Redacted

Armed Forces Radiobiology Research Institute

Reactor Facility

Emergency Plan

December 2003

Docket 50-170

License R-84

Armed Forces Radiobiology Research Institute
Bethesda, Maryland

Preface

This emergency plan was prepared in accordance with the following guidance.

- Code of Federal Regulations, Title 10, Part 50, Appendix E, as amended.
- Emergency Planning for Research and Test Reactors, USNRC Regulatory Guide 2.6, March 1983.
- American National Standard for Emergency Planning for Research Reactors, ANSI/ANS-15.16-1982; reaffirmed 1988.
- Manual of Protective Action Guides and Protective Action for Nuclear Incidents, EPA 400-R-92-001, October 1991.
- Standard Review Plan for the Review and Evaluation of Emergency Plans for Research and Test Reactors, NUREG-0849, October 1983; Appendix I revised April 1997.

Contents

1. Introduction

1.1 Purpose

This emergency plan sets forth the organizational structure and defines the general functions of the emergency response organization at the Armed Forces Radiobiology Research Institute (AFRRI) reactor facility. Specific procedures for dealing with emergency conditions that involve the reactor or other radiation sources are established in the AFRRI Reactor Emergency Response Guidebook.

1.2 Scope

This plan applies to all personnel who are responsible for responding to potentially hazardous situations that may require emergency action, including but not limited to the following situations:

(1) Radiation emergencies involving the TRIGA reactor or any other radiation source at AFRRI.

(2) Fires in the facility.

(3) Personnel injuries.

(4) Threats of civil disturbance (bomb threats, etc.).

(5) Natural disasters and physical plant malfunctions.

For emergency situations that extend beyond the AFRRI site boundary and do not involve the reactor, the National Naval Medical Center (NNMC) Disaster Preparedness Plan will take precedence.

1.3 AFRRI Site Boundary and Facility Description

AFRRI is a triservice military element of the Uniformed Services University of the Health Sciences (USUHS) and answers directly to the Office of the President of USUHS. AFRRI conducts scientific research in the field of radiobiology and related matters essential to the operational and medical support of the Department of Defense (DoD) and the military services. The AFRRI facility comprises several interconnected buildings and houses three major radiation sources and various intermediate and low-level radiation sources.

1.3.1 Site Boundary. AFRRI is located at NNMC. It is bounded on the south by Palmer Road South, on the west and north by Stone Lake Road, and on the east by a circular arc extending from Stone Lake Road to the northernmost corner of the AFRRI "N" parking lot, clockwise to the intersection of Palmer Road South and Grier Road (figure 1-1). Within this area, AFRRI has jurisdiction and control of activities.

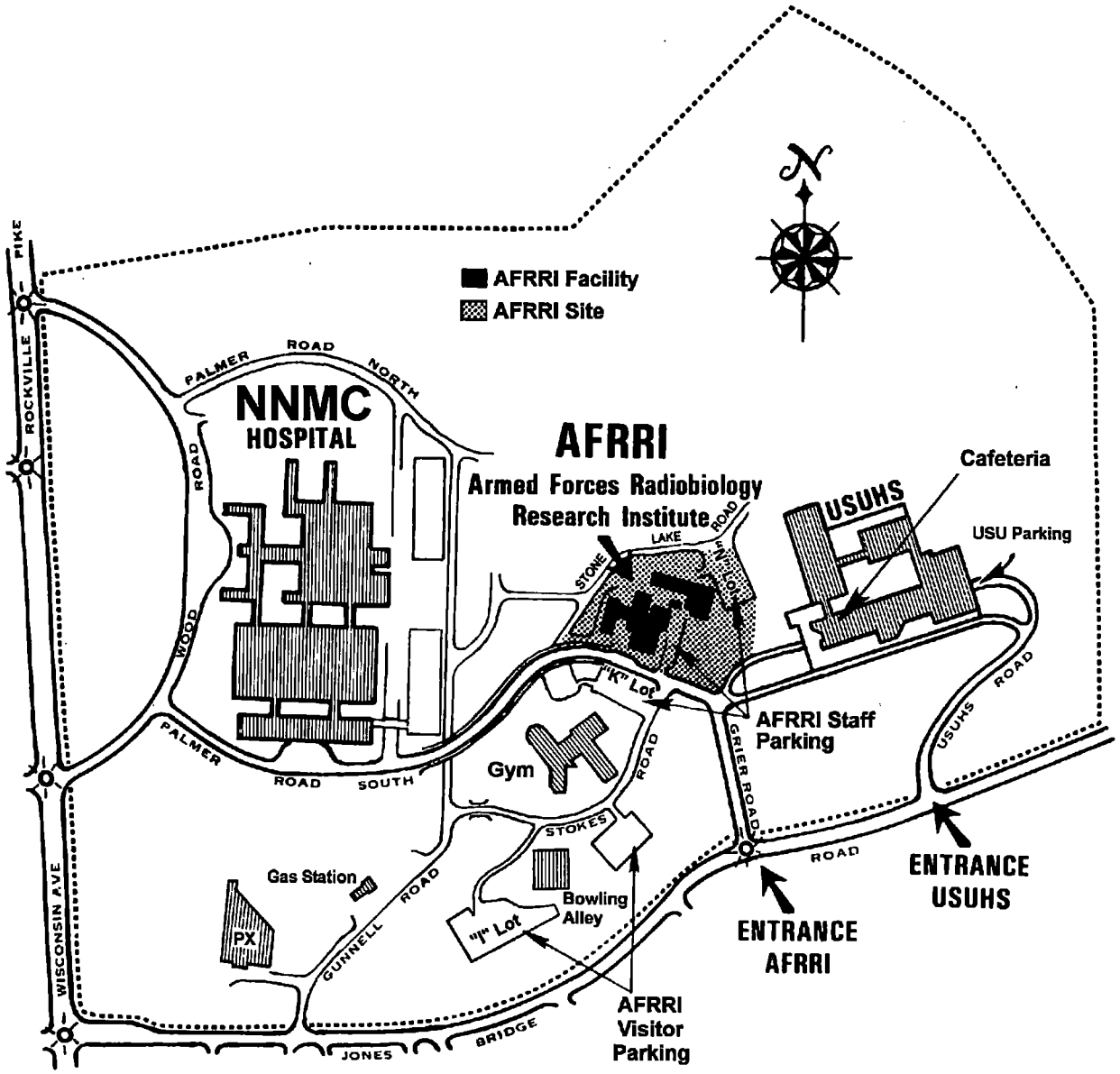


Figure 1-1. AFRRI site on the grounds of the National Naval Medical Center.

Facility Description.

The reactor, a TRIGA (training, research, isotope, General Atomic) Mark-F pool-type reactor, is operated under USNRC License R-84. It is capable of both pulsed and steady-state operation. The reactor is housed in building 42A.

These fuel elements are placed in a closely packed circular array and are submerged under a minimum of 14.5 feet of water. The reactor has an authorized maximum thermal power of 1.1 MW and may be pulsed to a peak power of over 3,000 MW.

Various unique exposure facilities may be used with the reactor operating in either the steady-state or pulse mode. The exposure facilities available for use include two large dry exposure rooms, a pneumatic tube system, an in-core experiment tube, the pool itself, and 18 small holes in the upper grid plate of the reactor core.

Credible accidents, including design-basis accidents, for the reactor are discussed in the AFRRI Reactor Facility Safety Analysis Report. The worst postulated radiation accident would stem from the rupture of the cladding of a spent fuel element outside of the reactor pool. The calculated total effective dose equivalent (TEDE) dose at the AFRRI site boundary is less than 1.3 mrem. More details on the radiological consequences of design-basis accidents can be found in the Safety Analysis Report.

