communication links and notification procedures with offsite agencies and support organizations shall be tested.

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, non-essential personnel evacuation, and record keeping.
3. Communication drills designed to ensure reliability of the system(s) and correct transmission and receipt of messages.

10.3 Critiques of Drills and Exercises

At the conclusion of each drill a critique to identify deficiencies shall be held by the participating RRF 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. Results shall be evaluated by the Reactor Safety Committee (RSC).

10.4 Emergency Plan Review and Update

The Emergency Plan shall be revised and updated as required based on drill results or changes in the facility and shall be reviewed annually by the RSC to ensure the plan is adequate and up to date. Applicable portions of the plan, agreements, and implementing procedures shall be distributed to authorized agencies and support organizations, and any revisions to implementing procedures affected by the plan shall be approved by the RSC and sent to authorized recipients within 30 days after the revised plans have been issued.

10.5 Emergency Equipment Maintenance Surveillance

Surveillance of emergency supplies insures availability and proper condition for immediate use. The RRF operations staff is responsible for surveillance of emergency supplies. Emergency

supplies at the RRF are verified to be operational and complete on a semi-annual basis, and fire extinguishers located throughout the facility are checked approximately annually by Campus Physical Plant or contracted service personnel. The pool level alarm system is verified operational on a bimonthly basis and is maintained by the RRF and Reed Physical Plant. Telephone and radio communication maintenance is provided by the utility company or the manufacturer of the equipment.

10.5.1 Inventory of Emergency Supplies and Equipment

The emergency kit is located in the evacuation corridor from the RRF facility. The kit is inventoried on a semi-annual basis or after each use and contains such items as portable survey instruments, protective clothing, flashlights, survey maps, swipe and barrier ropes and signs.

Firefighting facilities at the RRF include a wet-pipe sprinkler system and CO2 fire extinguishers distributed throughout the site. The condition of these extinguishers is checked and certified by the Reed Physical Plant or Contracted Service semi-annually. Additional emergency equipment is available from the Reactor Storeroom, ESC, and Offsite Support Organizations.

10.5.2 Radiation Monitoring Equipment Checks and Calibration

Portable health physics instruments, including dosimeters dedicated for emergency use shall be inspected and checked for operability and calibrated semi-annually. The RRF Operations staff conducts routine checks and calibrations of facility air and area radiation monitors.

Reed Reactor Facility

Emergency Plan

Appendix A

Agreement Letters

- A.1 City of Portland Police Bureau
- A.2 City of Portland Fire Bureau
- A.3 Buck Ambulance Service
- A.4 Good Samaritan Hospital
- A.5 Oregon Department of Energy

SAFETY RELATED DOCUMENT

Reed Reactor Facility

Emergency Plan

Appendix B

Emergency Implementation Procedures

Docket 50 - 288

License R - 112

August 1994

Reed Reactor Facility
3203 SE Woodstock Boulevard
Portland, Oregon 97202
(503) 771-1112 or (503) 777-8008

The Reed Institute dba
Reed College
3203 SE Woodstock Boulevard
Portland, Oregon 97202
(503) 771-1112

9409286328 16pp.

REED REACTOR FACILITY EMERGENCY IMPLEMENTATION PROCEDURES

INTRODUCTION

This set of procedures is designed to implement the Reed Reactor Facility Emergency Plan. It consists of descriptions of facility alarms and available equipment, and procedures to be followed in the case of an emergency.

1. FACILITY ALARMS

The facility is provided with the monitoring and safety devices described below. Appendix D provides data for the normal readings and alarm set points.

1) CONTINUOUS AIR MONITOR (CAM)

This Geiger-Muller (GM) counter monitors particulate and gaseous radioactivity in air sampled directly above the reactor pool. The amber failsafe light, red alarm light, and alarm bell are located on the CAM. Readout is accomplished with meters on the instrument and control console, and a stripchart recorder on the instrument. An alarm will activate the air confinement system. The shielded GM detector is placed next to a filter through which air from above the pool is drawn; the efficiency of the detector is about 10% for beta radiation.

