RSD

DEFENSE NUCLEAR AGENCY
ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE
BETHESDA, MARYLAND 20814

AFRRI 3020.2G
RSD:JAS:hs
30 September 1982

AFRRI INSTRUCTION 3020.2G

Subj: AFRRI Emergency Evacuation and Fire Plan

Ref: (a) AFRRI-NNMC Interservice Support (Host-Tenant) Agreement
(b) AFRRI Instruction 6310.1A
(c) NNMC Instruction 11320.1E, Fire Bill
(d) AFRRI Reactor Facility Emergency Plan [upon U. S. Nuclear Regulatory Commission (NRC) approval]

Encl: (1) Actions and Responsibilities of All AFRRI Personnel for Implementing the AFRRI Emergency Evacuation and Fire Plan
(2) Actions and Responsibilities of AFRRI Security Watch Personnel for the AFRRI Emergency Evacuation and Fire Plan
(3) Emergency Protection or Destruction of Classified Material; Security of the Armed Forces Radiobiology Research Institute
(4) AFRRI Emergency Organization: Assignments and Responsibilities
(5) Procedure for AFRRI Evacuation Search Teams
(6) Criteria for Notification of Outside Agencies
(7) Sources of Additional Help
(8) AFRRI Reactor Facility Emergency Plan (upon USNRC Approval)

1. Purpose. To establish an effective emergency evacuation and fire plan for AFRRI.

2. Cancellation. AFRRI Instruction 3020.2F, AFRRI Emergency Evacuation and Fire Plan, dated 16 January 1978, is hereby cancelled.

3. Scope. This Instruction provides guidance for all AFRRI personnel on responding to any hazardous condition at the AFRRI that requires emergency actions. The NNMC (National Naval Medical Center) Disaster Preparedness Plan will take precedence over this Instruction in accordance with Reference (a). The AFRRI Reactor Facility Emergency Plan (upon its approval by NRC) will likewise take precedence over this Instruction in accordance with Reference (d).

4. Evacuation Alarm. Full-scale evacuation of the AFRRI is initiated by sounding the fire bell for all emergency conditions.

5. Primary Action and Responsibilities

a. All AFRRI personnel. The required duties are listed in Enclosure 1 of this Instruction. A copy of this Instruction with pertinent enclosures shall be provided to all AFRRI personnel and shall be issued to each new employee by the Head, Occupational Safety and Health Office during the check-in procedure.

ATTACHMENT 1

b. Security Watch Personnel. Duties are listed in Enclosure 2, which will be posted at the AFRRI Reception Desk. Security Watch personnel will be required to be aware of its content. The AFRRI Administrative Officer is responsible for seeing that all watch-standers receive a briefing of this material at least semiannually.

c. AFRRI Emergency Personnel

(1) The AFRRI Emergency Organization assignments and responsibilities are outlined in Enclosure 4. The Radiation Safety Department (SAF) is responsible for the periodic training and for ensuring proper assignment of personnel to the AFRRI Emergency Organization. SAF is also responsible for maintaining a current roster of those assigned to the AFRRI Emergency Organization.

(2) Evacuation Search Teams. Duties are outlined in Enclosure 5. The AFRRI Administrative Officer is responsible for training and assigning personnel to all AFRRI evacuation search teams and for maintaining a current roster of these teams.

6. Supplementary Actions and Responsibilities

a. Reference (b) outlines the procedures for managing injured and/or contaminated personnel; the Medical Team Leader will implement these procedures.

b. Three separate AFRRI Fire and Emergency Evacuation Information Guides for use at the Emergency Command Post (ECP), at the Emergency Action Station (EAS), and at the AFRRI Reception Desk will be assembled and maintained by SAF. These guides will be kept in the ECP Emergency Box, in the Front Door Emergency Box, and at the AFRRI Reception Desk. Enclosures 4 and 6 outline the instructions governing the material in these guides.

c. An AFRRI Emergency Notification Roster shall be maintained by SAF and posted in the OOD/Security Watch instruction book. All department representatives identified in it shall maintain a list of home telephone numbers for their personnel; this shall constitute the AFRRI personnel recall roster.

d. The precautions and procedures of Reference (c) shall be adhered to, with the following exceptions:

(1) Emergency telephone number stickers and the employee safety booklet shall be used instead of posting Reference (c).

(2) The investigation and reporting requirements of DNA shall be followed.

e. The Administrative Officer shall

(1) Plan and conduct drills at least twice a year to exercise and test the procedures of this Instruction.

(2) Review and, if necessary, update this Instruction annually, not to exceed 14 months.

FOR THE DIRECTOR:

R. S. CUNNINGHAM
CDR, MSC, USN
Administrative Officer

DISTRIBUTION: C
Plus - 1 cy HQ, DNA
2 cys PAO, DNA
1 cy CO, NNMC
1 cy NNMC Rad Saf Officer
1 cy NNMC Security
1 cy NNMC Fire Dept
1 cy NNMC Emerg Room
1 cy RRFSC, AFRRI
1 cy RXSC, AFRRI
1 cy JNACC
1 cy NRC

ACTIONS AND RESPONSIBILITIES OF ALL AFRRI PERSONNEL FOR IMPLEMENTING THE AFRRI EMERGENCY EVACUATION AND FIRE PLAN

1. During Duty Hours

a. Upon DISCOVERY of fire, smoke, or other hazardous condition, personnel must

(1) PULL the nearest fire alarm.

(2) EVACUATE the Institute immediately.

(3) REPORT as soon as possible the nature and location of the emergency or hazard to the Emergency Action Station (EAS) Commander located outside the front entrance of AFRRI.

b. Upon HEARING a fire alarm, regardless of its duration, all personnel must

(1) EVACUATE the building immediately by the nearest safe exit.

(2) ASSEMBLE in appropriate muster area (see page 2 of this Enclosure).

(3) MUSTER in an orderly manner with respective Department Chairman/Head or representative, and comply with his/her verbal orders.

(4) DO NOT INTERFERE with emergency activities or act independently.

2. During Nonduty Hours

a. Sign in and out on the Security Area Register maintained at the AFRRI Reception Desk located at the front entrance of AFRRI on nonduty days and after 1800 hours on duty days.

b. Upon DISCOVERY of fire, smoke, or other hazardous condition, personnel must

(1) PULL the nearest fire alarm.

(2) EVACUATE the Institute immediately.

(3) REPORT as soon as possible the nature and location of emergency or hazard to the Security Watch or Duty Officer located at the front entrance of AFRRI.

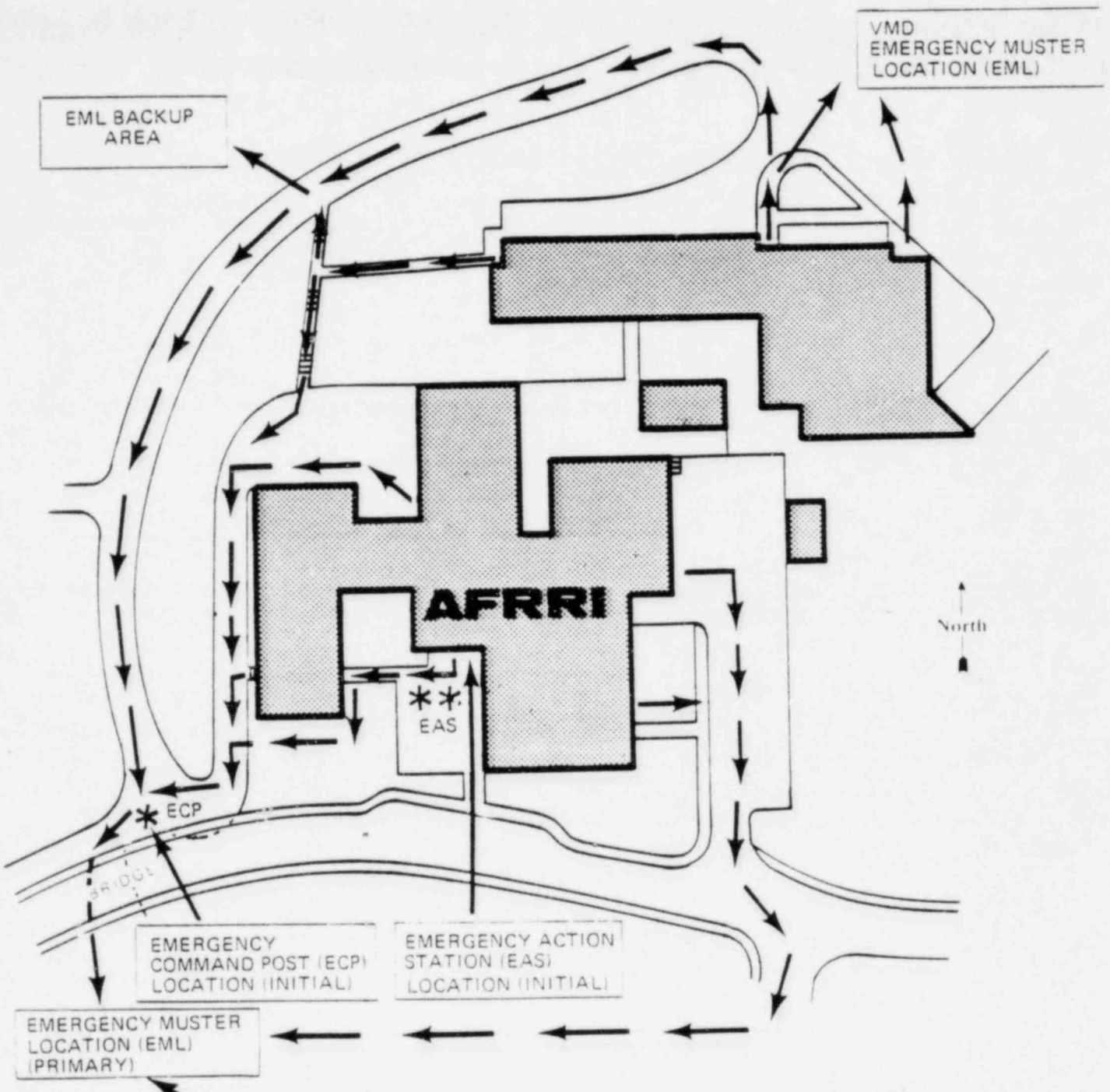
c. Upon HEARING a fire alarm, regardless of its duration, all personnel must

(1) EVACUATE the building immediately by the nearest safe exit.

(2) ASSEMBLE outside the front entrance of AFRRI with the Security Watch or Duty Officer.

(3) DO NOT INTERFERE with emergency activities or act independently.

AFRRI EMERGENCY MUSTER LOCATIONS [EML]



PRIMARY

ECP

LOG	ADM	PHY	BIC	DIR
SAF	EXH	BHS	RSD	STAT
		OSH	COMP	EPC
			BSO	CSD
			CPO	

(order of groups)

BACKUP

To be used only if Primary Muster Location is not available or hazard exists at Primary Emergency Muster Location

LOG	ADM	PHY	BIC	DIR
SAF	EXH	BHS	RSD	STAT
		OSH	COMP	EPC
			BSO	CSD
			CPO	

ACTIONS AND RESPONSIBILITIES OF AFRRI SECURITY WATCH PERSONNEL FOR THE AFRRI EMERGENCY EVACUATION AND FIRE PLAN

The following actions apply to nonduty hours:

1. Maintain the Security Area Register, which lists on-board personnel.

2. Upon DISCOVERY or notification of a fire or other hazardous condition, the Security Watch or Duty Officer will do the following:

a. PULL the nearest fire alarm.

b. EVACUATE the emergency area immediately.

c. UNLOCK the AFRRI front entrance (if applicable).

d. CALL the NNMC Fire Department (dial 147 or 50333).

e. CALL appropriate personnel listed on the AFRRI Emergency Notification Roster.

f. CHECK radiation monitors in Room 3112 for high radiation indications (i.e., $\geq$ 100 mR/hr).

g. TAKE the Security Area Register (which lists on-board personnel) and remain either at the front entrance or go to a safe area nearby.

h. MEET and brief responding Fire/Rescue personnel.

i. ESCORT and provide assistance as necessary to the Fire/Rescue personnel upon entry into AFRRI. [NOTE: If a radiological hazard exists or is suspected, contact Radiation Safety Department (SAF) before permitting entry.]

3. Upon HEARING a fire alarm initiated by someone else, Security Watch personnel will follow items 2b through 2i above. In addition, they will:

a. Obtain information about the emergency from the person who pulled the alarm.

b. Relay this information to the Duty Officer and the AFRRI Administrative Officer.

c. Make sure that the person who gave the information is available to assist emergency personnel upon arrival.

4. Responsibility and Authority. The Duty Officer is authorized to act on behalf of the Director and Deputy Director in their absence. Therefore, Security Watch personnel should use sound judgment; their primary concerns should be for personnel safety and protection of the Institute, in that order. In addition, the Duty Officer is responsible for directing and taking appropriate actions in response to an emergency until properly relieved by arrival on-station of the Emergency Command Post (ECP) Commander.