1.4 Reactor Operating Organization

The organization of personnel for managing and operating the reactor facility is shown in figure 1-2. Organizational changes may occur, based on requirements, and they will be described in internal documents. However, no changes may be made in the operational, safety, and emergency control chain in which the reactor facility director has direct responsibility to the director of AFRRI.

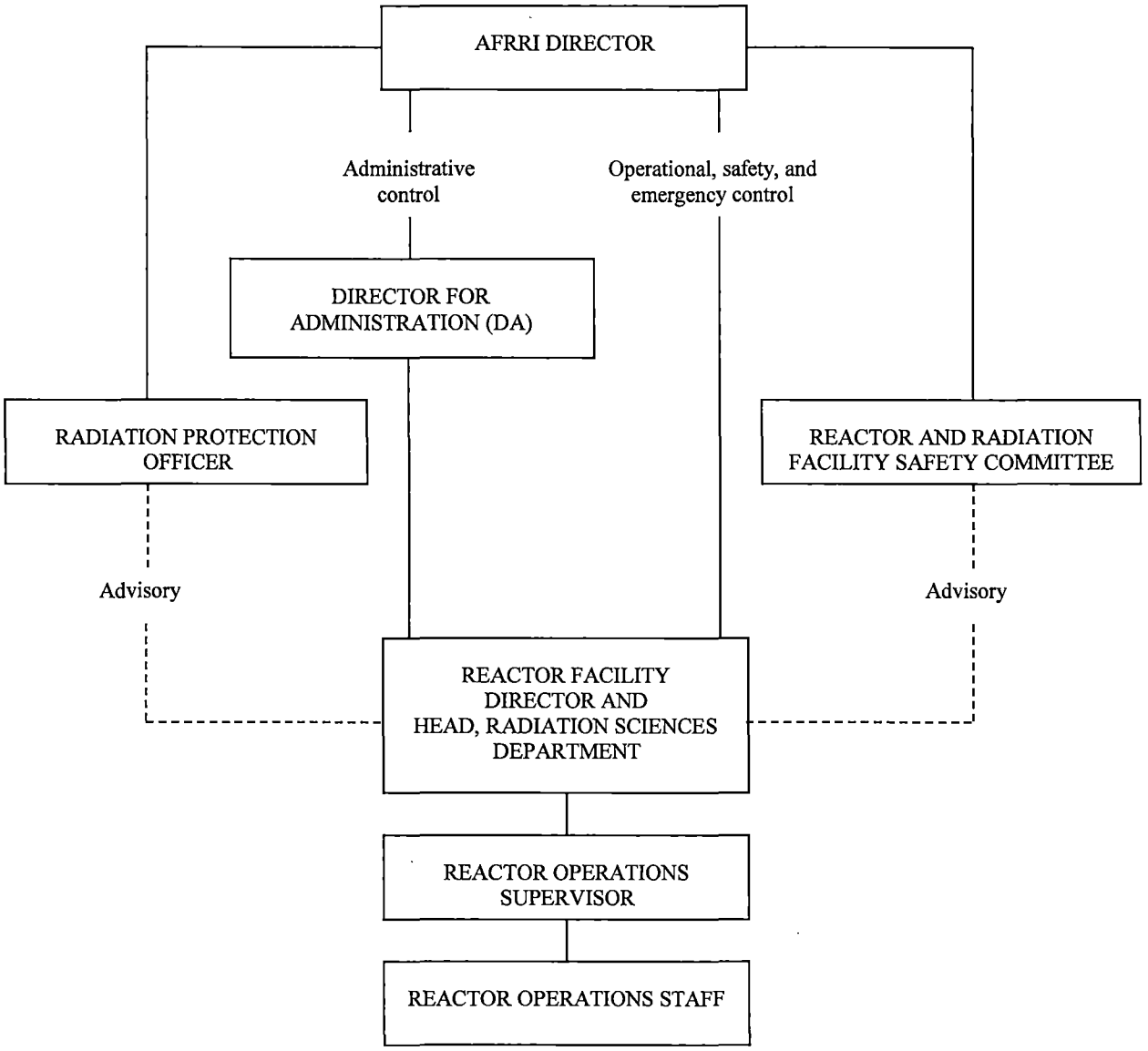


Figure 1-2. Organization of personnel for management and operation of the AFRRI reactor facility. Any reactor staff member has access to the director of AFRRI for matters of safety.

2. Definitions

To function effectively, all emergency response personnel must share a common understanding of the terminology used. Thus, the terms used in this plan and the AFRRI Reactor Emergency Response Guidebook are defined.

AFRRI

Armed Forces Radiobiology Research Institute, also referred to as "the Institute."

AFRRI facility

All buildings, appurtenances, and facilities of AFRRI in appendix A of the AFRRI Reactor Emergency Response Guidebook.

AFRRI Reactor Emergency Response Guidebook

A guidebook containing emergency action procedures, emergency organization personnel rosters, training guidelines, facility maps, and special facility instructions. This guidebook may be revised to reflect changes in the manning of emergency organization billets, in facility requirements, or in emergency action or training procedures.

AFRRI site

The area within the AFRRI site boundary as described in paragraph 1.3.1 and illustrated in figure 1-1.

Assessment action

Action taken during or after an emergency situation to obtain and process information necessary to implement specific emergency or recovery operations.

Corrective action

Action taken to diminish or terminate an emergency situation at or near the source of the problem to prevent or reduce the magnitude of a release of radioactive material under an emergency situation or to prevent or reduce the consequences of an accident.

Emergency

A condition that calls for immediate action that is beyond the scope of normal operating procedures and is necessary to avoid an accident or to mitigate the consequences of one.

Emergency action levels (EALs)

Specific reactor-related instrument readings or observations, radiological dose or dose rates, 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 procedures. See table 4-1.

Emergency classes

Classes of emergency situations grouped by severity level for which predetermined emergency procedures have been provided. See table 4-1.

Emergency Command Post (ECP)

The designated emergency coordination and decision center from which the ECP commander directs emergency action to be taken.

Emergency Command Post (ECP) commander

The commander with overall responsibility and final approval authority for all action taken on site during an emergency or recovery operation.

Emergency coordinator

The individual responsible for ensuring adequate emergency preparedness, coordinating this emergency plan with off-site agencies, planning and critiquing exercises, and periodically reviewing and updating this plan and the AFRRI Reactor Emergency Response Guidebook.

Emergency drill

A drill that tests the integrated capability of the overall emergency organization or a component thereof. It may include instruction periods to develop and maintain skills in a particular operation.

Emergency plan

A document that establishes the structure and general functions of the emergency response organization and provides the basis for action to cope with an emergency.

Emergency planning zone (EPZ)

The area in which emergency planning is performed to ensure that prompt and effective action can be taken to protect the public in the event of an accident. The EPZ size is established by the maximum distance within the AFRRI site boundary at which the protective action guide (PAG) is determined to be met.

Emergency response center (ERC)

Location (room 3430) for storing emergency equipment and supplies.

Emergency Response Team (ERT) commander

The commander with implementation responsibility for assessing and taking corrective/ protective action specifically within the confines of AFRRI during an emergency or recovery operation, for providing and interpreting emergency data, and for providing advice and assistance, as necessary, to the ECP commander for decision making during an emergency or recovery operation.

Emergency Response Team (ERT) location

Designated location for acquiring emergency status information and for assessing and implementing corrective/protective action decisions made at the ECP.

Licensee

An individual or organization that is licensed, e.g., AFRRI.

NNMC (also referred to as the post, base, or center)

National Naval Medical Center as illustrated in figure 1-1.

Off-site area

Geographical area beyond the AFRRI site boundary.

On-site area

Geographical area within the AFRRI site boundary.

Protective action

Measures taken to prevent or minimize personnel radiation doses or dose commitments that will otherwise be likely to occur if action is not taken in anticipation of an uncontrolled release of radioactive material or after an uncontrolled release of radioactive material.