2) AIR PARTICULATE and GASEOUS STACK MONITORS (APM & GSM)

These two GM counters monitor gaseous and particulate radioactivity in the air released from the facility stack. Amber failsafe lights, red alarm lights, and alarm bells are located on the north wall of the control room. Readout is accomplished with meters and stripchart recorders. The alarm trip point of the gaseous monitor will activate the air confinement system. Confinement is indicated by a red jewel light on the front of the GSM readout.

3) RADIATION AREA MONITOR (RAM)

This scintillation counter monitors ambient gamma radiation levels in the reactor room. The amber failsafe light, red alarm light, alarm bell and meter readout, in mR/hr, are located on the instrument. The RAM is visible from the windows in the exit corridor and from the control room.

4) WATER LEVEL MONITOR

A float device monitors the water level in the reactor tank for high or low water conditions. Red warning lights are mounted outside above the large double doors to the bay and in the evacuation corridor. A warning buzzer is located in the control room.

5) SECONDARY WATER LOW-PRESSURE ALARM

The secondary water system is provided with a low-pressure alarm which indicates any significant decrease in secondary water pressure by means of a high frequency audible alarm and a flashing red light on a panel on the south wall of the reactor bay.

6) BULK WATER ALARM

When the pool temperature reaches the maximum limit (120°F or 49°C), a sensor under the bridge will activate a warning light on the control console and sound a buzzer alarm in the control room.

7) EVACUATION ALARMS

A manually operated emergency evacuation klaxon can be activated by either of two large distinctly marked red buttons, one on the south wall of the reactor bay and one in the control room on the wall adjacent to the right edge of the control console. In addition, a red light in the radiochemistry laboratory will provide warning to individuals working in the laboratory or approaching the reactor control room or reactor bay.

8) FIRE ALARMS

A manual pull-station is located outside the control room door, the exit corridor, and others are located throughout the Psychology Building. These activate an internal fire alarm bell.

9) WATER CONDUCTIVITY

The conductivity of the reactor pool water is an indirect measurement of the radioactivity contained therein. The conductivity is measured by probes in the demineralizer loop and the values read from a device mounted on the north wall of the mechanical room by the demineralizer tanks.

10) SECONDARY WATER SYSTEM PUMP FAILURE ALARM

A red light with audible alarm next to the breaker on the east wall of the reactor bay sounds when the secondary water system pump fails.

2. FACILITY EQUIPMENT

1) EMERGENCY GRAB-BAG

An easily removable suitcase is located in the hallway near the north exit door. Upon evacuation of the facility, it shall be removed and taken outside. The contents of the emergency grab-bag are listed in Appendix B. These contents are checked on a semi-annual basis.

2) PORTABLE SURVEY METERS

During every startup checklist, each meter is tested to determine its operability. If a meter is working properly, it is left on the large shelf on the west wall of the control room. A minimum of one ionization chamber meter and one GM survey meter are necessary for operations to proceed. If a meter is not working properly, it is tagged and placed on a smaller shelf on the south wall to await repair. All properly working meters should be promptly returned to the control room west wall shelf after use. Additional portable monitoring equipment is available in the Emergency Support Center (ESC) (Director's Office, Room 102 Chemistry Building).

3) HAND AND FOOT MONITOR

A personnel hand and foot monitor is located by the south wall of the reactor bay next to the entrance to the control room. This may be a thin-window GM survey instrument or scintillation instrument.

4) EMERGENCY LIGHTS

Battery operated lights are located in the reactor bay, mechanical room, exit corridor, radiochemistry laboratory, and counting room area. They turn on any time the 110 V power is interrupted. They are expected to remain lit for about six hours.

5) FIRE EXTINGUISHERS

Carbon dioxide fire extinguishers are available in the reactor bay and the radiochemistry laboratory.

6) WEATHER CONDITIONS

Weather information can be obtained from the U.S. Weather Service whose 24-hour phone number is listed in Appendix A.

3. EMERGENCY IMPLEMENTATION PROCEDURES

The steps for each initiating event are serially numbered. In any emergency it shall be the judgement of the Emergency Coordinator which establishes the order and priority of actions. Descriptions of criteria and possible initiating events are given in the Reed Reactor Facility Emergency Plan.