EMERGENCY PROTECTION OR DESTRUCTION OF CLASSIFIED MATERIAL; SECURITY OF THE ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE

Emergency procedures for the protection, removal, or destruction of classified material within the Armed Forces Radiobiology Research Institute (AFRRI) due to natural disaster, civil disturbance, enemy action, entry by unauthorized persons, or evidence of forced entry are as follows:

1. After Normal Duty Hours

a. In case of any emergency listed above, the Security Watch will notify the AFRRI Duty Officer, the AFRRI Classified Material Control Officer/Custodian, and the National Naval Medical Center (NNMC) Security as soon as possible. Security Watch personnel will contact the proper persons listed on the DA Form 727 that is on the front of the safe in Room 3112. NNMC Security will provide a security force to help Security Watch personnel maintain security during disaster control operations, threats, or emergencies, by doing the following:

(1) Establish a perimeter security when directed.

(2) Control entering and exiting emergency vehicles and all other traffic.

(3) Ensure the greatest possible security for vital areas.

(4) Prevent riot, panic, hysteria, and other signs of potential mob action.

(5) Man and secure all entry points against illegal entry into the NNMC and the AFRRI, as appropriate.

(6) Prevent disorderly movements, or other detrimental activities.

(7) Prevent sabotage, espionage, and looting.

(8) Help to evacuate damaged areas.

(9) Perform other related tasks as directed.

(10) When directed, dispatch any teams and equipment required for emergency recovery operations.

(11) Coordinate the security operations of the emergency recovery unit with those of AFRRI.

b. The Classified Material Control Officer/Custodian or alternate will determine the extent of the emergency and thereby establish the procedures for safeguarding classified material.

c. If an unauthorized person is found in AFRRI after duty hours or if any evidence of forced entry into AFRRI is noted, the Security Watch will call the NNMC Security for assistance.

2. During Normal Duty Hours

a. The Classified Material Control Officer/Custodian (or in his/her absence, the alternate) will be notified, who will take responsibility for the security or destruction of all classified material within the AFRRI.

b. If the AFRRI is evacuated, anyone having classified material signed out from the Security NCOIC will return the material to the Security NCOIC at the top of the steps directly in front of AFRRI. The Security NCOIC shall safeguard the material until the emergency is over. Then he/she will either return the material to the person who signed for it or return it to the safe.

AFRRI EMERGENCY ORGANIZATION: ASSIGNMENTS AND RESPONSIBILITIES

1. Emergency Command Post (ECP). Physical Location: Initially, the ECP will be located under the bridge at the foot of the parking lot in front of AFRRI. The ECP may subsequently be moved to the AFRRI library or to another nearby building having adequate communications if safety, convenience, or the demands of the emergency warrant such a move.

a. ECP Commander

(1) Succession to Command is as follows:

(a) Director, AFRRI

(b) Deputy Director, AFRRI

(c) Senior military officer present

(2) Physical location will be at the ECP.

(3) Responsibilities: The ECP Commander has overall responsibility for the Institute and the safety of personnel on-site during an emergency and during recovery operations; for ensuring that outside agencies are notified as necessary; and for requesting any needed NNMC or off-site emergency support. The ECP Commander will utilize the Emergency Organization Staff, as outlined in this Instruction, to comply with all responsibilities and duties as stated.

(4) Duties:

(a) Ensure that the ECP Emergency Box in the Directorate Area is carried to the ECP during evacuation.

(b) Receive information about the emergency from the sources shown on the AFRRI Emergency Organization Diagram (see page 15 of this Enclosure).

(c) Ensure that the NNMC Fire Department has been notified. (Telephone numbers are listed in the ECP copy of the AFRRI Fire and Emergency Evacuation Information Guide located in the ECP Emergency Box.)

(d) If applicable, ensure that the NNMC Emergency Room is notified of injured personnel and their status. (Telephone numbers are listed in the ECP copy of the AFRRI Fire and Emergency Evacuation Information Guide located in the ECP Emergency Box.)

(e) Ensure notification of the CO, NNMC; the HQ, DNA; the NRC; and the Joint Nuclear Accident Coordination Center (JNACC) in case of an actual emergency, as necessary. (Telephone numbers are listed in the ECP copy of the AFRRI Fire and Emergency Evacuation Information Guide located in the ECP Emergency Box.)

(f) Ensure that additional support is summoned if evaluation of the emergency shows that more help is needed. (Sources of additional support with telephone

numbers are listed in the ECP copy of the AFRRI Fire and Emergency Evacuation Information Guide located in the ECP Emergency Box.)

(g) Approve information before its release to the news media by the DNA Public Affairs/Information Officer. (News release information directive is found in the ECP copy of the AFRRI Fire and Emergency Evacuation Information Guide located in the ECP Emergency Box.)

(h) Ensure personnel are designated to man the telephone(s) and other emergency communication equipment at the ECP.

(i) Ensure that the billet for Recorder for the ECP is manned, to log all actions and decisions at the ECP. (Log books and writing instruments are in the ECP Emergency Box.)

(j) If personnel are injured and/or contaminated, direct the Medical Team Leader to provide life-saving actions as needed, and monitor the decontamination of personnel as applicable via the Health Physics personnel. AFRRI Instruction 6310, latest revision, outlines decontamination procedures.

(k) Ensure the billets of Special Advisor on Emergency Conditions, EAS Commander, Search Team Marshal, and Medical Team Leader, are manned as applicable.

(l) Evaluate and provide final approval authority for all major emergency actions to be implemented at the EAS.

(m) Give orders to secure from the emergency condition and reoccupy the AFRRI when appropriate.

(n) Function as commander for all Emergency Recovery Operations, both immediate and long-term. This includes approval authority for the selection of major recovery alternatives, approval authority for major recovery actions, and authority for sanctioning normal Institute operational activities to resume.

(o) Final approval authority for any planned personnel exposures in excess of 10 CFR 20 limits. Such decisions should be made only after consultation with the Special Advisor on Emergency Conditions.

b. Recorder for ECP

(1) Succession is as follows:

(a) Secretary to Director

(b) Secretary to Deputy Director

(c) As designated on site by ECP Commander

(2) Physical location will be at the ECP.

(3) Responsibilities: The Recorder for the ECP is responsible to the ECP Commander for maintaining a log of all actions and decisions occurring at the ECP and

for holding reports for the record and subsequent filing with SAF after appropriate review and action has been taken.

(4) Duties:

(a) Receive and record information and reports from the Search Team Marshal and pass this information on to the ECP Commander.

(b) Maintain a log of all actions and decisions that occur at the ECP.

(c) Maintain a temporary file of reports for the record. These reports will be filed in SAF after they have been reviewed and appropriate action has been taken.

c. Special Advisor on Emergency Conditions (SAOEC)

(1) Succession is as follows:

(a) Head, Radiation Safety Department

(b) Acting Head, Radiation Safety Department

(c) Most-senior AFRRI Health Physicist on-site

(2) Physical location will be at the ECP.

(3) Responsibilities: The Special Advisor on Emergency Conditions is responsible to the ECP Commander for providing technical advice and interpretation of information on actual or potentially hazardous conditions, either radiological or nonradiological, and overseeing all health physics and radiation safety aspects of the emergency response at the ECP, the AFRRI site, and the Institute boundaries. As Head, SAF will maintain AFRRI files of all alerts and exercises under this Instruction.

(4) Duties:

(a) Establish appropriate radiation-monitoring programs for the AFRRI site boundary, Institute boundary, and unrestricted area as required by the emergency and as directed by the ECP Commander.

(b) Assure that proper notification is made to outside agencies as required, and verify these with the ECP Commander.

(c) Ensure the ECP Commander is provided with a current list of telephone numbers and sources of additional assistance available from outside agencies. (These are listed in the ECP copy of the AFRRI Fire and Emergency Evacuation Information Guide, in the ECP Emergency Box.)

(d) Assure the NNMC Radiation Safety Officer is notified in case of an actual radiological emergency/hazard.

(e) Decide if the nature of the emergency warrants a beta/gamma survey of the ECP, EAS, and/or Emergency Muster Location (EML), and advise the ECP Commander accordingly.

(f) Provide advice, assistance, data, and interpretation of data to the ECP Commander, as necessary.

(g) Provide advise, assistance, and consultation to the ECP Commander for any planned personnel exposures in excess of 10 CFR 20 limits.

d. Medical Team Leader

(1) The Director, AFRRI, shall identify two individuals to be assigned as the primary and alternate for this Billet.

(2) Physical location will be at the ECP.

(3) Responsibility: The Medical Team Leader is responsible to the ECP Commander for managing the treatment of injured and/or contaminated personnel as outlined in AFRRI Instruction 6310.1A.

(4) Duties:

(a) Assign and direct Medical Personnel to perform life-saving actions, as necessary, for injured/contaminated personnel.

(b) Establish and maintain close coordination with the Team I Health Physics Advisor if any personnel are contaminated or suspected of contamination.

(c) Establish and maintain communications with NNMC Emergency Room, as necessary.

e. Medical Personnel

(1) The Director, AFRRI, shall ensure at least two personnel, with alternates, have been identified for assignment to this Billet.

(2) Physical location will be at the ECP.

(3) Responsibilities:. The Medical Personnel are responsible to the Medical Team Leader for performing life-saving actions as necessary for injured/contaminated personnel.

(4) Duties:

(a) Perform life-saving actions as necessary on injured/contaminated personnel.

(b) Keep Medical Team Leader informed of nature and status of injured/-contaminated personnel.

f. Team I Health Physics Advisor

(1) Assignment and succession of a person to fill this billet shall be accomplished by the Head, Radiation Safety Department (SAF).

(2) Physical location will be at the ECP.

(3) Responsibilities: The Team I Health Physics Advisor is responsible to the Special Advisor on Emergency Conditions for assuring that all radiation surveys at and outside the boundaries of AFRRI are performed as required and as directed; assuring that all actions concerning radioactively contaminated personnel are performed as required and directed; and assessing radiation levels and environmental releases of radioactive material at and outside the boundaries of the Institute. The Team I Health Physics Advisor is also responsible for directing and assisting the Team I Health Physics Monitors in the decontamination of contaminated personnel.

(4) Duties:

(a) Assure that appropriate emergency radiation equipment is readily available (or accessible) and operable.

(b) Assign Team I Health Physics monitoring personnel to perform surveys of radioactively contaminated personnel and of areas outside the boundaries of AFRRI, as directed.

(c) Direct and assist the Team I Health Physics Monitor in the decontamination of contaminated personnel.

(d) Assign Team I Health Physics monitoring personnel to accompany injured/contaminated persons to the NNMC emergency room, if requested by the Medical Team Leader.

(e) Assure that radiation surveys outside the confines of AFRRI are performed as required by the emergency conditions when directed by the Special Advisor on Emergency Conditions; provide this data to the Special Advisor on Emergency Conditions.

g. Team I Health Physics Monitors

(1) The assignment of two personnel and alternates for this billet shall be accomplished by Head, SAF.

(2) Physical location will be at the ECP.

(3) Responsibilities: The Team I Health Physics Monitors are responsible to the Team I Health Physics Advisor for performing their assigned health physics monitoring tasks.

(4) Duties:

(a) Perform surveys and conducting the decontamination of radioactively contaminated personnel as required and as directed by the Team I Health Physics Advisor.

(b) Accompany injured/contaminated persons to the NNMC emergency room when directed.

(c) Perform radiation surveys outside the confines of AFRRI as directed by the Team I Health Physics Advisor; provide this data to the Team I Health Physics Advisor.

h. Search Team Marshal

(1) Succession is as follows:

(a) Administrative Officer

(b) Chief, Administrative Services Division

(2) Physical location will be at the ECP.

(3) Responsibilities: The Search Team Marshal is responsible to the ECP Commander for personnel accountability and for information on the general status of the AFRRI facility immediately after an emergency evacuation.

(4) Duties:

(a) Receive sweep reports from the Evacuation Search Teams.

(b) Receive muster reports from the Department Chairmen/Heads.

(c) Determine (from compiling and evaluating data received) if anyone is missing and who might still be in AFRRI.

(d) Report information on personnel accountability and facility status to the ECP Commander and to the Emergency Action Station Commander, as applicable.

(e) Provide Evacuation Search Team Sweep Reports, Department Muster Reports and any additional personnel or Facility Reports to the ECP Recorder for disposition and filing with SAF.

i. Evacuation Search Teams

(1) Assignment of personnel and alternates to fill these billets shall be the responsibility of the AFRRI Administrative Officer.

(2) Location. After each Evacuation Search Team Member has searched its assigned area(s), they will report to the Search Team Marshal at the ECP. Each Team Member will then muster with their department at the Emergency Muster Location (EML).

(3) Responsibilities: Each Evacuation Search Team Member is responsible to the Search Team Marshal for searching a specific assigned area(s) for personnel and hazards, and reporting the search results to the Search Team Marshal and, if required, to the EAS Commander.

(4) Duties: Each Team Member is to perform the following duties in assigned zone(s), subject to their own discretion and good judgment in case of difficulty:

(a) CHECK all spaces (including rest rooms and equipment rooms) for personnel and immediate hazards.

(b) CLOSE doors to offices and laboratories.

(c) CLOSE corridor doors.

(d) TURN OFF or extinguish (if possible without undue risk) all sources of heat, fire, and/or sparks.

(e) CLOSE gas jets (if possible without undue risk).