Protective action guides

Projected radiological dose or dose commitment values to individuals that warrant protective action following a release of radiological material. Protective action is warranted if 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 a dose that unavoidably occurs prior to the assessment. As demonstrated in the AFRRI Safety Analysis Report, 1 rem total effective dose equivalent or 5 rem committed dose equivalent to the thyroid (ANSI/ANS 15.16 and Environmental Protection Agency (EPA) 400-R-92-001) cannot be reached within AFRRI's site boundary for any credible accident conditions.

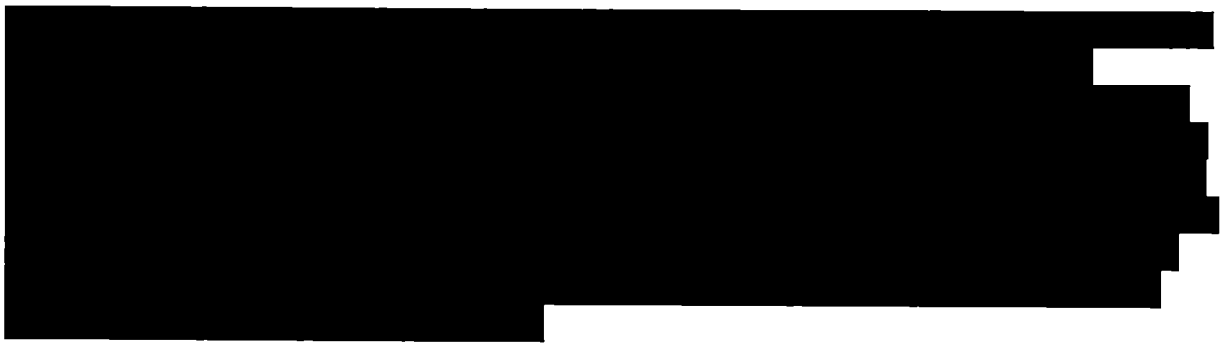
Radionuclide and X-Ray Safety Committee (RXSC)

A committee that provides oversight and review of AFRRI's byproduct licenses.

Reactor and Radiation Facility Safety Committee (RRFSC)

A committee of individuals from within and outside of AFRRI that is responsible to the director for overseeing, reviewing, and monitoring all operations, procedures, activities, and systems/structures associated with the major radiation sources to ensure safety and regulatory compliance.

Reactor facility operations boundary



Recovery action

Action taken after an emergency to restore the facility to a safe status.

3. Organization and Responsibilities

The organizational structure and responsibilities of the emergency response organization include interactions with off-site governmental agencies. Specific responsibilities and emergency response actions are described in greater detail in the AFRRI Reactor Emergency Response Guidebook. The information presented here pertains to any class of emergency.

3.1 On-Site Emergency Response Organization

The function of the emergency response organization is to respond to any emergency situation involving the reactor or other AFRRI radiation sources. The minimum emergency response organization shall consist of the Emergency Command Post (ECP) commander and the Emergency Response Team (ERT) commander. Additional AFRRI manpower and resources and local support agencies are available and can be called into service by the ECP commander or ERT commander as necessary. The structure of the AFRRI reactor emergency organization is shown in figure 3-1. Interaction with off-site support agencies is discussed in section 3.2.

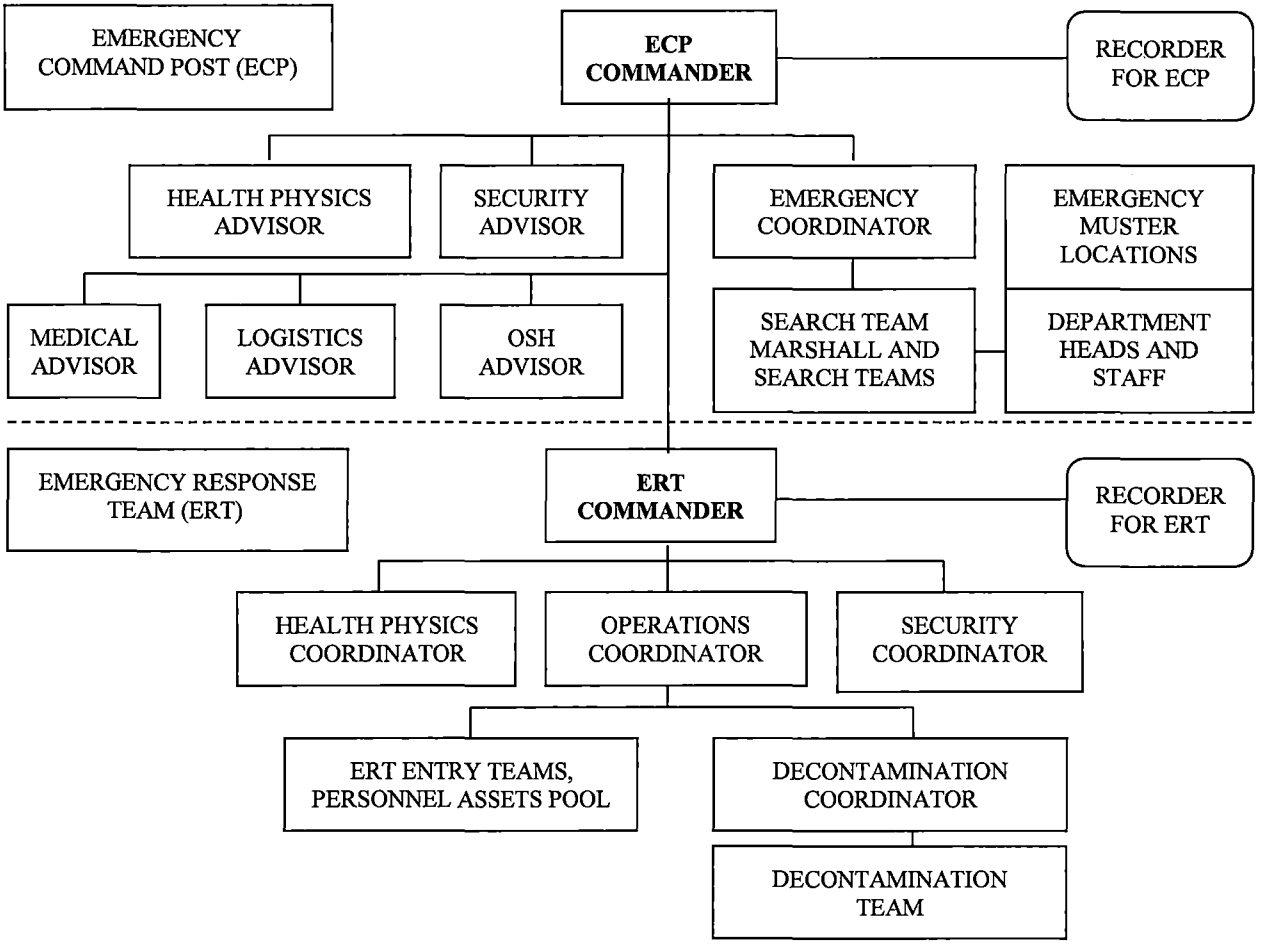


Figure 3-1. AFRRI reactor emergency organization.

The emergency response organization is divided into two groups: ECP and ERT. ECP is the emergency coordination and decision group, and ERT is the action and implementation group. The following sections outline the responsibilities and general duties of the members of the ECP and ERT groups. All slots in the emergency response organizational structure must always be filled. If assigned personnel are not available at the time of an emergency, the ECP commander shall assign personnel to the empty slots.