3.1 PROCEDURE FOR A NON-REACTOR SAFETY RELATED EVENT

Minimum Required Responses:

1. **Shut down the reactor** if one or more of the personnel required for operation is incapacitated or occupied by the situation.
2. **Evacuate the facility** if appropriate. See Appendix C.
3. **Send for medical assistance** if required. See Appendix A.
4. **Apply emergency first aid** as required.
5. **Secure the main facility circuit breaker** in the case of electrical hazard. The breaker is located on the east wall of the exit corridor, near the emergency exit. Turn the key to secure the breaker. If the key is missing a spare is in the emergency grab bag.
6. **Notify the first available person on the Emergency Notification Call List.**
7. **Notify the police and Reed Campus Community Safety** if necessary, or for help in other operations such as directing support traffic or evacuating the Psychology Building. See Appendix A.
8. **Decontaminate personnel and facility** as required provided decontamination will not aggravate personnel injuries nor increase the severity of the event. All entrance to and exit from the facility shall be controlled by the Emergency Coordinator until decontamination is complete. Notify the Reactor Health Physicist in any case of major personnel (contamination not completely removable) or facility contamination. Phone numbers are in the **Emergency Notification Call List** or Appendix A.
9. In case of **civil unrest**, the reactor shall be shutdown, and the four (4) facility doors shall be dead-bolt locked.
10. In case of **loss of power** to the facility, secure Control Console Circuit Breaker A and all circuit breakers in the Mechanical Room Circuit Breaker Box. Isolate the pool by appropriate valve changes. After power is restored, return systems to service.
11. The **Emergency Coordinator** who is also on the **Emergency Notification Call List** shall **Notify Reed Reactor Facility Management and Oregon Department of Energy**. See Appendix A.

3.2 PROCEDURE FOR AN UNUSUAL EVENT

Minimum Required Responses:

1. **Shut down the reactor.**
2. **Evacuate the facility**, if necessary. See Appendix C.
3. **Obtain medical, rescue, and/or fire-fighting assistance** as required. See Appendix A.
4. **Bomb threats with radiological release implications** shall be referred to Reed Security and the Portland Police Bureau. See Appendix A.
5. **Notify the police and Reed Campus Community Safety** if necessary, or for help in other operations such as directing support traffic or evacuating the Psychology Building. See Appendix A.
6. **Notify the first available person on the Emergency Notification Call List.**
7. **Secure the primary water system and isolate the pool** by appropriate valve changes if necessary.
8. **Secure the main facility circuit breaker** in the case of electrical hazard. The breaker is located in the exit corridor. A key is always in the breaker.
9. After an on-site investigation of the situation, the **Emergency Coordinator** who is also on the **Emergency Notification Call List** shall notify the **State and Federal agencies, Nuclear Insurer, and Reed Reactor Facility Management listed in Appendix A.** These calls should be made from a phone where a return call from the agency is always possible. The phone of choice is the Emergency phone in the Emergency Support Center (Director's Office - Chemistry Room 102). A key to the Emergency Support Center and the Chemistry Building is in the emergency grab bag.
10. **Appropriate protective and recovery actions** shall be planned and then commenced under the direction of the Emergency Coordinator with the assistance of such support agencies or personnel as required by the nature of the incident.

3.3 PROCEDURE FOR AN ALERT

Minimum Required Response:

1. Evacuate the facility. See Appendix C.
2. Obtain medical, rescue, and/or fire-fighting assistance as required. See Appendix A.
3. Notify the police and Reed Campus Community Safety if necessary, or for help in other operations such as directing support traffic or evacuating the Psychology Building. See Appendix A.
4. Notify the first available person on the Emergency Notification Call List.
5. Collect all necessary or available radioactive material release data as outlined in Appendix E. Only a person on the Emergency Notification Call List may authorize re-entry into the facility.
6. With the available release data, the Emergency Coordinator who is also on the Emergency Notification Call List shall notify the State and Federal agencies, the Nuclear Insurer, and Reed Reactor Facility Management listed in Appendix A. These calls should be made from a phone where a return call from the agency is always possible. The phone of choice is the Emergency phone in the Emergency Support Center (Director's Office - Chemistry Room 102). A key to the Emergency Support Center and the Chemistry Building is in the emergency grab bag.
7. Appropriate protective and recovery actions shall be planned and then commenced under the direction of the Emergency Coordinator with the assistance of such support agencies or personnel as required by the nature of the incident.