(f) SECURE classified material and lock any safe observed open.

(g) REMOVE (or secure) all flammable liquids from the immediate vicinity of a fire or hazard (if possible without undue risk).

(h) REPORT any unsecured radioactive source to the Search Team Marshal at the ECP and the EAS Commander at the EAS.

(i) DO NOT TURN OFF interior lights, unless they are the source of a hazard.

(j) DO NOT MOVE an injured person unless in imminent danger and likely to sustain further injury if not moved or removed.

(k) PUT OUT any fire in assigned zone, without endangering life; or leave zone and report its status to the Search Team Marshal at the ECP and the EAS Commander at the EAS.

NOTE: Report always to the Search Team Marshal at the ECP, whether or not able to search assigned zone(s). Make sure that the Search Team Marshal correctly records the Team's report, including any hazards noted and any areas not searched. If an immediate hazard is observed in an assigned area, report directly to the EAS Commander at the EAS. Then report to the Search Team Marshal at the ECP, and muster at the EML.

2. Emergency Action Station (EAS). Physical Location: Initially, the area immediately outside the front door of the AFRRI will be the EAS (see page 2 of Enclosure 1 of this Instruction). After establishing this station, the EAS Commander may move the EAS to another area having adequate communications, for reasons of safety or efficiency; before doing so, the EAS Commander will notify the ECP Commander for approval to move.

a. EAS Commander

(1) Succession to Command is as follows:

(a) Chief, Radiation Sources Division

(b) Physicist-In-Charge (PIC), Reactor

(c) Acting PIC, Reactor

(2) Physical location will be at the EAS.

(3) Responsibilities: The EAS Commander is directly responsible to the ECP Commander for the immediate and continuing assessment of emergency conditions and for all actions taken within the boundary of the Institute during the emergency (including entry) and during any recovery or restoration operation(s).

(4) Duties:

(a) Act for the Director of AFRRI in performing staff and technical supervision of and compliance with emergency evacuation procedures and actions.

(b) Establish the Emergency Action Station (EAS) and notify ECP when operational.

(c) Assign personnel to fill vacant emergency billets at the EAS, if necessary.

(d) Direct and advise all EAS personnel.

(e) Establish and maintain close communications with the ECP Commander, and to provide him/her with status and emergency information. (This can be most easily accomplished by designating a runner to transport one of the three Emergency Walkie-Talkies available at the EAS to the ECP Commander, when evacuating the building.)

(f) Receive reports directly from the person who initiated the evacuation or when applicable from an Evacuation Search Team(s) within whose search zone(s) an emergency or hazard is noted.

(g) Receive personnel accountability reports/information from the Search Team Marshal.

(h) Receive notification and information on the location, extent, and type of hazard or emergency throughout its duration.

(i) Meet and brief responding Fire/Rescue personnel upon their arrival at AFRRI.

(j) Direct the establishment of Institute controlled-access points as necessary, for personnel traffic control and Institute physical boundary security.

(k) Establish, direct, and coordinate all Entry Team activities.

(l) Recommend actions to the ECP Commander and implement them, if approved.

(m) Implement and carry out all directives from the ECP Commander pertaining to activities within the Institute boundaries during an emergency or recovery/-restoration operation.

b. Recorder for EAS

(1) Succession is as follows:

(a) Secretary of Radiation Safety Department.

(b) Secretary of Radiation Sciences Department.

(c) Alternate as assigned on-site by the EAS Commander.

(2) Physical location will be at the EAS.

(3) Responsibilities: The Recorder for the EAS is responsible to the EAS Commander for maintaining a log of all actions and decisions that occur at the EAS, and for forwarding received reports and information to the EAS Commander.

(4) Duties:

(a) Receive and record information from the Area Controller.

(b) Receive and record information from the EAS Commander.

(c) Maintain a log of all actions and decisions made at the EAS.

(d) Upon termination of alert turn in all records and reports to SAF for filing.

c. Team II Health Physics Advisor

(1) Succession is as follows:

(a) Head of the Safety Operational Health Physics Division

(b) Alternate assigned by Head, SAF

(2) Physical location will be at the EAS.

(3) Responsibilities: The Team II Health Physics Advisor is responsible to the EAS Commander for the assessment of radiological conditions within the Institute, and for the direction and coordination of activities of the Team II Health Physics Monitors.

(4) Duties:

(a) Ensure that the EAS Emergency Box, located in the AFRRI main lobby, is moved to the EAS.

(b) Ensure that the front door emergency constant air monitor (CAM) is properly positioned and functioning.

(c) Assure that a Team II Health Physics Monitor(s) begins to dress out in appropriate protective equipment for entry with the Entry Team (firemen and others) upon direction and establishment by the EAS Commander.

(d) Inform and advise the EAS Commander of radiological conditions within the Institute, including the result of the emergency CAM sampling.

(e) In coordination with the Area Controller, aid in the setup of a controlled-access point to prevent or reduce the spread of contamination, if necessary, upon establishment and direction by the EAS Commander.

(f) Assist in coordinating Entry Team efforts as directed by the EAS Commander.

(g) Assign a Team II Health Physics Monitor(s) to accompany the Entry Team(s) to perform radiation surveys, upon establishment of an Entry Team(s) by the EAS Commander.

(h) Assess and advise the EAS Commander of the on-site health physics aspects of the emergency or hazardous condition, during the course of the emergency, as necessary.

d. Team II Health Physics Monitors

(1) This billet will be filled by at least two Health Physics personnel assigned by SAF.

(2) Physical location will be at the EAS.

(3) Responsibilities: The Team II Health Physics Monitors are responsible to the Team II Health Physics Advisor for performing their assigned health physics monitoring tasks.

(4) Duties:

(a) When evacuating the building, move the EAS Emergency Box to the EAS and set up the front door emergency constant air monitor (CAM).

(b) Dress out as directed by the Team II Health Physics Advisor.

(c) If designated a member of an Entry Team by the EAS Commander or the Team II Health Physics Advisor, perform radiation surveys continuously during the entry, and inform and advise the Entry Team Leader of the radiation environment and any radiation hazards. Keep a close watch on radiation dose to the Entry Team Members, and recommend to Entry Team Leader necessary actions to prevent overexposure.

(d) Report results of radiation surveys to the Team II Health Physics Advisor or the Entry Team Leader, as appropriate.

e. Nonradiological Hazards Advisor

(1) Succession is as follows:

(a) Head, Occupational Safety and Health Office (OSH)

(b) Alternate assigned on-site by EAS Commander.

(2) Physical location will be at the EAS.

(3) Responsibilities: The Nonradiological Hazards Advisor is responsible to the EAS Commander for providing information, advice, and assistance concerning nonradiological hazards.

(4) Duties:

(a) Assure that appropriate and operable emergency equipment is readily available, or accessible, and operational.

(b) Provide information, advice, and assistance as necessary to the EAS Commander concerning nonradiological chemical and toxic material hazards within the Institute.

f. Area Controller

(1) Succession is as follows:

(a) Security NCOIC

(b) Acting Security NCOIC

(c) Alternate assigned on-site by EAS Commander.

(2) Physical location will be at the EAS.

(3) Responsibilities: The Area Controller is responsible to the EAS Commander for facility boundary security, for vehicular traffic control at the site, and for personnel traffic control at the facility boundary.

(4) Duties:

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

(b) Control personnel access to the AFRRI to ensure that only authorized personnel enter the building during an emergency.

(c) Assign personnel to establish and maintain facility boundary security and personnel traffic control at the facility controlled-access point(s) upon establishment and direction by the EAS Commander.

g. Facility Advisor

(1) Succession is as follows:

(a) Facility Manager, LOG

(b) Assistant Facility Manager, LOG

(2) Physical location will be at the EAS.

(3) Responsibilities: The Facility Advisor is responsible to the EAS Commander for providing information, advice, and assistance concerning the AFRRI facility.

(4) Duties:

(a) Duties of the Facility Advisor are to perform tasks as assigned and provide information as requested by the EAS Commander pertaining to the AFRRI facilities and equipment.

(b) Serve as a member of the Entry Team at the direction of the EAS Commander.

h. Fire Marshal

(1) Succession is as follows:

(a) NNMC Fire Marshal

(b) Representative of NNMC Fire Marshal at the site

(2) Physical location will be at the EAS.

(3) Responsibilities: The Fire Marshal is responsible to the EAS Commander for providing and coordinating fire-fighting and rescue operations during an emergency.

(4) Duties:

(a) Receive briefing upon arrival at the scene, by the EAS Commander.

(b) Assign fire and rescue personnel to the Entry Team(s) upon direction by the EAS Commander.

(c) Establish and maintain communications with entering fire and rescue personnel.

(d) Coordinate activities of entering fire and rescue personnel.

(e) Inform and advise the EAS Commander of the activities of entering fire and rescue personnel, and of the status of the fire hazard or other nonradiological hazard, as appropriate.

(f) Ensure that fires, other nonradiological hazards, and injured personnel are given fire and rescue attention and treatment, as appropriate, by entering fire and rescue personnel.

i. Radiation Source Advisors

(1) Succession is as follows:

(a) Primary Source Manager from each of the three major AFRRI radiation sources (i.e. Reactor, Cobalt, and LINAC)

(b) Alternates assigned by Chief, Radiation Sources Division

(2) Physical location will be at the EAS.

(3) Responsibilities: The Radiation Source Advisors are responsible to the EAS Commander for providing information, advice, and assistance concerning their respective major radiation source facilities at AFRRI.

(4) Duties: Duties of the Radiation Source Advisors are to provide information, advice, and assistance upon request by the EAS Commander concerning their respective major radiation source facilities at AFRRI.

j. Entry Team. Personnel appointed to an Entry Team are selected by the EAS Commander at the time of or during an emergency from competent personnel available at the EAS. An Entry Team usually consists of one or more firemen, a Team II Health Physics Monitor, and a member from LOG. Other personnel may be assigned by the EAS Commander, depending on the nature of the emergency.

The EAS Commander will assign the duties of the Entry Team before entry into the Institute. An Entry Team Leader will be appointed by the EAS Commander. Upon entry, the Entry Team members are responsible to the Entry Team Leader who, in turn, is responsible to the EAS Commander. Communications will be established and maintained between the EAS Commander and the Entry Team Leader upon entry into the Institute.

k. Person Turning In Alarm

Upon DISCOVERY of a fire or other hazardous condition,

(1) PULL the nearest fire alarm.

(2) EVACUATE the Institute immediately.

(3) REPORT the nature, extent, and location of the emergency or hazardous condition to the EAS Commander or the Security Watch, as appropriate, at the EAS.

NOTE: The person turning in or initiating an evacuation alarm shall report to the EAS Commander or to Security Watch Personnel, as appropriate, at the EAS immediately after evacuating the Institute, regardless of whether the alarm was intentional or inadvertent.

3. Emergency Muster Location (EML). Physical Location: The Emergency Muster Location (EML) will be under the bridge adjacent to the front entrance of AFRRI for all AFRRI departments except VMD. VMD will muster in the rear parking lot behind Building 47 (New Animal Facility).

a. Department Chairmen/Heads

(1) Succession is as follows:

(a) Department Chairman/Head for each department

(b) Acting Department Chairman/Head for each department

(2) Physical location will be at the EML.

(3) Responsibilities: Each Department Chairman/Head is responsible at the EML for personnel accountability and control within his/her department at the EML and for reporting this personnel accountability information to the Search Team Marshal at the ECP.

(4) Duties:

(a) Muster and account for all Department personnel at the EML.

(b) Give Department muster report to the Search Team Marshal at the ECP, to include the names of any Department personnel not accounted for, who might be inside the AFRRI.

(c) Provide to the Search Team Marshal the names of all Department personnel who have pocket ion chamber dosimeter readings greater than 100 mR.

b. Staff

(1) All persons not assigned a specific emergency duty or responsibility and who are in the AFRRI complex at the time of an emergency are classed as staff.

(2) Staff Responsibilities. Upon hearing the fire bell, all staff members will immediately evacuate the AFRRI complex via the nearest safe exit, and assemble at the EML.