3.1.1 ECP Personnel Responsibilities and Duties

ECP commander

The ECP commander directs the activities of the ECP and has overall responsibility for the safety of all personnel on site and for the Institute during an emergency or recovery operation; has final approval authority for all actions taken on site during an emergency or recovery operation, including downgrading and terminating emergencies; is responsible for ensuring that outside agencies are notified, requesting any needed NNMC or other off-site emergency support; and is the final approval authority for any public information releases during or following emergency recovery actions if the Public Affairs Office (PAO) of USUHS is unavailable.

(1)Line of succession

(2) Responsibilities

(a) Direct emergency operations and ensure proper implementation of the emergency plan and the emergency procedures in the AFRRI Reactor Emergency Response Guidebook.

(b) Ensure that necessary USNRC, USUHS, and NNMC notifications are made.

(c) If necessary, the AFRRI licensee may authorize emergency workers to incur planned special radiation exposures in excess of 10 CFR 20 occupational limits, with the concurrence of the health physics advisor, if available. In such cases, the requirements of 10 CFR 20.1206 will be followed.

(d) Ensure that radiation/radiological assessment actions are carried out, that emergency assessment is made, and that corrective/protective action is implemented by the ERT commander as necessary.

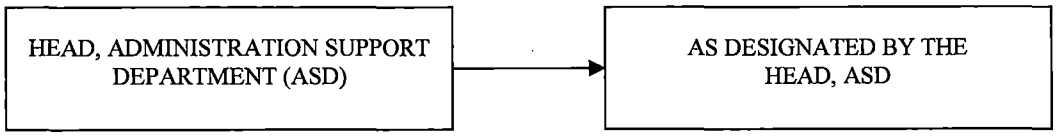
(e) Terminate an emergency and initiate recovery operations based on advice from the ERT commander and other support staff.

The ECP commander may call on all manpower, services, space, and equipment resources available within AFRRI, at NNMC through the interservice support agreement, or from other sources, and apply them as necessary on site. To accomplish this, the ECP commander may delegate authority for certain operations to the ERT commander or designee.

Emergency coordinator

The emergency coordinator is responsible for emergency preparedness and external emergency notification requirements.

(1) Line of succession



(2) Responsibilities

(a) Notify USNRC, USUHS, NNMC, and others as required. Keep the ECP commander advised of such notifications.

(b) Coordinate all activities within the ECP by using the expertise available to provide the best assessment of the situation to the ECP commander for decision making.

(c) Coordinate this emergency plan and any pertinent procedures with other applicable off-site organizations as necessary.

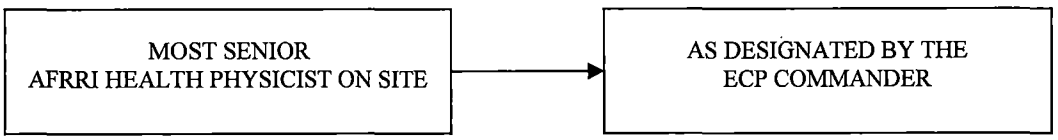
(d) Maintain current search team rosters and personnel accountability rosters. Ensure personnel are available to fill slots in the emergency organization.

(e) Forward a report of each emergency event to the reactor for filing.

Health physics advisor

The health physics advisor assesses all radiological conditions and coordinates required action with health physicists and the ERT commander.

(1) Line of succession



(2) Responsibilities

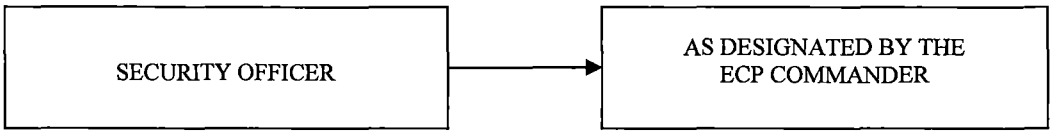
(a) Assist and advise the ECP commander on radiological matters, and help determine the course of further action.

(b) Coordinate with outside support agencies on radiological matters if necessary.

Security advisor

The security advisor advises the ECP commander on all security issues and coordinates external and internal security.

(1) Line of succession



(2) Responsibilities

(a) Establish and maintain coordination with security coordinator, as necessary.

(b) Coordinate security issues with off-site security support as required.

(c) Perform security duties as directed by the ECP commander.

Medical advisor

The medical advisor advises the ECP commander on all medical issues and provides assistance and expertise in the event of a medical emergency.

(1) Personnel: A physician designated by the ECP commander.

(2) Responsibilities

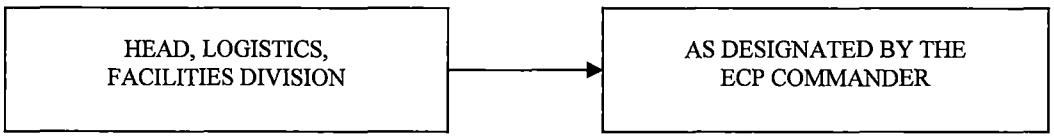
(a) Coordinate medical treatment of injured/contaminated personnel.

(b) Provide medical information when applicable to the ECP/ERT commanders.

Logistics advisor

The logistics advisor provides guidance to the commander on logistics issues, and coordinates all logistical requirements for the Institute.

(1) Line of succession



(2) Responsibilities

(a) Establish and maintain coordination with ERT commander on facilities, equipment, and systems as directed by the ECP commander.

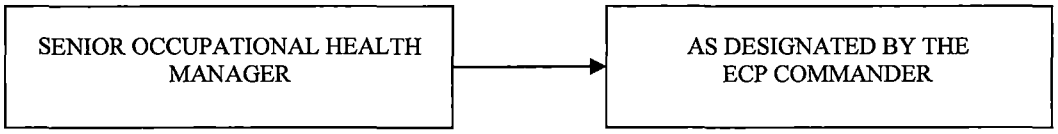
(b) Coordinate off-site facility engineering support as required.

(c) Perform duties as directed by the ECP commander.

Occupational safety and health (OSH) advisor

The OSH advisor provides expertise and assistance to the ECP commander in all nonradiological OSH matters.

(1) Line of succession



(2) Responsibilities

(a) Ensure that appropriate and operable emergency OSH equipment is readily available.

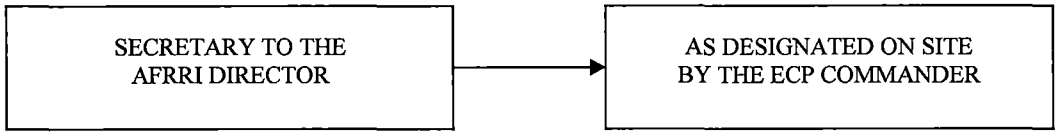
(b) Provide recommendations, perform research, and provide information on nonradiological hazardous situations.

(c) Perform duties as directed by the ECP commander.

Recorder for ECP

The Recorder for ECP is responsible for documentation of the sequence of the entire emergency event.

(1) Line of succession



(2) Responsibilities

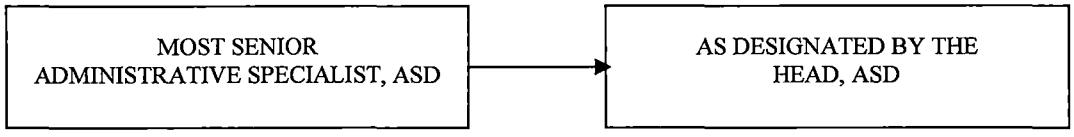
(a) Log the sequence of events as they occur. Log as much pertinent information as possible, including all decisions made by the ECP commander.

(b) Forward the log to the emergency coordinator for disposition.

Search team marshal

The search team marshall organizes, manages, and implements search team operations in an emergency.

(1) Line of succession



(2) Responsibilities

(a) Coordinate with department heads on personnel accountability and on the general

status of the AFRRI facility immediately after an emergency evacuation.

(b) Report that information to the ECP commander and to the ERT commander, as applicable.