APPENDIX A
PROFESSIONAL ASSISTANCE

MEDICAL EMERGENCY

1. Administer life-saving first aid.
2. Call ambulance (911 on EMERGENCY PHONE, 9-911 on BLACK PHONE); advise if contamination is present. Direct response to the service road on the north side of SE Woodstock Boulevard opposite house number 3626.
3. Have an assistant go to Woodstock Boulevard at the service road to direct the ambulance. If an assistant is not available or is contaminated, contact Reed Community Safety (7533 on BLACK PHONE or 777-7533 on EMERGENCY PHONE) and request assistance from the on-duty personnel.
4. In any accident involving radiation or radioactivity, the ambulance should take the injured ONLY to GOOD SAMARITAN HOSPITAL, 23rd and Northrup Emergency Room Entrance. The hospital should be notified that a radiological injury is on the way (229-7260 on EMERGENCY PHONE, 9-229-7260 on BLACK PHONE).

FIRE EMERGENCY

1. DO NOT BREATHE THE SMOKE OR FUMES.
2. ASSURE THE SAFETY OF ALL PERSONNEL.
3. DO NOT ATTEMPT TO FIGHT THE FIRE (unless it is wastebasket size with no possibility of radioactive material being involved).
4. CALL Fire Department (911 on EMERGENCY PHONE, 9-911 on BLACK PHONE); advise if contamination is present. Direct response to the service road on the north side of SE Woodstock Boulevard opposite house number 3626.
5. Have an assistant go to Woodstock Boulevard at the service road to direct the response. If an assistant is not available or is contaminated, contact Reed Community Safety (7533 on BLACK PHONE or 777-7533 on EMERGENCY PHONE) and request assistance from the on-duty personnel.
6. Secure the main facility circuit breaker (in the exit corridor) in the case of electrical hazard. The keys to the Psychology electrical closet and the circuit breaker are in the emergency grab bag.

APPENDIX A (Continued)

POLICE AND REED COMMUNITY SAFETY ASSISTANCE

1. Go through Reed Community Safety (7533 on BLACK PHONE or 777-7533 on EMERGENCY PHONE) whenever possible.
2. CALL Police Department (911 on EMERGENCY PHONE, 9-911 on BLACK PHONE); advise if contamination is present. Direct response to the service road on the north side of SE Woodstock Boulevard opposite house number 3626.
3. Have an assistant go to Woodstock Boulevard at the service road to direct the response. If an assistant is not available or is contaminated, contact Reed Community Safety (7533 on BLACK PHONE or 777-7533 on EMERGENCY PHONE) and request assistance from the on-duty personnel.

TECHNICAL ASSISTANCE

The following Offsite Support Agencies are available for technical assistance in case of any emergency at the Reed Reactor Facility. If a member of the Emergency Notification Call List is not able to respond, the licensed operator who is the Emergency Coordinator shall request assistance from these agencies. These calls should be made on the EMERGENCY PHONE in the control room or in the Emergency Support Center (Director's Office, Room 102 of the Chemistry Building). A key to the Chemistry Building and the Emergency Support Center is in the emergency grab bag.

1. State of Oregon Department of Energy, Salem: 1-503-378-4040
Ask for Dept. of Energy Duty Officer

After hours pager: 1-503-370-2340
2. US Nuclear Regulatory Commission Region IV, Texas: 1-817-860-8100
3. State of Oregon Radiation Control Section, Portland: 731-4014
4. American Nuclear Insurers, Inc., Farmington, CT: 1-203-561-3433

METEOROLOGICAL INFORMATION

U.S. Department of Commerce, Weather Bureau:
24-hour (emergency only): 281-2618
(Administrative Offices 281-1911)

APPENDIX A (Continued)

REQUIRED NOTIFICATION OF REGULATORY AGENCIES AND INSURER

The Emergency Coordinator who is on the Emergency Notification Call List has the responsibility to notify the following Agencies in the event of an ALERT incident. These calls should be made on the EMERGENCY PHONE in the control room or in the Emergency Support Center (Director's Office, Room 102 of the Chemistry Building). A key to the Chemistry Building and the Emergency Support Center is in the emergency grab bag.