(3) Duties:

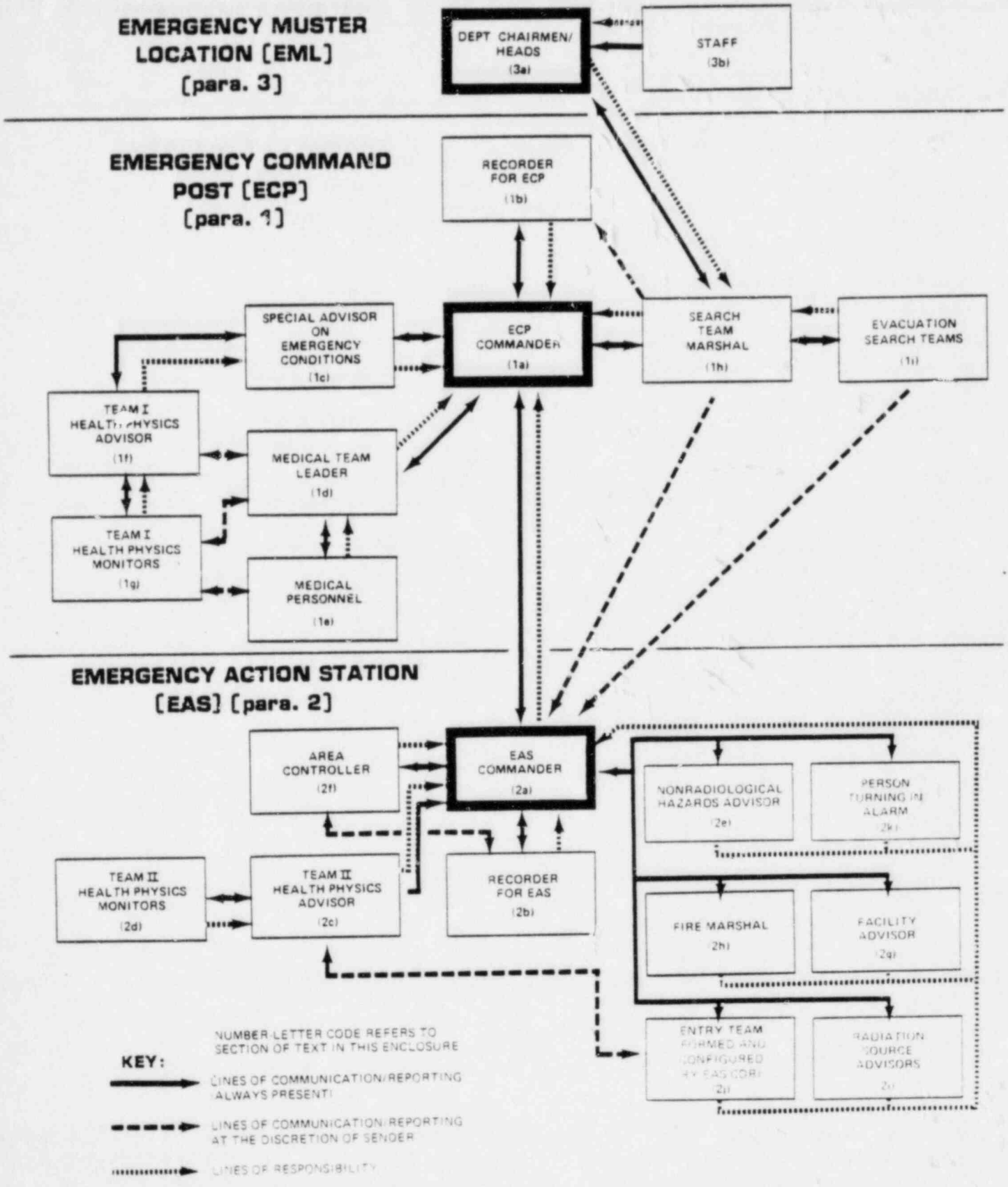
(a) Immediately evacuate the building via the nearest safe exit upon hearing a fire alarm.

(b) Muster in an orderly fashion with the appropriate Department Chairman/Head or representative at the EML (see Enclosure 1).

(c) Follow the directions of the appropriate Department Chairman/Head or representative and the ECP Commander. (Under no circumstances is any member of the staff to interfere with any emergency activities or to act independently after reporting to the EML.)

NOTE: During nonduty days and after 1800 hours on duty days, in addition to the above, each staff member is responsible for signing in and out on the Security Area Register maintained at the AFRRI Reception Desk.

AFRRI EMERGENCY ORGANIZATION: LINES OF RESPONSIBILITY AND FLOW OF INFORMATION



PROCEDURE FOR AFRRI EVACUATION SEARCH TEAMS

1. Search Areas. The specific search zones within AFRRI are illustrated on page 2 of this Enclosure.

2. Duties. Each Evacuation Search Team shall perform the following duties in its assigned zone(s), subject to discretion and good judgment in case of difficulty:

a. CHECK all spaces (including rest rooms and equipment rooms) for personnel and immediate hazards.

b. CLOSE doors to offices and laboratories.

c. CLOSE corridor doors.

d. TURN OFF or extinguish (if possible without undue risk) all sources of heat, fire, and/or sparks.

e. CLOSE gas jets (if possible without undue risk).

f. SECURE classified material and lock any safe observed open.

g. REMOVE or secure all flammable liquids from the immediate vicinity of a fire or hazard (if possible without undue risk).

h. REPORT any unsecured radioactive source to the EAS Commander at the EAS and the Search Team Marshal at the ECP.

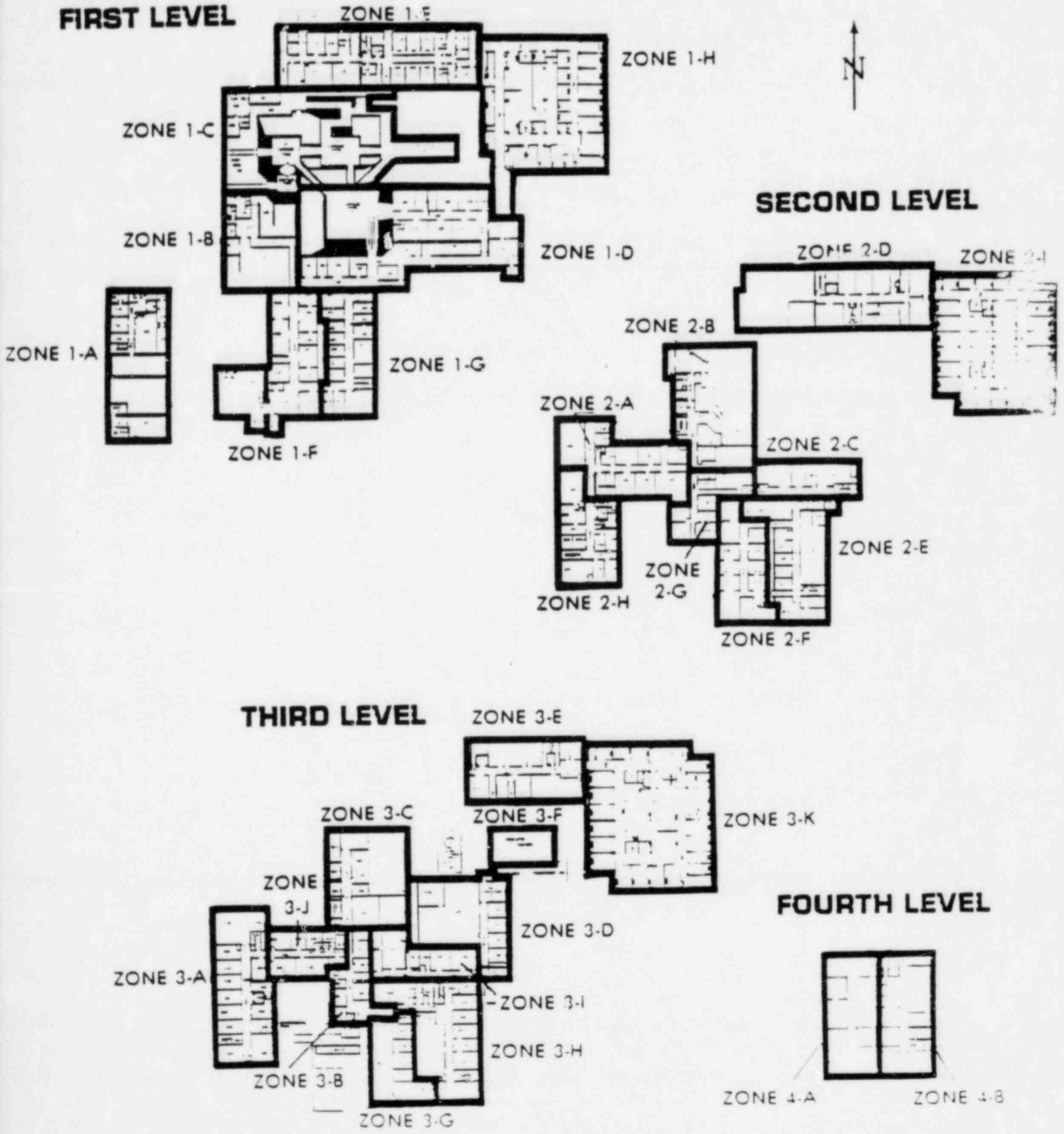
i. DO NOT TURN off interior lights, unless they are the source of a hazard.

j. DO NOT MOVE an injured person unless he/she is in imminent danger and likely to sustain further injury if not moved or removed.

k. PUT OUT any fire in assigned zone, without endangering life; or leave zone and report its status immediately to the EAS Commander at the EAS and the Search Team Marshal at the ECP.

NOTE: Report always to the Search Team Marshal at the ECP, whether or not able to search assigned zone(s). Make sure that the Search Team Marshal correctly records the Team's report, including any hazards noted and any areas not searched. If an immediate hazard is observed in an assigned area, report directly to the EAS Commander at the EAS. Then report to the Search Team Marshal at the ECP and remain available at the ECP to provide additional assistance, if needed. If not needed, muster at the EML.

AFRRI ZONE ASSIGNMENTS FOR EVACUATION SEARCH TEAMS



CRITERIA FOR NOTIFICATION OF OUTSIDE AGENCIES

REQUIRED NOTIFICATION

Personnel Notified	Requiring Instruction or Regulation	Conditions
NNMC Fire Department	NNMC/AFRRI Host-Tenant Agreemt N00168-81274-007; term. date Sep 86	Fire and/or hazardous conditions
HQ, DNA	DNA Instruction 7730.2B	Nuclear accident or significant incident involving nuclear material
	AFRRI Instruction 5200.14	Felony, crimes, incidents
	AFRRI Instruction 5200.14	Natural phenomenon or disaster; racial or labor disturbances involving DNA personnel or facilities
	DNA Instruction 5230.1; AFRRI Instruction 5230.1	Nuclear accident or significant incident
NRC (after consultation with and concurrence of EAS Commander & Reactor Physicist-in-Charge)	AFRRI Reactor License R-84	Reactor or nuclear accident or incident
PAO, DNA	DNA Instruction 5230.1; AFRRI Instruction 5230.1	Nuclear accident or significant incident
JNACC	DNA Instruction 7730.28	Nuclear accident or significant incident
CO, NNMC	NNMC/AFRRI Host-Tenant Agreemt N00168-81274-007; term. date Sep 86	Formally declared emergencies & drills or practice activities in preparation for operations under emergency conditions
NRC (immediate)	Title 10 CFR, Part 20, Standards for Protection Against Radiation	Any incident involving by-product, source, or special nuclear material that has caused or threatened to cause violations of 10 CFR 20.402 or 20.403
News Media Representatives	DNA Instruction 5230.1; AFRRI Instruction 5230.1	Promotion of public safety or prevention of widespread public alarm

SOURCES OF ADDITIONAL SUPPORT

Personnel/ Organization	Committing Instruction, Regulation, or Letter	Type Support Offered
Disaster Preparedness Officer/Plan	NNMC/AFRRI Host-Tenant Agreemt N00168-81274-007; term. date Sep 86	Complete emergency support
NNMC Emergency Room	NNMC/AFRRI Host-Tenant Agreemt N00168-81274-007, term. date Sep 86	Emergency medical treatment
NNMC Ambulance	NNMC Instruction 11240.20	Emergency medical treatment
NNMC Radiation Safety Office	NHBETH Instruction 6470.40	Film badge development safety and interpretation; radioactive material counting and monitoring
NNMC Decontamination Facility	NHBETH Instruction 6470.40	Decontamination of personnel
NNMC Security	NNMC Instruction 11320.1C	Perimeter control
NBS (Dr. Schwebel)		Radioactive material counting and analysis
NRC Emergency Team	NRC Radiological Assistance Program	
Environmental Protection Agency		Environmental evaluation
Maryland Department of Health		Environmental evaluation

RADIATION SOURCES DIVISION
INSTRUCTION NUMBER 5-1

4 January 1982

FUNCTIONS AND ORGANIZATION OF THE REACTOR BRANCH

1. Purpose. To set forth the functions and organization of the Reactor Branch IAW AFRRI Instruction 5100.1, "AFRRI Organization," and to define the duties of the personnel.

2. Applicability. The provisions of this instruction are applicable to the Reactor Branch staff.

3. Cancellation. RSD Instruction 5-1, "Functions and Organization of the Reactor Branch," dated 27 March 1981, is hereby cancelled.

4. Functions.

a. Operates, calibrates and maintains the AFRRI-TRIGA Reactor and associated systems in compliance with appropriate regulations.

b. Provides radiation exposures in the various experimental facilities in direct support of the AFRRI research mission.

c. Supplies instruction and technical assistance to the AFRRI staff, relating to reactor operations, utilization, performance, limitations, instrumentation, design, and modification.

d. Conducts research to analyze reactor characteristics and performance, develop and advance its capabilities, increase its reliability and safety, and evolve new applications.

5. Organization. The block diagram presented in Enclosure 1 defines the organizational relationships among the positions. The duties and qualifications for each position are defined in the following paragraphs:

a. Physicist-In-Charge (PIC) of the Reactor Branch.

(1) The PIC will possess an NRC Senior Reactor Operator License for the AFRRI-TRIGA Reactor under the provisions of 10 CFR-50 and 10 CFR-55.