(c) Provide ECP search team sweep reports, department muster reports, and any additional personnel or facility reports to the ECP recorder for disposition and filing.

Search teams

Search teams are responsible for execution of search team missions under the direction of the search team marshal.

(1) Personnel: Emergency coordinator shall assign personnel and alternates to fill these billets.

(2) Responsibilities

(a) Search assigned areas for personnel and hazards.

(b) Report results to the search team marshall.

(c) Muster with appropriate departments/offices at the emergency muster locations.

3.1.2 ERT Personnel Responsibilities and Duties

ERT commander

The ERT commander is directly responsible to the ECP commander for implementing, directing, and carrying out actions on site to assess and correct emergency situations. The ERT commander's sphere of control over activities is normally confined on site but may carry off site.

The ERT commander receives his authority from the ECP commander. Upon activation of this emergency plan, the ERT commander may assemble the manpower pool subteams and direct their activities to assess and correct the emergency situation. The ERT commander is responsible to the ECP commander for all action taken within the Institute and has authority to make on-the-spot decisions and to direct or take immediate action, provided that the ECP commander is informed of such immediate decisions and action as soon after the fact as possible.

(1) Line of succession

(2) Responsibilities

(a) Establish and direct the ERT organization; establish and maintain close communication with the ECP commander to provide status and emergency information.

(b) Advise the ECP commander on possible courses of action for dealing with emergency conditions.

(c) Implement all ECP commander directives pertaining to activities within the Institute during an emergency or recovery operation.

(3) Special qualifications: USNRC-licensed reactor operator.

Operations coordinator

The operations coordinator directs all operations of the ERT under the direction of the ERT commander.

(1) Personnel: As designated by the ERT commander.

(2) Responsibilities

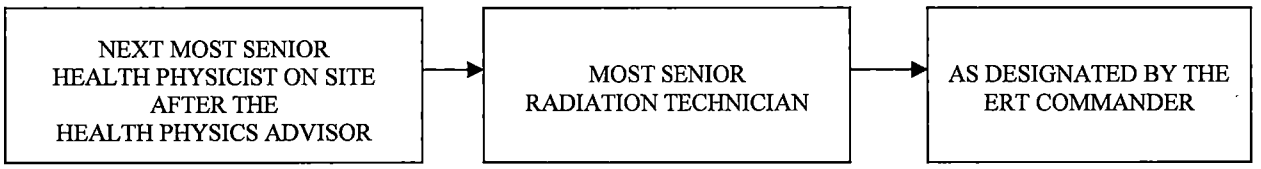
(a) Coordinate all operational actions within the ERT for the ERT commander.

(b) Provide information, advice, and assistance as requested by the ERT commander and pertaining to the activities of ERT personnel.

Health physics coordinator

The health physics coordinator assesses all radiological conditions and coordinates with entry team health physics monitors.

(1) Line of succession



(2) Responsibilities

(a) Assess radiological conditions within the Institute, and direct and coordinate activities of the health physics monitors of the entry teams.

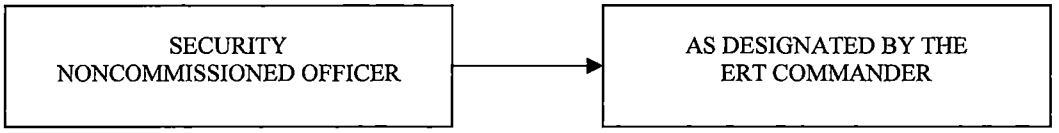
(b) Ensure availability of emergency health physics monitoring and decontamination equipment.

(3) Special qualifications: Background in health physics.

Security coordinator

The security coordinator is responsible for providing site security as directed by the ERT commander.

(1) Line of succession



(2) Responsibilities

(a) Direct and control traffic on the roads surrounding AFRRI to ensure quick access for emergency vehicles and equipment.

(b) Establish and maintain facility boundary security and personnel traffic control at controlled access points as directed by the ERT commander.

(c) Secure any area within the AFRRI site boundary as directed by the ERT commander.

ERT entry teams

(1) Personnel: ERT entry teams provide immediate on-site entry assessment and response capability for the Institute as directed by the ERT commander. Each team consists of at least two members with the composition determined by the ERT commander, based on the situation. External emergency response personnel may be counted as part of the two-member teams when appropriate. Assignment of personnel and alternates to fill these billets is the responsibility of the ERT commander.

(2) Responsibility: Carry out protective and corrective action as directed by the ERT commander.

Personnel assets pool

(1) Personnel: As designated by the ERT commander.

(2) Responsibility: Support activities of the ERT as directed by the ERT commander.

Recorder for ERT

The recorder for ERT is responsible for documentation of the entire sequence of the emergency event.

(1) Personnel: As designated on site by the ERT commander.

(2) Responsibilities

(a) Log the sequence and time of events as they occur. Log as much pertinent information as possible.

(b) Forward the log to the emergency coordinator for disposition.

Decontamination Coordinator

The decontamination coordinator provides expertise and assistance to the operations coordinator in decontamination management.

(1) Personnel: As designated by the ERT commander.

(2) Responsibilities

(a) Supervise the decontamination team in preparation, setup, and decontamination during the incident.

(b) Provide information as required by the operations coordinator.

(c) Ensure that the contamination is isolated, secured, and cleaned up.

Decontamination Team

(1) Personnel: As designated by the decontamination coordinator.

(2) Responsibility: The decontamination team provides on-site assessment and response capability for minor contamination. The decontamination team is also responsible for isolating, securing, and cleaning equipment and personnel during radiological decontamination.

3.2 Interface Between AFRRI Emergency Organization, Off-Site Local Support Agencies, and Federal Agencies

There are no credible events that require direct interaction of the AFRRI emergency response organization with off-site governmental agencies except for USNRC, USUHS, and NNMC. Figure 3-2 shows the interfaces with off-site local support organizations and agencies.