1. US Nuclear Regulatory Commission Region IV, Texas: 1-817-860-8100
2. State of Oregon Department of Energy, Salem: 1-503-378-4040
Ask for Dept. of Energy Duty Officer

After hours pager: 1-503-370-2340
3. American Nuclear Insurers, Inc., Farmington, CT: 1-203-561-3433
4. State of Oregon Radiation Control Section, Portland: 731-4014

REQUIRED NOTIFICATION OF REED REACTOR FACILITY MANAGEMENT

The Emergency Coordinator who is on the Emergency Notification Call List has the responsibility to notify Reed Reactor Facility Management in the event of ANY emergency incident at the facility. These calls should be made on the phones in the control room or in the Emergency Support Center (Director's Office, Room 102 of the Chemistry Building). A key to the Chemistry Building and the Emergency Support Center is in the emergency grab bag.

1. Dean of the Faculty
7258 on the BLACK PHONE (Reed Offices)
9-294-0644 on the BLACK PHONE (Home)
294-0644 on the EMERGENCY PHONE (Home)
2. If the Dean of the Faculty is not available,
then notify the Vice-President -Treasurer
7506 or 7240 on the BLACK PHONE (Reed Office)
9-658-3851 on the BLACK PHONE (Home)
658-3851 on the EMERGENCY PHONE (Home)

APPENDIX B

CONTENTS OF EMERGENCY GRAB-BAG

- 1 Controlled copy of the Reed Reactor Facility Emergency Plan
- 1 Controlled copy of the Emergency Implementation Procedures
- 1 Controlled copy of the Emergency Notification Call List
- 1 High Level Survey Meter
- 1 Low Level Survey Meter
- 1 Flashlight
- 1 Pad of paper with pencil
- 1 Roll of masking tape
- 1 Master key to the Chemistry Building
- 1 Key to the main breaker trip in the exit corridor
- 1 Master key to the Psychology Building
- 1 Key to the Psychology Building electrical closet
- 1 Key to the back door to the RRF at the top of the stairs
- 1 Key to the external secondary water system valves
- 1 Box of polyethylene gloves
- 1 Set of protective clothing: suits and shoes
- 2 High Radiation Area signs
- 1 Radiation Area sign
- 1 Roll of radiation tape
- 500 Feet Nylon Line for delimiting exclusion areas
- 2 Black felt tip pens
- 2 0-200R pocket dosimeters
- 2 0-20R pocket dosimeters
- 1 Dosimeter charger
- 4 D cell batteries
- 1 First-Aid kit: Gauze, sterile pads, swabs, cloth strips, band aids, hydrogen peroxide, forceps, adhesive tape
- 6 safety pins
- 2 pair safety goggles

APPENDIX C

EVACUATION OF THE FACILITY

1. Push either the red evacuation alarm button to the right of the control console or the one on the South wall of the Reactor Bay.
2. Remove and take control console key.
3. All persons shall immediately exit the facility.

Personnel on the north side of the reactor bay shall exit via the emergency exit door at the Northeast Corner of the Reactor Bay (this door is equipped with audible and security alarms).

Personnel in the control room shall exit through the evacuation corridor.

Personnel in the radiochemistry laboratory, counting rooms, and break room shall exit via the stairway to the upper corridor of the Psychology Building unless that is the source of the incident, then they shall use the exit corridor.