(2) The PIC is responsible to the Head, Radiation Sources Division, for design, operational, technical, administrative, and safety matters pertaining to the utilization of the reactor in support of AFRRI approved research programs.

(3) The PIC is directly responsible to the Head, Radiation Sources Division, for insuring compliance with the NRC Facility License (R-84) including all amendments, other NRC regulations, and AFRRI instructions.

(4) The PIC will resolve conflicts between the various AFRRI user requirements concerning scheduling of the reactor in the event that the Chief Supervisory Operator (CSO) who schedules the routine use of the reactor, is unable to resolve the conflict. The PIC will contact the Chief, Radiation Sources Division, in the event of a conflict involving a question of research priorities.

ATTACHMENT 2

(5) The PIC will sign all Reactor Use Requests (RURs) thereby giving his official approval for operation of the reactor as indicated.

(6) The PIC, as the Chief of the Reactor Branch, will participate in special development projects as authorized or directed by the Chief, Radiation Sources Division.

(7) The PIC is responsible for the training of Reactor Operator trainees in preparation for NRC certification as ROs or SROs.

(8) The PIC is also the principal administrative officer of the Branch and as such will maintain the files and periodically review and update operating procedures.

(9) The PIC is responsible for the completion and submittal of all required reports.

(10) During the absence of the PIC for more than one day, the Director will designate, orally or in writing, a qualified individual to act as the PIC. In all other absences, the CSO is authorized to act on behalf, and instead of the PIC.

(11) The PIC may deviate from the provisions of the RSD instructions if such a deviation does not violate the AFRRI-TRIGA Reactor License, NRC regulations, applicable AFRRI safety directives, and he has received prior approval from the Chief, Radiation Sources Division for each and every such deviation.

(12) The PIC's staff includes the CSO, all assigned reactor operators, and all assigned reactor operator trainees.

b. Chief Supervisory Operator (CSO).

(1) The CSO will possess an NRC Senior Reactor Operator License for the AFRRI TRIGA Reactor under the provisions of 10 CFR-50 and 10 CFR-55.

(2) The CSO is responsible to the PIC for the efficient, safe operation of the reactor on a daily routine, and for its maintenance.

(3) After tentatively scheduling reactor time the CSO will forward to the PIC RURs submitted by investigators.

(4) The CSO will schedule reactor time as requested by approved users for approved research. In the event of an unresolved scheduling conflict he will refer the matter to the PIC.

(5) The CSO will schedule the operations and maintenance activities of the assigned licensed operators and trainees.

(6) The CSO will conduct training on the operations/maintenance of the reactor system, and ~~will conduct~~ is responsible for the recurring training of licensed operators IAW NRC regulations and the AFRRI Reactor Operator Requalification Program.

(7) The CSO will direct the supply activities of the Reactor Branch. The supply activities include requisitioning equipment and expendable supplies, maintaining supply records, and equipment inventories.

(8) The CSO is primarily responsible for execution of the Reactor Maintenance Program as prescribed in RSD Instruction 5-4.

c. Reactor Operator (RO).

(1) All assigned ROs will possess either an NRC Senior Reactor Operator (SRO) or an NRC Reactor Operator License for the AFRRI-TRIGA Reactor, under the provisions of 10 CFR-50 and 10 CFR-55.

(2) The RO will be directly responsible for the safe and legal operation of the reactor in compliance with the Reactor License (R-84), 10 CFR, AFRRI Instructions and the RSD Instructions.

(3) The RO will perform operation and maintenance duties as assigned by the CSO, and other duties as assigned by the PIC.

d. Reactor Operator Trainee.

(1) High School or equivalent.

(2) Be in training for NRC operator examination.

(3) At no time will a reactor operator trainee manipulate the controls of the reactor alone (i.e., while not under the direct supervision of a licensed RO or SRO).

6. Performance Ratings.

a. The military performance ratings will be accomplished IAW AFRRI Instruction 1600.1, "Performance Ratings and Schemes."

b. The civilian performance ratings will be accomplished IAW DNA Instruction 1434.1, "Performance Evaluation."

7. Radiation Sources Division Instructions.

a. The Reactor Branch will function and operate the AFRRI-TRIGA Reactor and support systems IAW the Reactor License, 10 CFR, AFRRI Instructions and all applicable RSD instructions; i.e., RSD 5-series.

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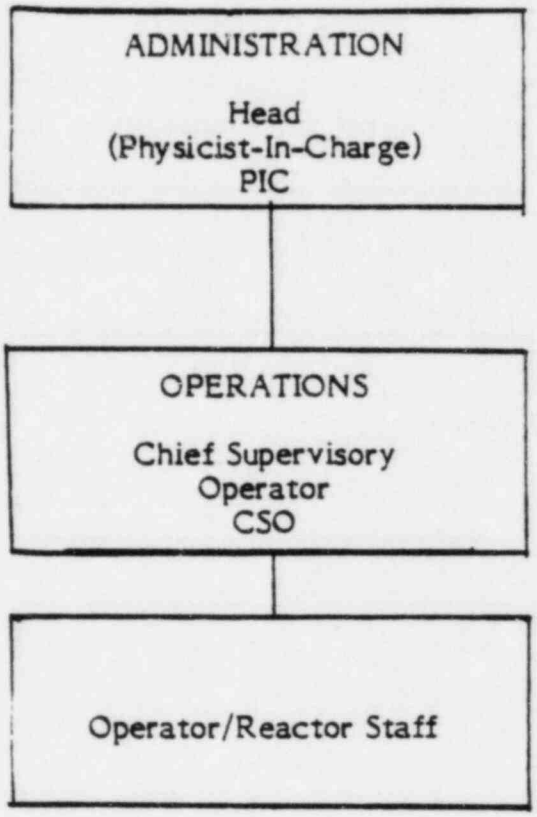
CAPT, USAF
Reactor Branch Chief and Physicist-In-Charge

RONALD R. SMOKER
MAJ, EN, USA
Chief, Radiation Sources Division

REACTOR BRANCH ORGANIZATION



Enclosure 1 to RSD Instruction 5-1.

RADIATION SOURCES DIVISION
INSTRUCTION NUMBER 5-2

4 January 1982

ADMINISTRATIVE LIMITS AND CONTROLS FOR REACTOR OPERATIONS

1. Purpose. To establish the administrative limits and controls for reactor operations that will insure compliance with the Reactor License (R-84) and the Technical Specifications.

2. Applicability. The provisions of this instruction are applicable to the AFRRI-TRIGA Reactor and all operations conducted using the reactor, the reactor support equipment, and the irradiation facilities.

3. Cancellation. RSD Instruction 5-2, "Administrative Limits and Controls for Reactor Operations," dated 27 March 1981 is hereby cancelled.

4. Operating Limits. The operation of the AFRRI-TRIGA Reactor and associated facilities will be performed IAW the AFRRI-TRIGA Reactor License (R-84), Technical Specifications, and with the following administrative operating limits and controls.

a. Administrative Controls

b. Mode Operation Limits (See Table 1)

c. Miscellaneous Operation Limits (See Table 2)

5. Administrative Controls.

a. The minimum operable instrumentation for reactor power operation shall consist of the following:

(1) Two independent reactor power level monitoring channels which indicate the power level of the reactor during the steady state mode of operation.

(2) An N.I channel for pulse operation which indicates the integrated power produced during a pulse.

(3) Scrams as indicated in Table 3.

(4) A minimum of two radiation area monitors and a continuous air monitor in the reactor room. The radiation area monitor directly over the reactor pool surface and the continuous air monitor shall produce audible and visible alarm signals in the control room. The second area monitor in the reactor room shall have a visible alarm in the control room. The continuous air monitor in the reactor room must be capable of automatically isolating the reactor room air volume upon receipt of a high level alarm.

(5) Two radiation area monitors in the preparation area on the wall directly opposite both Exposure Room #1 and Exposure Room #2 plug doors to serve as radiation streaming detectors.

(6) A radiation detector system continuously sampling the effluent from the reactor building ventilating system exhaust stack and capable of producing a visible alarm at the control console.

b. A "Startup Checklist" will be accomplished each day (or other extended operational period) that reactor power operations are planned, prior to performing any operations (other than those required for the startup). A Senior Reactor Operator (SRO) will approve and sign the completed "Startup Checklist." The licensed SRO that approves the checklist cannot be the same licensed operator that accomplished the checklist.

c. Excess reactivity will be measured on each day (OR OTHER EXTENDED OPERATIONAL PERIOD) THAT any power operation is planned. This measurement will be the first reactor power operation of that day after completion and approval of the startup checklist. The same SRO that signed/approved the startup checklist will initial this k-excess measurement in the logbook.

d. The reactor will be operated in Modes II and III IAW the "Mode II Checklist" and "Mode III Checklist," respectively.

e. A "Nuclear Instrumentation Checklist" will be accomplished each week that a reactor operation is planned. The completed checklist will be reviewed and signed by the Chief Supervisory Operator (CSO) or the Physicist-In-Charge (PIC).

f. An "Annual Shutdown Maintenance Checklist" will be accomplished by the CSO during each annual shutdown maintenance period. The checklist will be reviewed and signed by the PIC.

g. Before any Mode II or More III operation, the reactor will be at a steady state power level for at least 30 seconds, since the last control rod movement, and with the power level at cold critical.

h. When the reactor is operating, all doors and hatches into the Reactor Room will be closed with the exception that Door 3161 may be opened to permit personnel passage from the hallway into the Reactor Room or return.

i. During reactor power operations, no person will be allowed inside the chain surrounding the Reactor Pool except as authorized by the PIC or CSO.

j. The Reactor Operator at the console or the Senior Reactor Operator on duty, as appropriate, will be notified before opening, closing or use of any exposure facility.

k. When an unprogrammed scram occurs, the reactor operator will notify the senior operator on duty and the CSO and PIC and make appropriate logbook entries. Reactor operations will cease until the scram condition or cause has been investigated and corrected.

l. The CLOSE switch for the lead shield doors will not be depressed during normal operations while the core dolly is in Position 2. The CLOSE switch may be depressed, with the core dolly in POSITION 2, to check the operability of the reactor core position safety interlock. This will be accomplished under the direct supervision of the CSO.

m. During normal operations, no attempt will be made to drive the core dolly into Region 2 when the lead shield doors are not fully open. Only the CSO may perform this action but only to check the operability of the reactor facility core position safety interlock.

n. A "Shutdown Checklist" will be accomplished each day (or other extended operational period) for which a "Startup Checklist" was performed.

o. The reactor operator will maintain in the "Reactor Operations Logbook" a clean and concise account of all operations. The entries will be made IAW the "Reactor Operations Logbook Entry Checklist" such that all operations being performed could be reproduced at any future date. The future reproduction of any reactor operations would include using the "Malfunction Logbook," the Maintenance Log," the Reactor Use Request," etc.

p. For any reactor operation, excluding routine reactor maintenance, a minimum of two NRC licensed operators will be present in the AFRRI complex. One operator will be an NRC licensed senior reactor operator. The second operator may be an SRO or RO. When the key is in the reactor console, a licensed operator will be present in the control room. If the operator at the reactor console anticipates the need for assistance, a second staff member or operator will be available such that voice communication can be established between the two.

q. "Reactor Operating Instruction Books" will be in the Reactor Control Room and be accessible to the operator at the reactor console. These notebooks will contain the following information pertinent to reactor operations:

(1) AFRRI-TRIGA Reactor License R-84

(2) AFRRI-TRIGA Technical Specifications

(3) RSD Instructions

(4) Pertinent AFRRI Instructions

(5) RAD-SAF SOPs (HPPs) & RSIs

(6) Completed checklists for the current year

(7) Current core data

(8) Other data as desired

r. Reactor Experiments.

(1) Before any experiment can be conducted using the reactor and/or experimental facilities, the experiment will be reviewed by the "Reactor and Radiation Facility Safety Committee." If approved, the "Reactor and Radiation Facility Safety Committee" will issue either a "Special Reactor Authorization" or a "Routine Reactor Authorization."

(2) The scheduling of reactor experiments will be accomplished IAW AFRRI Instruction 3000.4 "Reactor Operations," and RSD Instruction 5-1.

(3) Before an experiment can be performed, the reactor operator will insure that the following conditions are met:

(a) Except as noted in paragraph 4 below, a Reactor Use Request (RUR), AFRRI Form 2, has been completed, approved, and signed by the PIC.

(b) No unsafe conditions exist with either the reactor systems or the experimental facilities.

(4) The following operations do not require an RUR:

(a) Reactor operator training

(b) Instrumentation checks and calibrations

(c) K-excess measurements

(d) Reactor and reactor facility parameter measurements

(e) Maintenance

(f) Tours

(5) If it is anticipated that an experiment will cause a reactivity change in excess of ± 0.5%Δk/k, (± $.71) k-excess measurements will be made, at the core position where the experiment will be performed, both with and without the experiment inserted. In addition, k-excess measurements will be made on all new experiments regardless of their anticipated worth.