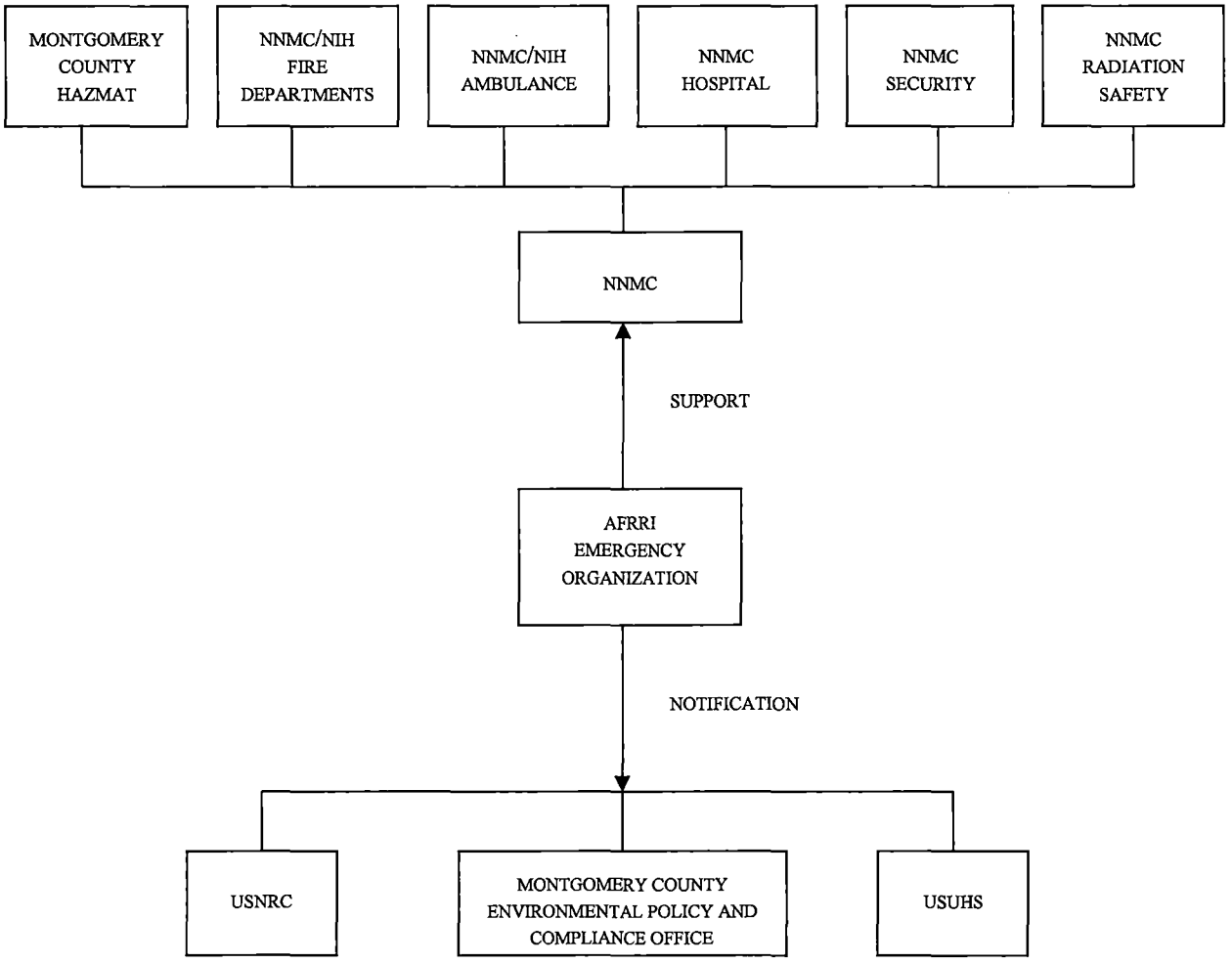


Figure 3-2. Interface with off-site organizations.

USNRC

Title 10, Code of Federal Regulations (CFR) and the AFRRI reactor Technical Specifications outline requirements for reporting emergencies to the USNRC. Notification procedures (e.g., telephone, FAX, written reports) are provided in the AFRRI Reactor Emergency Response Guidebook and the Technical Specifications.

USUHS

The USUHS Office of the President will be notified in the event of an emergency at AFRRI and is responsible for notifying other appropriate offices. USUHS will coordinate with the ECP commander all information releases to the news media and the public during or after an emergency or recovery operation.

NNMC

The NNMC grounds encompass the AFRRI site. As the host under an interservice support agreement, NNMC provides services and support to AFRRI. NNMC support includes firefighting and rescue resources, ambulance service, major or sustained medical treatment and hospital services, and security response forces. NNMC may also draw additional support from the National Institutes of Health (NIH) in these areas. In addition, NNMC can provide emergency assistance/support to AFRRI, as necessary, in such areas as personnel decontamination and radiological assessment.

To ensure a clear understanding of the emergency support responsibilities of key NNMC support organizations, a written interservice support agreement is in effect with NNMC.

Montgomery County Environmental Policy and Compliance Office

The Montgomery County Environmental Policy and Compliance Office will be notified in the event of any Class 1 or higher reactor emergency condition or any NRC-reportable event involving any other major radiation source at AFRRI. The Montgomery County office provides expertise and assistance in regulatory requirements for managing a contaminated site and in public notification.

4. Emergency Classification System and Emergency Action Levels

The NRC defines four standard emergency classes. These classes in order of escalation are as follows: Class 1, Notification of Unusual Events; Class 2, Alert; Class 3, Site Area Emergency; and Class 4, General Emergency. To allow for the appropriate response to emergencies that are less severe than Class 1, Notification of Unusual Events, AFRRI has incorporated an additional classification: Class 0, Events Less Severe than the Lowest Category. The emergency classification system is designed to facilitate communication between facility personnel, local on-site emergency support personnel, and federal organizations if necessary.

Based on the radiological dose analysis of design-basis accidents as presented in the Safety Analysis Report, the most severe emergency class that could apply to AFRRI is Class 2, Alert. Thus, this emergency plan covers only Class 0, Class 1, and Class 2 emergencies. Each of the three emergency classes addressed by this plan has emergency action levels associated with it. These action levels provide specific trigger points that are intended to activate appropriate portions of the AFRRI emergency organization and initiate protective action appropriate for the emergency event. Table 4-1 outlines the postulated emergency scenarios and associated emergency actions for each possible class of emergency at AFRRI.

Table 4-1. Emergency Classification System and Emergency Action Levels.

Class 0	General Scenario Description	Emergency Action Levels
Events Less Severe than the Lowest Category	Events of this classification are generally peripheral to reactor operations and do not necessarily require changing the reactor status. Nevertheless, the reactor might be shut down due to injury of a key individual, to reallocate personnel, or if a potential for escalation is perceived to exist. Similarly, the reactor operations boundary or a specific area within it might be evacuated and/or isolated as necessary if, for example, a potential for radiological escalation is perceived to be present.	(a) Receipt or notification of vague bomb threats or civil disturbances nonspecific to reactor. (b) Observation or notification of personnel injury or disablement within the reactor operations boundary. (c) Notification or receipt of officially declared severe weather warning for the immediate area. (d) Observation of a small unusual loss or drop of normal reactor pool water that is determined to be within the capabilities of normal makeup water system(s). (e) Observation of a minor radiation incident within the reactor operations boundary, or alarm(s) below the EAL thresholds identified for a Class 1 emergency condition listed in the next section of this table. (f) Fire alarm not involving the reactor facility or minor fire that is within the reactor facility and is extinguished within 15 minutes. (g) Notification or receipt of unanticipated* reactor facility intrusion detection system alarm(s). (Note: Such events will be acted upon in accordance with the AFRRI Reactor Facility Physical Security Plan, which is protected from public disclosure.) (h) Malfunctions of the AFRRI or NNMC physical plant that may adversely affect the reactor.

Table 4-1 (continued)

Class 1	General Scenario Description	Emergency Action Levels
Notification of Unusual Events	Emergencies that may arise as a result of either man-made events or natural phenomena that are recognized as possessing significant hazard potential. Events in this classification will normally warrant termination or alteration of normal routines and possible evacuation and/or isolation of specific areas.	(a) Receipt or notification of bomb threats or civil disturbances specifically directed against the reactor and having potential for radiological release or reactor facility structural damage implications. (b) Minor explosion within the reactor operations boundary. (c) Fire that is within the reactor facility and is not extinguished within 15 minutes. (d) Official report or observation of an imminent severe natural phenomenon in the immediate local area that might cause structural damage to the reactor facility. (e) Actuation of low pool water level alarm and observation of a significant loss of pool water. (f) Unanticipated* actuation of the following alarms: (1) R1 radiation area monitor (RAM), 10 mrem/hr for 1 minute; (2) R2 RAM, 10 mrem/hr for 1 minute; (3) R5 RAM, 10 mrem/hr for 1 minute; (4) E3 RAM, 10 mrem/hr for 1 minute; (5) E6 RAM, 10 mrem/hr for 1 minute; (6) either reactor room continuous air monitor (CAM), 20K cpm for 1 minute; or (7) stack gas monitor for 1 minute.

Table 4-1 (continued)

Class 2	General Scenario Description	Emergency Action Levels
Alert	This class of emergency may exist when events have occurred or are in progress that require emergency response to prevent, control, or limit a serious potential or actual radiological hazard. Suspension of the normal routine is strongly indicated, as is evacuation and/or isolation of affected areas, as necessary.	(a) Observation of an irradiated fuel element cladding rupture during a fuel-handling operation. (b) Official report or observation of a severe natural phenomenon on site causing damage to the reactor facility. (c) Fire within the reactor facility (15-minute duration) or explosion (including missile impact) that is determined to have directly compromised the reactor facility structure. (d) Low pool water level alarm actuation in conjunction with a loss of pool water in excess of the capabilities of the normal and emergency makeup water systems. (e) Verified visual observation of extensive fuel damage involving multiple cladding failures (alone), or unanticipated* alarms of either reactor room CAM in conjunction with radiation alarms for R1, R2, and R5 RAMs and /or the stack gas monitor.