4. The operator shall momentarily silence the alarm by pressing down on the small black button on the console alarm and use the PA system to direct persons in the reactor bay to the appropriate exits.
5. Upon leaving the control room, the operator is responsible for removing and taking the control console key, closing the door between the control room and the reactor bay, locking the control room door (it locks upon closing), and closing the door between the radiochemistry laboratory and the exit corridor.
6. The first staff person using the exit corridor shall take the emergency grab bag. The operator shall check that it has been taken.
7. Evaluate evacuating the Psychology Building. If the event could hazard people in the Psychology Building (fire, loss of reactor tank water level, etc), contact Reed Campus Security to evacuate the Psychology Building.
8. The Emergency Coordinator shall be
 - A. The Senior Member of the Emergency Notification Call List present, or
 - B. The Senior Reactor Operator on duty or present, or
 - C. The Reactor Operator on duty or present.
9. After exiting the building, personnel should assemble in the Emergency Support Center (Director's Office, Room 102 of the Chemistry Building). A key to the Chemistry Building and the Emergency Support Center is in the emergency grab bag. The group as a whole shall check to see if everyone known to have been in the facility is present or accounted for. An oral report of absent individuals shall be made to the Emergency Coordinator. The emergency grab-bag shall be turned over to this individual.

10. A person who has been monitored and is free of transferable radioactivity should take the Emergency Notification Call List, Appendix A, to notify the first available person on the Emergency Notification Call List and other appropriate sources of assistance.
11. Re-entry into the reactor room shall be authorized by personnel on the Emergency Notification Call List. Re-entry shall be accomplished with the aid of survey meters and protective clothing, or as directed by the Reactor Health Physicist. The protective items are available in the emergency grab-bag.
12. If necessary to save a life or to prevent a serious accident, the Emergency Coordinator may authorize limited re-entry if exposure rates are below 100 R/hr; in all cases, personnel doses shall be limited to a maximum of 25 rem.

APPENDIX D

ENVIRONMENTAL MONITOR READINGS

	Normal Reading during operations	Alarm Set Point
CAM	400 cpm	45,000 cpm
RAM	0.1 mR/hr	2 mR/hr
Gaseous Stack Monitor	100 cpm	500 cpm
Particulate Stack Monitor	150 cpm	27,000 cpm
Portable Survey Meter (GM) at reactor bay door	0.1 mR/hr	
Secondary Water Pressure	34 psi	45 psi
Bulk Water Temperature	20 C	48 C

APPENDIX E
RELEASE DATA NEEDED FOR AN ALERT INCIDENT
(As applicable, record the data and do the calculations on this page.)

1. (a) Date _____ (b) Time of Incident _____
(c) Location of Incident _____
 2. Raw Data (Not all data may be able to be collected)
 - (a) Reading on CAM: _____ cpm. Time of Readings: _____
 - (b) Reading on APM: _____ cpm.
 - (c) Reading on GSM: _____ cpm.
 - (d) Reading on RAM: _____ mR/hr.
 - (e) Reading with Survey Meter _____ at Door to Reactor Bay: _____ mR/hr.
 - (f) Reading with Survey Meter _____ at (Location) _____: _____ mR/hr.
 - (g) Approximate Wind Direction: _____
 - (h) Wind Velocity (calm, gentle, moderate, strong): _____
 3. Chemical and physical form of any released radionuclides: _____

 4. Radionuclides observed from gamma-ray spectrometry of CAM Filter: _____

- Gamma rays from key fission products (E in MeV):
- | | | | | |
|--------|----------|-------------|------------|------------|
| Cs-138 | 32.2 min | 0.46 (34%) | 1.01 (31%) | 2.22 (16%) |
| Cs-139 | 9.3 min | 1.107 (14%) | | |
| Ba-140 | 12.8 day | 0.534 (34%) | | |
5. Effluent Release Calculations using the Raw Data from Section 2:
 - (a) Rate of Release in uCi/min:

$$\frac{\text{_____ cpm} - 50 \text{ cpm}}{2(c) \text{ bkg}} = \text{_____ cpm} \times 0.06 \text{ uCi min}^{-1} \text{ cpm}^{-1} = \text{_____ uCi/min}$$
 - (b) Total Release:

$$\frac{\text{_____ uCi/min}}{5(a)} \times \text{_____ min} = \text{_____ uCi}$$
 - (c) Radiation to Unrestricted Areas in mrem/hr:

$$\frac{\text{_____ cpm} - 50 \text{ cpm}}{2(c) \text{ bkg}} = \text{_____ cpm} \times 1 \times 10^{-4} \text{ mrem hr}^{-1} \text{ cpm}^{-1} = \text{_____ mrem/hr}$$
 6. Number of injured persons and extent of injuries: _____