TABLE 1

MODE OPERATION LIMITS AND ASSOCIATED SCRAM SETTINGS

MODE	MAXIMUM POWER LIMITS	AUTOMATIC SCRAM SETTINGS
I & IA	1 MW Steady State	110% of Maximum Power (1.1 MW) Fuel temperature of 500°C (2 TC channels).
II	1 MW Steady State	110% of Maximum Power (1.1 MW) Fuel temperature of 500°C (2 TC channels)
III	2.3%Δk/k Pulse ($3.28)	Peak Power not to exceed 2750 MW. Fuel temperature of 500°C (2 TC channels).

TABLE 2

MISCELLANEOUS OPERATION LIMITS

PARAMETER	OL[1]	TSL[2]
Maximum Excess Reactivity With Infinite Water Reflector and With or Without all Experiments Installed	3.3% Δk/k ($4.72)	3.5% Δk/k ($5.00)
Maximum Absolute Reactivity Change for Experiments	2.0% Δk/k ($2.86)	2.1% Δk/k ($3.00)
Bulk Water Temperature	50°C	60°C
Maximum Fuel Temperature	500°C	600°C
Primary Coolant Conductivity	2.0[3] $\frac{\mu mho}{cm}$	2.0[4] $\frac{\mu mho}{cm}$

1 - Operating Limit

2 - Technical Specification Limit

3 - Maximum Measured

4 - Averaged Over One Month

TABLE 3

MINIMUM REACTOR SAFETY SYSTEM SCRAMS

Originating Channel	Set Point	Mode in Which Effective SS	Pulse
1. Percent Power	$\leq$1.1 Mwt	X	
2. Scram Button on Console		X	X
3. Preset Pulse Timer	Less than or equal to 15 seconds		X*
4. Pool Water Level	$\geq$ 14 feet above top of core	X	X
5. Scram Button in Exposure Room		X	X
6. Fuel Temperature (2 independent channels)	$\leq$600°C	X	X
7. Loss of Ion Chamber High Voltage		X	X
8. Loss of Facility Electrical Power		X	X

*Required, as a minimum, to scram the transient rod following a pulse.

4 January 1982

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Reactor Branch Chief and
Physicist-In-Charge

RONALD R. SMOKER
MAJ, EN, USA
Chief, Radiation Sources Division

RADIATION SOURCES DIVISION
INSTRUCTION NUMBER 5-3

4 January 1982

REACTOR ~~BRANCH~~ EMERGENCY PROCEDURES

1. Purpose. To set forth the emergency procedures to be followed in the event of a radiation alarm or hazard, a fire, or other threatening events to the Reactor Facility should occur.

2. Applicability. The provisions of this Instruction are applicable to the AFRRI-TRIGA Reactor, the Reactor Branch staff, and the Safety Department staff.

3. Cancellation. RSD Instruction 5-3 "Reactor Branch Emergency Procedures," 27 March 1981, is hereby cancelled.

4. Radiation Hazard. The auxiliary detection systems for the AFRRI-TRIGA Reactor are presented in Table I (See Enclosure 1). The sensor, range, alarm settings, and alarm notification are included in Table I for each individual system. Any deviation from these established setpoints requires the authority by the PIC, subsequent to coordination through the Head, Radiation Sources Division, and the Head, Radiation Safety Department, in writing.

a. Immediate action. The licensed reactor operator at the console will respond to activated alarms as follows:

(1) If any alarm listed in Table I occurs, the reactor will be scrammed within 15 seconds unless the operator is certain of the cause of the alarm, and that no hazard exists. If the alarm occurred as a result of a malfunction on any instrument required by the Technical Specifications for the AFRRI Reactor (indicated by # in Table I) the reactor will be scrammed immediately. The PIC or his designee will be immediately notified, and the alarm will be recorded in the Reactor Operations Log.

(2) In the event of an alarm from the Stack Particulate Monitor, the operator will ascertain if the LINAC is operating. This information will be considered before determining which action to take in (3) below.

(3) If any alarm listed in Table I occurs, the PIC or his designee will decide which one of the following actions to take:*

*(In the absense of the PIC or his designee, the licensed reactor operator at the reactor console will make the decision himself or herself).

(a) Action #1 - Sound the fire alarm to evacuate the AFRRI complex.

(b) Action #2 - Give oral orders to evacuate the immediate area in the vicinity of the radiation hazard.

(c) Action #3 - No radiation hazard exists and evacuation is not required.

(4) At no time will any reactor operator take actions in response to instrumentation which would be in violation of the Technical Specifications of the AFRRI Facility License R-84.

b. Action #1. The Reactor Branch staff will respond to this action as follows:

(1) AFRRI Instruction 3020.2, "AFRRI Emergency Evacuation and Fire Plan" will be implemented, and the Reactor Branch staff will respond in accordance with that Instruction.

(2) If the reactor is operating, the operator will scram the reactor, insure that all rods are seated, and lock the reactor console. The operator will pickup all the keys in the Reactor Console Room, the Reactor Operations Log and the Emergency Checklist, close the doors to the Reactor Control Room, and then report to the PIC. The operator will give the keys, emergency checklist, and the Reactor Operations Log to the PIC.

(3) The reactor operator will insure that the experimental facilities are secured.

(4) A detailed investigation of the radiation hazard will be conducted, and a written report, summarizing the results of the investigation, will be completed by either the PIC or his designee, and submitted through the Head, Radiation Sources Division to appropriate management levels within 48 hours.

c. Action #2. The Reactor Branch staff will respond to this action as follows:

(1) Same as subparagraph 4b(2).

(2) The Health Physics Division personnel will be immediately notified of the hazardous condition by either the PIC, CSO, or the reactor operator.

(3) The reactor operator will insure that the experimental facilities are secured.

(4) A Command Post will be established at the nearest safe point to the evacuated area having adequate communications. The PIC, his designee, Chief, Radiation Sources Division, or the CSO, as available, in that order, will act as the Command Post Commander under such situations.

(5) If time allows, a two man re-entry team will consist of one member of the Reactor Branch staff, and one member of the Health Physics Division staff. The team will suit up accordingly and will enter the evacuated area to determine the type, size, and extent of the radiation hazard. The team will remove injured personnel if required. The corrective action taken will be determined by the information accumulated by the re-entry team. The amount and type of protective equipment carried or worn by the re-entry team will be determined based on considerations of the type of hazard existing.

(6) Injured and/or contaminated personnel will be handled in accordance with AFRRI Instruction 6310.1, "Management of Injured and/or Contaminated Personnel."

(7) Same as subparagraph 4b(4).

d. Action #3. The Reactor Branch staff will respond to this action as follows:

(1) A thorough investigation will be conducted by the PIC or CSO to determine the cause of the alarm; the findings of this investigation will be reported to the Chief, Radiation Sources Division and Head, Radiation Safety Department, orally or in writing within 48 hours.

(2) Corrective actions will be taken by the PIC, his designee, CSO, or Chief, Radiation Sources Division together with Head SAF to insure that the alarm will not sound unnecessarily in the future.

5. Fire Hazard. The Reactor Branch staff will respond to a fire hazard emergency as follows:

a. When the fire alarm is sounded (continuous tone bell), this indicates that AFRRI Instruction 3020.2, "AFRRI Emergency Evacuation and Fire Plan," has been implemented. The Reactor Branch will respond in accordance with that Instruction.

b. Same as subpapagraph 4b(2).

c. The reactor operator will insure that the experimental facilities are secured.

d. If the reactor operator on the console discovers the fire he will follow the procedures in subparagraph 4b(2). In addition, he will pull the nearest fire alarm when exiting the AFRRI complex.

e. Personnel with contaminated clothing will not attempt to change clothes prior to evacuation, but will segregate themselves when outside the building.

f. No attempt will be made to remove fuel elements from the reactor pool/core during a fire.

g. If the fire occurred in the Reactor facility then an investigation will be initiated IAW subparagraph 4b(4).

6. Natural Disaster. The Reactor Branch staff will respond to a natural disaster such as flood, tornado, hurricane, earthquake, etc., as follows:

a. If either a forecast is received that a natural disaster is imminent or a natural disaster strikes the AFRRI complex, the reactor operator will immediately scram the reactor, if operating, and then place the reactor in a secured condition, and notify the PIC, CSO, and Chief, Radiation Sources Division.

b. The reactor operator will insure that the experimental facilities are secured.

7. Bomb Threat. The Reactor Branch staff will respond to a bomb threat as follows:

a. Upon receipt of a bomb threat, Administrative Services Division and the PIC will be notified immediately.

b. The Reactor Branch staff will take appropriate action in accordance with AFRRI Instruction 5200.4, "Physical Security Plan for AFRRI," and AFRRI Instruction 5220.4, "Physical Security Plan for AFRRI-TRIGA Reactor Facility."

8. Civil Disorder, Unauthorized Entry Into Reactor Controlled Access Area, Attempted or Actual Theft/Diversion of SNM, or Threats of Sabotage Against AFRRI or the AFRRI Reactor. The Reactor Branch staff will respond to these threats in accordance with AFRRI Instruction 5220.4, "Physical Security Plan for AFRRI-TRIGA Reactor Facility."

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TABLE I

SYSTEM	TECH SPEC REQUIRED	RANGE	ALARM SETPOINTS	ALARM NOTIFICATION
1. R-1[a]	#	1 to 10^6 mr/hr	a) 500 mr/hr when reactor staff are on duty b) 20 mr/hr during non-duty hours	a)[1] Local audible buzzer and red light. b)[5] Instrument module - audible buzzer and red light. c)[3] Annunciator Panel - audible horn and red light.
2. R-2[a]	#	1 to 10^5 mr/hr	10 mr/hr*	5 Instrument module - red light.
3. R-3[a]		1 to 10^5 mr/hr	10mr/hr*	5 Instrument module - red light.
4. E-3[a] and E-6[a]	#	1 to 10^5 mr/hr	10 mr/hr*	a)[4] Local red light. b)[5] Instrument module - red light.
5. Stack RAM[a]		1 to 10^5 mr/hr	100 mr/hr*	5 Instrument module - red light.
6. Stack Gas[b]	#	10^2 to 10^6 cpm	10^5 cpm**	5 Instrument module - red light.
7. Reactor Room Cam[c]	#	50 to $5x10^4$ cpm	10^4 cpm***	a)[1] Local audible bell and red light. b)[1] Annunciator panel - red light. c)[5] Air damper closed lights on instrument module. d)[5] Instrument module - red light. e)[3] Annunciator panel - audible horn and red light.
8. NMC Criticality Monitor[a]	#	1 to 10^3 mR/hr	a) 50 mr/hr - when reactor personnel are on duty**** b) 20 mr/hr - during non-duty hours	5 Audible bell and red light.
9. Water Box Gamma Monitor[c]		0 to 1.0 ma	0.5 ma	5 Red light on instrument module
10. Main Stack Exhaust Fan Monitor	#	n/a	Motor Failure	5 Bell and red light on wall.
11. Phase I Stack Flow Alarm	#	n/a	0 CFM (Phase I Stack Flow)	5 Bell and red light on wall.

a - Scintillation detector
b - Proportional detector
c - GM detector
d - Float activated switch

1 - Reactor Room
2 - Room 3152
3 - Hallway 3101
4 - Prep Area
5 - Control Room

* - Loss of signal alarm: [5]Instrument module - blue light

** - Loss of signal a)[2]Local audible horn and red light; Loss of air pump alarm: [5]Audible horn + RED LIGHT
b)[5]White light on instrument module

*** - Low level alarm: [1]Local yellow light; Loss of signal alarm: [5]White light on instrment module

**** - Loss of signal alarm: [5]White light

ADD TO TABLE I:

	SYSTEM	RANGE	ALARM SETPOINTS	ALARM NOTIFICATION
12.	Stack Particulate[c]	10 to 10^5 cpm	2×10^3 cpm	[5]Instrument module-red light
13.	Pool H_20 Level monitor [d,1]	N/A	Loss of $\gtrsim$6" H_20 from pool	[5]Console-Red light scram indicator [3]Annunciator Panel-audible horn and red light

RADIATION SOURCES DIVISION
INSTRUCTION NUMBER 5-4

4 January 1982

REACTOR MAINTENANCE PROGRAM FOR THE AFRRI-TRIGA REACTOR

1. Purpose. To set forth an organized and systematic reactor maintenance program for the AFRRI-TRIGA Reactor and to establish maintenance records that will provide a permanent maintenance history of the reactor systems and auxiliary support equipment.

2. Applicability. The provisions of this Instruction are applicable to the AFRRI-TRIGA Reactor and the Reactor Branch Staff.

3. Cancellation. RSD Instruction 5-4 "Reactor Maintenance Program for the AFRRI-TRIGA Reactor," dated 27 March 1981 is hereby cancelled.