*Unanticipated means that the alarm or other threshold indication is associated with a real emergency hazard and not the result of a test or calibration of the system or the result of planned and approved work permit operations where such alarms or thresholds would be anticipated as a matter of course.

5. Emergency Response

Specific procedures for assessment action, activation of the emergency organization, and notification of appropriate federal, state, and local officials, as well as emergency organization billet assignments, call rosters, and detailed facility information are provided in the AFRRI Reactor Emergency Response Guidebook for use by ECP and ERT commanders and other key emergency organization members for dealing with various emergency situations. Emergency response guidance is provided in the following procedures in the AFRRI Reactor Emergency Response Guidebook:

(1) General Instructions to the First Responder

(2) Assessment Action Procedures

(3) Activation of Emergency Organization Procedures

(4) Emergency Response Implementation Procedures

(5) Notification Procedures

The information presented in the AFRRI Reactor Emergency Response Guidebook is not limited to the above procedures; however, the guidebook is the essential set of instructions for coping with emergencies.

At AFRRI, emergency response actions to radiological emergencies apply within the emergency planning zone (EPZ). In accordance with USNRC Regulatory Guide 2.6, Emergency Planning for Research and Test Reactors, ANSI/ANS 15.16, American National Standard for Emergency Planning for Research Reactors, and NUREG-0849, Standard Review Plan for the Review and Evaluation of Emergency Plans for Research and Test Reactors, the EPZ associated with the reactor is within the AFRRI reactor facility operations boundary.

5.1 Assessment Action

Assessment action is that action taken to determine the magnitude of an emergency situation and to provide continuous assessment of the impact of a release of radioactive materials. Because nonradiological emergencies are more likely at AFRRI, assessment action will also apply to emergencies associated with fires, bomb threats, personnel injuries, civil disturbances, and natural disasters. Specific occurrences requiring assessment are outlined in the EALs presented in table 4-1. The assessment action for each EAL and the protective action guides (if necessary) are presented for each class of emergency in the AFRRI Reactor Emergency Response Guidebook.

5.2 Activation of the Emergency Organization

The minimum working emergency organization will be activated by the ERT commander or, when absent, by the senior reactor operator on duty during normal duty hours and by the officer of the day (OOD) or the security watchman during nonduty hours upon authorization by the ERT commander. Larger segments of the emergency organization will be activated by the ECP commander pending the results of preliminary assessment action taken by staff on the scene of the emergency. Guidelines, based on the EALs, for alerting or activating progressively larger

segments of the emergency organization are presented in the AFRRI Reactor Emergency Response Guidebook.

5.3 Implementation Procedures

Implementation procedures are those instructions required to carry out protective and corrective action. These procedures have been developed for each class of emergency and are presented in the AFRRI Reactor Emergency Response Guidebook.

5.4 Notification Procedures

Notification procedures for each class of emergency are developed in accordance with 10 CFR 20 and the Technical Specifications for the AFRRI Reactor Facility. These procedures, found in the AFRRI Reactor Emergency Response Guidebook, indicate the appropriate local, state, and federal officials who must be notified in the event of an emergency.

6. Emergency Facilities and Equipment

6.1 Emergency Command Post (ECP)

The ECP is the designated area where the ECP commander receives information about the emergency, directs assessment and corrective/protective action to be implemented, requests/summons support, initiates notification of off-site agencies, authorizes and approves information for public release through USUHS, and makes decisions during the course of the emergency. The primary ECP is in the Office of the Director, and the secondary ECP is located under the bridge on Palmer Road South.

The ECP commander may relocate both the ECP and the ERT to appropriate alternate locations as the situation dictates.

The ECP is the emergency coordination and decision center. Assessment and corrective/protective action can be implemented from the ECP; however, in most instances the emergency response team (ERT) will implement such action. Communication links (via telephone/radio) will be established between the ECP and ERT locations as soon as possible after they are manned. These communication links will be maintained at all times during the emergency.

6.2 Emergency Response Team (ERT) Location

The ERT location is the designated area where the ERT carries out or coordinates required assessment and protective/recovery action. Due to the availability of radiation monitoring equipment, the primary ERT location is the reactor control room (room 3160). The secondary ERT location is AFRRI's front lobby. Equipment will be drawn from the ERC, room 3430.

6.3 Radiological Assessment Equipment

Readouts for the following fixed radiation/radiological monitors are in the reactor control room: five reactor RAMs, three of which monitor the reactor room at various points and two of which are associated with the reactor exposure rooms; two reactor room continuous air monitors (CAMs) that survey for airborne radioactive particulates; and a stack gas monitor with associated stack flow monitor that surveys for radioactive gases in the reactor stack. Other radiation/radiological monitors located in the reactor control room will indicate high radiation in the reactor primary coolant loop and high radiation fields at other points within the reactor facility operations boundary. Also located within the reactor control room are portable radiation survey meters, one of which is a high range unit (up to 1,000 R/hr).

The majority of the emergency assessment equipment, including decontamination supplies and meteorological readouts, are contained in the ERC. Portable emergency radiation survey meters and other emergency equipment are located at selected points in AFRRI in transportable emergency caches. The readout panel for the facility fire alarm is in the security room near the ERC. This panel provides information on fire alarm locations throughout the facility.

Available elsewhere within AFRRI, but outside of the reactor facility operations boundary, are portable and fixed radiation survey and assessment equipment, air samplers, and multichannel analyzers with various detectors that are capable of providing radioisotopic analysis.

6.4 Decontamination, First Aid, and Medical Facilities

6.4.1 Decontamination Facilities. AFRRI has on-site facilities and manpower for limited decontamination. NNMC has additional decontamination facilities that are available to AFRRI in an emergency. Within the confines of the reactor building (both within and outside the reactor facility operations boundary) are several decontamination sinks and showers with warm or hot drains. In addition, there are other sinks with blockable cold drains that could be used for short-term or minor decontamination. Within the reactor room as well as just outside the reactor control room are decontamination supplies for short-term confinement of minor spreadable contamination. SHD maintains equipment and supplies to handle major radioactive contamination problems and decontamination efforts. Protective clothing is located in portable emergency caches (see paragraph 6.6) as well as in the ERC.

If injured or contaminated personnel cannot be decontaminated/treated at AFRRI, they should be appropriately packaged and transported by ambulance to the NNMC hospital, which has full hospital emergency facilities to handle personnel decontamination. SHD should prepare individuals for transport to the NNMC hospital, which is located approximately 500 meters from AFRRI.

6.4.2 First Aid. The on-site staff includes medically trained personnel and at least one physician. Responding NNMC fire and ambulance personnel are also trained to provide first aid. The first available trained individual should provide immediate first aid. Paramedical and medical personnel should provide subsequent on-site treatment. Major medical treatment will be provided at the NNMC hospital.

The AFRRI medical staff will be notified of personnel injury on-site by telephone, public address system, or radio. Ambulance and medical services will be requested by telephone or radio. Transport of injured personnel will be by ambulance. Preparation of an individual for transport will be in accordance with internal procedures.

6.4.3 Ambulance Service. NNMC-contracted ambulance service will be used for transport of injured/contaminated personnel to the NNMC hospital. For transport of a contaminated individual, a health physics member of SHD will accompany the individual in the ambulance to advise paramedics on proper handling, to minimize personnel exposures and the spread of contamination, and to provide estimated exposure information.

6.4.4 NNMC Hospital. The NNMC hospital handles all emergency cases on the base, and it is a designated and certified radiation accident emergency facility capable of handling radiation-exposed and contaminated victims. Training of hospital personnel is performed on a continual basis. The NNMC hospital has a radiation safety office that is staffed with personnel trained in radiation assessment and control techniques.

6.5 Emergency Communications

Primary emergency communication between the primary ECP and ERT locations will be by telephone. Primary emergency communication between the secondary ECP and ERT locations will be by radio.

There will be at least one telephone at each ECP or ERT location. With the addition of mobile cellular phones owned by AFRRI, this number can be increased.

The AFRRI front desk controls the public address system. This system transmits from the front desk but is audible throughout AFRRI. Public communication systems are also available in NNMC security vehicles, and at least one portable loudspeaker (bullhorn) is available for use at the ECP or ERT location.

An alternate communication system, totally independent of ground links, is available for emergency use. This system uses self-powered, hand-held radio units, several of which are designated emergency units and are kept in the reactor control room. These radios operate on a common dedicated frequency assigned to AFRRI and will be used as the primary means of emergency communication on site whenever the secondary ECP and ERT locations are used. Additional radios are available from the AFRRI Logistics Department.

Alternate units (radio, bullhorn, and public address/intercom system) will be tested on a regular basis by the reactor staff, and power pack changes will be made in accordance with manufacturer recommendations.

6.6 On-Site Emergency Caches

Emergency caches are located at various points in AFRRI. One of these emergency caches is located at the ERC and is available for use at both primary and secondary ERT locations. Emergency caches are also located on the third floor of stairwell 3317 and in hallway 3106 near the reactor control room. These caches are portable. Equipment necessary to support emergency action on site and to permit entrance to an area with radiological contamination are in these emergency caches.

Emergency caches should be inventoried quarterly, not to exceed four months, by SHD. Any equipment due for calibration shall be exchanged for calibrated equipment. A list of required equipment is provided in the AFRRI Reactor Emergency Response Guidebook and at each cache location.

7. Recovery Operations

Normally only the ECP commander can authorize downward classification or termination of an emergency based on the predetermined EALs cited in this plan and the results of assessment action described in the AFRRI Reactor Emergency Response Guidebook.

Recovery procedures will be implemented by the ECP commander as described in the AFRRI Reactor Emergency Response Guidebook. A recovery plan must be tailored to the actual situation as it existed and to the emergency conditions that were experienced. Recovery plans that are written and approved will include specific considerations of contamination levels, identified hazards, and radiation levels. Decontamination, if required, shall conform to the provisions of 10 CFR 20 and internal SHD health physics procedures.

8. Maintaining Emergency Preparedness

The elements necessary for maintaining an acceptable state of emergency preparedness and the effectiveness of this emergency plan include radiological training, review and update of the emergency plan and associated implementing procedures, and maintenance and inventory of equipment and supplies used in emergencies.

8.1 Initial Training and Periodic Retraining Program

An initial emergency response training and periodic retraining program will be conducted to maintain the ability of emergency response personnel to perform their assigned functions. Programs to train and requalify personnel for participation in the emergency plan are as follows:

(1) All licensed reactor operators (ROs) and senior reactor operators (SROs) will receive training on this plan and the AFRRI Reactor Emergency Response Guidebook as required by the Reactor Operator Requalification Program. Operator trainees receive extensive emergency plan training as part of the TRIGA Reactor Operator Training Program.

(2) ECP personnel will receive an annual briefing on this plan and the AFRRI Reactor Emergency Response Guidebook.

(3) All AFRRI personnel are required to attend an annual radiation safety briefing, which covers general responses to emergency conditions.

(4) Security personnel (officer of the day and security watchmen) will receive a briefing on emergency response and the emergency plan annually.

(5) NNMC Security and Fire Department personnel will receive an AFRRI-specific orientation annually. Training/certification of NNMC emergency, security, medical, and radiation safety personnel is conducted by NNMC under pertinent military regulations.

(6) ERT training will be conducted on a quarterly basis. This quarterly training need not involve the entire ERT. All ERT personnel will receive training in general emergency functions at least annually. Specific training requirements are determined by the ERT commander.

8.2 Emergency Drills

Emergency drills to test the effectiveness of the emergency plan and the emergency organization will be conducted as follows:

(1) Annually, not to exceed 15 months, on-site emergency drills will be conducted as action drills. Each required emergency measure will be executed as realistically as reasonably possible. The appropriate emergency equipment will be used by emergency organization personnel.

(2) Every other year the annual action drill will involve a simulated emergency scenario to test the preparedness and responsiveness of the full on-site emergency response organization, and to an appropriate extent, the off-site personnel, services, and equipment.

(3) The emergency scenario will be developed, planned, and exercised by the ERT commander or designee in conjunction with assigned observers chosen by the emergency coordinator or designee. An invitation will be extended to non-AFRRI members of the Reactor and Radiation Facility Safety Committee (RRFSC) to participate as planners or observers for the drill. The planners of the drill will not participate in the drill, and the scenario will not be published prior to the drill.

(4) Off-site (e.g., NNMC) emergency personnel, services, and equipment will be called upon, used, or included in the drill as appropriate and necessary. At a minimum, communication links and notification procedures will be tested once every two years.

(5) After each drill, there will be a debriefing, at which time observers will critique the drill. The critiques will then be evaluated by the facility emergency response personnel. Any deficiencies identified in the emergency plan, the implementing procedures, or their actual use during the drill will be reviewed and corrected as appropriate.

8.3 Emergency Plan Review and Update

This emergency plan and the AFRRI Reactor Emergency Response Guidebook will be reviewed biennially, not to exceed 30 months. Updates and changes to both the emergency plan and the AFRRI Reactor Emergency Response Guidebook will be reviewed by the RRFSC. The biennial review of the plan will also include a review of any support agreements and off-site emergency telephone numbers. The ERT commander is responsible for ensuring that this biennial review is conducted.

Copies of this emergency plan shall be routinely provided to designated off-site (NNMC) emergency response units. In addition, copies of this emergency plan and the AFRRI Reactor Emergency Response Guidebook shall be readily available (at a minimum) to AFRRI security force personnel, reactor staff personnel, SHD personnel, and the AFRRI director.

8.4 Equipment Maintenance and Inventory

The operational readiness of all emergency equipment is ensured by a routine maintenance program. Emergency supplies and equipment shall be routinely inventoried and verified to be operational and complete by SHD. Fire extinguishers, located throughout AFRRI, are also routinely checked monthly by the NNMC Fire Department. The reactor annunciator/alarm box (which provides audible and visual alarms during nonduty hours for low reactor pool water, high airborne radiation in the reactor room, and a high radiation field in the reactor room) is located outside the reactor facility operations boundary in hallway 3101 near the AFRRI security desk, and is verified to be operational on a quarterly basis by the reactor staff who also maintain it.

Telephone and radio communication equipment maintenance is provided by NNMC or the manufacturer of the equipment as necessary and appropriate. Emergency radios are inventoried and verified to be operational by the reactor staff on a regular basis. Fixed on-site public address systems are used by (a) the reactor staff within the reactor facility operations boundary and (b) the security staff for announcement throughout AFRRI on a routine day-to-day basis as required. Surveillance of these systems occurs as a result of their daily use, and any required maintenance is performed by the AFRRI Logistics Department. All other off-site (NNMC) emergency

supplies and equipment are inventoried and maintained by NNMC personnel in accordance with their own procedures.

Maintenance and calibration of the reactor facility's radiation safety and radiation detection/measuring equipment are conducted in accordance with internal procedures. Surveillance/testing is performed on a routine basis and whenever the systems are used.

An inventory list of the minimum required emergency equipment is provided in the AFRRI Reactor Emergency Response Guidebook.