4. Definitions.

a. Malfunction. The failure of a component of a reactor system that will prevent the system from either operating in its normal manner or from performing its intended function.

b. Modification. Any physical change, other than direct replacement or equivalent substitution, in either the components or the design of the reactor system or its associated equipment.

c. Major Modification. Any physical change, in either the components or the design of the reactor system, or its associated equipment that will require an amendment to the existing Technical Specifications of the Reactor License (R-84) and therefore approval by the Nuclear Regulatory Commission (NRC).

d. Minor Modification. Any physical change, other than direct replacement or equivalent substitution, in either the components or the design of the reactor system or its associated equipment, that will not require an amendment to the existing technical specifications of the Reactor License (R-84). Minor modifications require notification and concurrence of the RRFSC and are authorized by the PIC. Minor modifications will be documented by the Reactor PIC in a Minor Modification Log and reported to the USNRC per 10 CFR 50.59 and in the Annual Report.

e. Equivalent Substitution. Direct replacement or substitution of a component, subsystem, or system which does not alter the intended function and does not constitute either a major or minor modification. Equivalent substitutions do not specifically require notification or concurrence of the RRFSC and are authorized by the Reactor PIC or CSO. Equivalent substitutions must not involve changes with unreviewed safety questions. Equivalent substitutions will be documented within the as-built drawings, as appropriate, and in the Maintenance Log, and will be reviewed and initialled by either the Reactor PIC or CSO.

5. Responsibilities. Responsibilities for the reactor maintenance program are delineated as follows:

a. Head, Reactor Branch (Physicist-In-Charge, PIC):

(1) Has authority to approve any change in either the components or the design of the reactor system or its associated equipment that does not constitute a major modification.

(2) Performs periodic inspections to insure that the maintenance schedules and procedures are followed, and that all maintenance records are being properly maintained.

(3) Reviews the Malfunction Log quarterly to insure that proper corrective measures have been taken.

(4) Prepares documentation for proposed major and minor modifications, and maintains the major and minor modification records/logs.

b. Chief Supervisory Operator (CSO):

(1) Has primary responsibility for implementation of the reactor maintenance program in accordance with the Reactor License (R-84).

(2) Supervises the reactor operators in the performance of all reactor maintenance.

(3) Accomplishes the training of reactor operator trainees in the reactor maintenance program.

(4) Supervises, when necessary, maintenance personnel from outside the Reactor Branch when working on reactor systems and auxiliary support equipment.

(5) Maintains current and accurate reactor maintenance records except for minor and major modifications.

(6) Insures that all changes in the reactor systems are reflected in the as-built drawings.

(7) Schedules preventive maintenance to include the annual shutdown maintenance period.

(8) Recommends to PIC changes that will enhance the reactor maintenance program and procedures.

(9) Has authority to approve an equivalent substitution.

c. Reactor Operator (RO):

(1) Performs reactor maintenance as directed by the Chief Supervisory Operator.

(2) Immediately notifies the Chief Supervisory Operator and PIC whenever a malfunction occurs.

(3) Informs the Chief Supervisory Operator and/or PIC whenever maintenance on any component of either the reactor or auxiliary systems is required.

(4) Recommends to Chief Supervisory Operator and/or PIC changes that will enhance the reactor maintenance program and procedures.

6. Maintenance Program. The AFRRI-TRIGA Reactor Maintenance Program is conducted in compliance with the Technical Specifications of the NRC Reactor License (R-84), and to insure the safe and reliable operation of the reactor in support of the AFRRI research program. In order to facilitate the administration of the maintenance program, the reactor system is divided into component systems. Likewise, the maintenance program is divided into three general categories:

a. Preventive Maintenance. Consists of maintenance that is scheduled in advance and is accomplished in accordance with the schedule indicated on the Maintenance Chart.

b. Corrective Maintenance. Consists of maintenance that is non-scheduled and that requires either repairs or calibrations as a result of a malfunction or detection of a marginally operating component, subsystem, or system.

c. Modifications. Consist of major and minor modifications as defined in subparagraphs 4.c. and 4.d., respectively. Modifications are made to the existing reactor systems and associated equipment to increase the safety and/or reliability of reactor operations.

7. Maintenance Records. The AFRRI-TRIGA Reactor maintenance records are maintained in compliance with the Technical Specifications of the NRC Reactor License (R-84), and to provide a permanent history of all maintenance performed on each reactor system and auxiliary equipment.

a. Maintenance Log.

(1) The Maintenance Log will consist of a file system delineating each major component or system of the reactor. The first section will be a list of current components in the system. Each section will refer to the frequency of inspection, or preventive maintenance, or calibration of the component specified. Each section will describe the action required or refer to manuals or files giving such description. Direct replacements, modifications, or equivalent substitutions to any component, subsystem, or system, and any change in procedure covering calibration or inspection or the frequency of inspection will be appropriately referenced in each systems section.

(2) There will be a space provided in each system section for a written statement of actions taken on any component, subsystem, or system along with the date, signature of the operator completing the action, and a block for the CSO's or PIC's initials upon review of the action taken.

b. Malfunction Log. Consists of a bound notebook with all information pertinent to the reactor systems malfunctions in it. The entries in the Malfunction Log will be made by the individual discovering the malfunction and will consist of the date the malfunction occurred, the component that malfunctioned with a description of the malfunction, the corrective action taken, and the initials of the individual. The CSO or PIC wll review the malfunction statements and initial the Malfunction Log.

c. Maintenance Chart. A chart may be used to cover a calendar year depicting the date on which preventive maintenance is scheduled to be performed for components in the system. The dates for preventive maintenance are depicted on the chart with an (X). The Maintenance Chart is to be used for informal reference only, actual records will be contained within the Maintenance Log. The Maintenance Chart may be color coded to highlight the required timing frequency for maintenance.

d. Modification Records. Consists of all proposed major and minor Modification Memorandums pertinent to reactor modifications. These records will be maintained in a current status by the PIC.

e. As-Built Drawing Records. Consists of all as-built prints of the components of the reactor systems as originally designed and includes any modifications made to these reactor systems. These records will be maintained in a current status by the CSO.

f. Calibration Data Records. Consists of final data taken during calibrations of the various reactor parameters specified in the Technical Specifications of the Reactor License (R-84). These records will be maintained in a current status by the CSO.

8. Manuals. The maintenance program will be accomplished in accordance with the procedures set forth in the Reactor Maintenance Manual and as recommended in the manufacturers' manuals except where updated or modified based on operational experience.

9. Modification Procedures. A modification will be documented, approved and reviewed prior to being accomplished. The proposed modification will be documented in a "Modification Memorandum." The Memorandum will contain the following information:

a. The purpose of the modification.

b. A detailed description of the modification to include figures and as-built drawings as deemed necessary.

c. An analysis of the modification with empahsis placed on the reactor Technical Specifications, the safety of operation of the reactor, and the safety of personnel.

d. A Minor Modification Memorandum will be prepared by the CSO, approved by the PIC and reviewed by the Chief, Radiation Sources Division. A Major Modification Memorandum will be prepared by the PIC, reviewed by the Chief, Radiation Sources Division, reviewed by the Reactor and Radiation Facility Safety Committee, approved by the Director and approved by the NRC.

11. Reactor Core Maintenance. The maintenance on the reactor core will be accomplished in accordance with the following conditions:

a. Maintenance on the control rods will be performed only when the reactor is in a shutdown condition.

b. The PIC will insure that the number of non-essential personnel in the Reactor Room will be kept to a minimum when core maintenance is performed.

c. The core maintenance will be recorded in either the Reactor Operations Log, Maintenance Log, or Malfunction Log,or a combination of these, as required.

d. A control rod will only be manually removed from the reactor core under the following conditions

(1) The reactor will be in a shutdown condition.

(2) A minimum of three individuals will be present, and at least two of these individuals will possess an NRC license. One individual will be either the PIC or CSO and possess an NRC Senior Reactor Operator license. The second individual will possess either an NRC Senior Reactor Operator license or an NRC Reactor Operator license.

(3) One licensed operator will observe the core nuclear instrumentation.

(4) The minimum shutdown margin provided by the remaining control rods with the most reactive control rod fully removed shall be $1.00 (0.7%$\Delta$k/k).

e. The loading and unloading of the fuel elements in the reactor core will be accomplished in accordance with RSD Instruction 5-8 "Reactor Core Loading and Unloading Procedures."

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Reactor Branch Chief and Physicist-In-Charge

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Chief, Radiation Sources Division

RADIATION SOURCES DIVISION
INSTRUCTION NUMBER 5-5

15 March 1982

REACTOR ROOM POWER HOIST OPERATIONS PROCEDURES

1. Purpose. To set forth the procedures to be followed by the Reactor Branch staff in the operation of the Reator Room Power Hoist.

2. Applicability. The provisions of this Instruction are applicable to the Reactor Branch staff.

3. Cancellation. The RSD Instruction 5-5, "Reactor Room Power Hoist Operations Procedures," dated 31 March 1981 is hereby cancelled.

4. General.

a. The power hoist will not be operated without the permission of the Physicist-In-Charge (PIC) of the Reactor Branch or his designee.

b. A minimum of two people will be present during the operation of the power hoist. One of the two people must be from the Reactor Branch.

c. The key to the power hoist circuit breaker lock will remain secured in the Reactor Branch key box when the power hoist is not in use.

5. Operation.

a. The reactor will be in a shutdown condition before electrical power is applied to the hoist.

b. Restraining lines will be attached to all loads, prior to being lifted by the power hoist, to control swinging of the load, and to assist in guiding the load during horizontal movement.

c. Any equipment to be used with the hoist for actual operations such as hooks, slings, cables, chains, etc; must be visually inspected for wear and damage, if acting as load bearing devices, and must be load tested or certified prior to their being used with the hoist for any operation. The results of the visual inspection and the load testing will be documented in the Reactor Operations Logbook or Maintenance Log as appropriate. This paragraph does not apply to the annual hoist load testing by the inspectors if their certified equipment is used.

d. While electrical power is applied to the hoist and overhead rails, the following additional administrative controls will apply:

(1) The personnel in the Reactor Room will remain clear of the hoist, load, and overhead power rails. Personnel will not stand directly under the load for any reason. All personnel should remain as far from the load as the length of the longest load-bearing cable, if possible.

(2) Tools and poles, longer than 10 feet, will not be raised vertically in the Reactor Room to include the storage area over the Control Room.

(3) The control box will be continuously in the possession of the operator when power is applied to the hoist and overhead rails.

f. Before any load is lifted in the vicinity of the reactor pool, simulated operations will be conducted in another location by the operator and the procedures approved by the PIC or his designee.

g. Before any load is lifted in the vicinity of the aluminum floor hatch in the Reactor Room, the areas on the first and second levels beneath the hatch will be secured to ensure all personnel are kept out of areas directly below the load.

h. The power hoist will be load tested and certified periodically by licensed inspectors. Results of the load test will be filed in the maintenance files and the maximum load rating will be stenciled or marked on the hoist.

i. The operator shall test the brakes each time a load approaching 10,000 lbs. is handled. The brakes shall be tested by raising the load a few inches, applying the brakes and checking for slippage.

j. A load shall not be lowered below the point where two full wraps of cable remain on the drum.

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RADIATION SOURCES DIVISION
INSTRUCTION NUMBER 5-6

27 March 1981

REACTOR OPERATOR TRAINING AND REQUALIFICATION PROGRAM

1. Purpose. To set forth a reactor operator training program to insure that candidates for USNRC Senior Reactor Operator and Reactor Operator license are properly trained in facility design, operation, maintenance, nuclear theory, and emergency procedures applicable to the AFRRI-TRIGA Mark-F Reactor. To set forth a reactor operator requalification program, in accordance with 10 CFR-55, Appendix A and IAW the "AFRRI Reactor Facility Operator Requalification Program."

2. Applicability. The provisions of this instruction are applicable to the Reactor Branch staff and to all operators licensed by USNRC on the AFRRI-TRIGA Reactor.

3. Cancellation. RSD Instruction 5-6, "Reactor Operator Training and Requalification Program," dated 27 June 1979 is hereby cancelled.

4. Responsibilities. The authority to implement both the reactor operator training program and the reactor operator requalification program is delegated to the Head, Reactor Branch through the Head, Radiation Sources Division.

5. Training Programs. The reactor operator training program is designed to provide the training for both Senior Operator and Reactor Operator candidates for USNRC operator licenses. Personnel assigned to the Reactor Branch will be presumed to possess a general familiarity with reactor operations by virtue of previous training and experience. All such personnel will enter the training program to achieve the desired level of competency as a nuclear reactor operator. Certain individuals assigned to the Reactor Branch will be subsequently provided additional training to enable them to become a candidate for a USNRC Senior Operator's License. The reactor operator trainees will follow an organized program. The extent of the training program will be developed in view of the trainees' previous training and experience. The program may include classroom lectures and examinations, on-the-job training and demonstration, console operation, and operation of the experimental facilities. Principally, the reactor nuclear theory and radiological safety portions of the program will consist of classroom lectures while the remaining portions will be conducted by on-the-job techniques and supplemented by lectures as necessary.

a. Reactor Operator Training. The reactor operator training will be conducted in accordance with the "Reactor Operator Requalification Program." This training program is designed to provide personnel previously trained in the basic principles of nuclear reactor operations with an acceptable familiarity and operational competency with the AFRRI-TRIGA Mark-F Reactor. Completion of this course demonstrates ability to operate the reactor and accomplish all operator assigned tasks, without supervision, during all normal reactor startups, operations, and shutdowns. In addition, each operator must be capable of establishing and insuring a safe configuration during any abnormal condition; must demonstrate familiarity with the design and control of the reactor necessary for knowledgeable and competent operation; must possess a thorough knowledge of nuclear safety, the possible hazards associated with this facility, and response to the separate levels of alarm; must demonstrate a thorough knowledge of the directives applicable to and the reports required of all operations.

b. Senior Reactor Operator Training. The senior reactor operator training will be accomplished in accordance with the "Reactor Operator Requalification Program." This training program is designed to provide personnel with that depth of knowledge required for supervisory direction, analysis of routine reactor data and solution of problems associated with reactor operation or experiment handling. Completion of this course demonstrates competence to direct the activities of licensed reactor operators in all routine, non-routine, or emergency reactor operations to include accomplishment of required data forms, observance and interpretation of reactor parameters, and timely response to and solution of abnormal parametric conditions; must be capable of directing and training other operators and effecting an accurate and timely analysis of emergency indications.

6. Requalification Program. The requalfication program will be conducted in accordance with the NRC approved AFRRI "Reactor Operator Requalification Program." All NRC licensed reactor operators and senior reactor operators are required to participate in the requalification program.

7. Recommendation for Licensing. Upon completion of the required training, the Chief, Reactor branch will determine the level of competency of the license candidates and forward to the Chief, Radiation Sources Division, a recommendation for submission of the candidate to the USNRC for licensing. The Chief, Radiation Sources Division will review the recommendation submitted and make a determination whether or not the candidate will be submitted to the USNRC for licensing. If approved the candidate will prepare an application either for licensing in accordance with 10 CFR-55.10 or for renewal .. reactor license in accordance with 10 CFR-55.33. The application will be coordinated with the Chief, Reactor Branch; Chief, Radiation Sources Division; and Director, AFRRI prior to being forwarded to the USNRC.

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(effective 13 Oct 1981)

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RADIATION SOURCES DIVISION
INSTRUCTION NUMBER 5-7

18 March 1981

PNEUMATIC TRANSFER SYSTEMS AND CORE EXPERIMENT TUBE OPERATION PROCEDURES

1. Purpose. To set forth the procedures to be followed by the Reactor Branch staff in the operation of the Pneumatic Transfer Systems (PTS), and the Core Experiment Tube (CET).

2. Applicability. The provisions of this Instruction are applicable to the Reactor Branch staff and the Radiation Safety Department staff.

3. Cancellation. RSD Instruction 5-7 dated 8 April 1980 is hereby cancelled.

4. General. All use of the PTS and CET will be under the supervision of a Senior Reactor Operator. When not in use, the control key for the PTS will remain secured in the Reactor Branch key box.

5. Irradiation. No irradiation will be carried out without an approved RUR and, when required, an SWP.

6. Operator and Monitors.

a. A licensed operator of the Reactor Branch will operate or directly supervise a trainee in the operation of the PTS and the CET. His responsibilities include:

(1) Physical operation or direct supervision of the operation of the PTS control panel or CET, as appropriate.

(2) Communication with the reactor operator at the console in the reactor control room.

(3) Inspection of rabbits to be used to preclude use of cracked or otherwise damaged rabbits.

b. A monitor from the Radiation Safety Department (SAHP) will be present when a retrieval is in progress, and will insure compliance with applicable Health Physics Standard Operating Procedures of the SAHP.

c. In all cases the reactor operator at the console in the reactor control room is responsible for making the appropriate operations log book entries and for coordinating the insertion and retrieval of experiments.

NOTE: Items 7 and 8 apply only to the Pneumatic Transfer Systems.

7. Aluminum rabbits will be diverted to the hot cell , and therefore can only be irradiated in the "A" system.

8. If the anticipated radiation level of any returned rabbit is greater than 1.0 R/hr at 1 meter from the receiving station, the following precautions will be taken:

a. Unless experiment requirements dictate otherwise, the PTS operator will use the remote or auxiliary control unit.

b. All non-essential personnel will exit from the Radiochemistry Laboratory prior to returining the rabbit.

c. A radiation survey meter will be set up near the receiving station so that it will be visible from the remote or auxiliary control unit.

d. The rabbit will be irradiated in the "A" system and then diverted to the Hot Cell or returned to the terminus.

NOTE: Items 9 through 12 apply only to the CET.

9. Only CET type rabbits will be used with the CET. CET rabbits will be raised or lowered into the CET through the use of a fishing pole assembly which allows the operator to maintain up to approximately six feet between himself and the retrieved experiment. At the direction of an SRO a plastic rabbit may be simply dropped into the CET without using the fishing pole assembly.

10. Irradiated CET rabbits will be raised near the pool surface, within the CET, for dose rate measurements by the SAHP monitor. Experiments too active for safe transfer will be returned to a lower portion of the CET and allowed to decay.

11. To protect the fishing pole assembly and the extractor from undue activation, insertions and retrievals are best performed when the reactor is shut down. Normally the extractor will not be lowered into the active core region when the power level is greater than 100 watts.

12. Open air transfer of a sufficiently "cool" rabbit will be accomplished only after nonessential personnel have cleared the immediate area.

13. Radiological safety considerations will be coordinated through SAHP.

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RADIATION SOURCES DIVISION
INSTRUCTION NUMBER 5-8

27 March 1981

REACTOR CORE LOADING AND UNLOADING PROCEDURES

1. Purpose. To set forth the procedures to be followed by the Reactor Branch staff in the complete loading and unloading of the AFRRI-TRIGA reactor core.

2. Applicability. The provisions of this instruction are applicable to the Reactor Branch staff, and the Health Physics Division staff.

3. Cancellation. RSD Instruction 5-8 dated 14 December 1976 is hereby cancelled.

4. General.

a. The reactor core loading and unloading procedures contained herein apply to the preparation phase as well as the actual loading and unloading phases. These procedures are based on two (2) separate core loadings and one core unloading of the AFRRI-TRIGA reactor. Emphasis is placed on following the procedures specified herein to insure continuity of operation and retention of experience within the Reactor Branch.

b. All activities associated with either the loading or unloading of the reactor core will be recorded in the Reactor Operations Logbook.

c. The minimum number of personnel that will be required is (1) Physicist-in-Charge (PIC) or his designee, (2) Chief Supervisory Operator (CSO), (3) One NRC licensed reactor operator, and (4) Health Physics Division representative.

d. A daily Startup Checklist will be completed prior to the movement of any fuel elements.

e. An approved Special Work Permit will be initiated prior to the movement of any fuel elements, if and as required.

f. If any new fuel elements are to be used, each element must be inspected when received at AFRRI. Each element will be removed from its shipping container, cleaned, and inspected for visual defects. Length and bow measurements must also be made and recorded. Smears of the element cladding for alpha contamination must be performed by the Health Physics Division representative prior to being handled by Reactor Branch personnel.

g. If any new thermocouple elements are to be used, a thermocouple calibration will be performed. The fuel element will be placed in a water bath, and Emf readings will be recorded over the range 20-100 degrees Centrigade.

h. At no time will more than six (6) new fuel elements be out of their shipping containers and on the reactor room floor level.

i. The Physicist-In-Charge or his designee must directly supervise all sequences of loading and unloading the reactor core.

j. An NRC licensed reactor operator will continuously observe the nuclear instrumentation at the control console during all movements of control rods and fuel elements.

k. No fuel element which has experienced burnup in the core shall be removed from the reactor pool unless at least two (2) weeks have transpired since its use in the core.

5. Nuclear Instrumentation.

a. The following nuclear instrumentation is the minimum required for a reactor core loading:

(1) Two ionization chambers will be located outside the core shroud, along the core centerline, and adjacent to core positions F-4 and F-12, respectively. The readouts for these chambers will be picoammeters, or equivalent.

(2) One BF_3 or fission chamber will be located outside the core shroud, along the core centerline, and adjacent to core position F-8. The readout for this chamber will be a scaler unit.

b. The minimum nuclear instrumentation required for the unloading of the reactor core is:

(1) One BF_3 or fission chamber will be located outside the core shroud, along the core centerline, and adjacent to core position F-8. The readout for this chamber will be a scaler unit.

c. An operational check of the channels will be made as follows prior to the movement of any fuel element.

(1) A neutron source (3-5 curies) will be placed in the neutron source holder, and an increase in the readings will be observed on all channels.

(2) The neutron source will be removed from the neutron source holder and the readings will be taken and recorded.

(3) Replace the neutron source in the neutron source holder, and then generate a bias curve for the startup channel identified in 5.a.(2) or 5.b. above as appropriate. Record all channel readings with the source. These measurements will be performed several times in order to obtain reasonable reproducibility. These readings will be the basis for future calculations of source multiplication only in the loading of a reactor core. The neutron source reading will be the difference between the readings with and without the neutron source in place in the reactor core.

d. The nuclear instrumentation will be turned on and allowed to stabilize prior to the movement of any fuel elements, or making measurements of source effect.

6. Core Loading.

a. A 1/M curve is obtained by plotting the inverse multiplication vs the amount of fuel added (total amount in the core). The inverse multiplication is the ratio of the source reading to the reading with the fuel added. The loading curve will seldom be a straight line but may be either concave or convex dependent upon the geometry (source-detector distance). Hence, a number of different channels will yield different predictions of criticality. Since not all channels will agree, a conservative approach will be taken and the smallest number of estimated fuel elements required for criticality will be used to dictate future steps.

b. The fuel elements will be loaded in accordance with Table 1.

TABLE 1

FUEL LOADING SCHEDULE

STEP #	# ELEMENTS ADDED	# ELEMENTS TOTAL	REMARKS
1	4	4	Load four thermocouple elements, 2 in the B ring and 2 in the C ring.
2	14	18	Complete loading of B and C rings.
3	15	33	Load D ring.
4	15	48	Load E ring positions 1, 2, 4, 6, 8, 9, 10, 12, 14, 16, 17, 18, 20, 22 and 24. This loading is designed to complete a compact array around the control rods as well as to fill water gaps.
5	9	57	Complete loading of E ring.
6	9	66	Load F ring in positions 1, 5, 9, 13, 17, 21, 22, 23, and 27.

c. After each step of the fuel loading, perform the following:

(1) Record readings.

(2) Withdraw control rods 50%.

(3) Record readings.

(4) Withdraw control rods 100%.

(5) Record readings.

(6) Calculate M, 1/M for the step.

(7) Plot 1/M vs # fuel elements.

(8) Plot 1/M vs weight of uranium-235.

(9) Plot 1/M vs control rod position (50% and 100%).

(10) Predict critical loadings.

(11) Estimate worth of the control rods.

(12) INSERT CONTROL RODS TO FULL "IN" POSITION.

d. AFRRI-TRIGA Core I (aluminum clad elements) attained criticality with 72 fuel elements, 2811.33 grams uranium-235. AFRRI-TRIGA Core II (stainless steel clad elements) attained criticality with 69 fuel elements, 2630 grams uranium-235.

e. Continue the loading sequence as detailed below until criticality is obtained, and until the excess reactivity is 40-50 cents:

TABLE I (Continued)

FUEL LOADING SCHEDULE

STEP #	# ELEMENTS ADDED	# ELEMENTS TOTAL	REMARKS
7	2	68	Load F ring positions 1 [illegible] d 25.
8	2	70	Load F ring positions 3 and 11.

f. Prior to loading the core to an operational configuration, the following measurements will be made:

(1) Control rod calibrations using the rod drop techniques.

(2) The worth of fuel elements in the remaining vacancies (E and F ring) vs water, taken one at a time.

(3) Estimate the core configuration for an excess reactivity of approximately $3.20.

g. The loading sequence will continue in order to attain a critical configuration with the transient rod in the DOWN position. This is the basis for the excess reactivity estimate of approximately $3.20.

TABLE I (Continued)

FUEL LOADING SCHEDULE

STEP #	# ELEMENTS ADDED	# ELEMENTS TOTAL	REMARKS
9	2	72	Load F ring positions 7 and 15.
10	4	76	Load F ring positions 2, 14, 18, and 29. Record critical rod Bank position; Calibrate the lower portion of the transient rod (0-25%) via the positive-period technique.
11	4	80	Load F ring positions 8, 10, 24, and 30. Calibrate the middle portion of the transient rod (25-75%) via the positive-period method.
12	2	82	Load F ring positions 16 and 20, and this should complete the operational configuration as stated above.

h. Calibrate the four control rods via the positive-period method, and then compute the excess reactivity in the reactor core (K-excess must not exceed $5.00).

i. Complete the core loading, insuring that the K-excess does not exceed $5.00.

TABLE I (Continued)

FUEL LOADING SCHEDULE

STEP #	# ELEMENTS ADDED	# ELEMENTS TOTAL	REMARKS
13	5	87	Load F ring positions 4, 6, 12, 26, and 28.

j. Recalibrate the four control rods via the positive-period method, and then compute the K-excess reactivity in the reactor core.

7. Core Unloading

a. The reactor core will be unloaded starting with the F ring and ending with the B ring.

b. The fuel elements will be individually removed from the reactor core, identified by serial number, and placed either in the fuel storage racks or a shipping cask.

c. If the fuel elements are to be loaded into a shipping cask, the following actions will be taken in preparing the shipping casks for loading:

(1) A radiological survey will be made of the shipping cask upon arrival and before it will be removed from the truck.

(2) The cask will be moved from the truck to the Prep Area.

(3) The hatches, which provide access from the Prep Area to the Reactor Room, will be opened and the lifting hook to the power hoist lowered to the Prep Area.

(4) The power hoist will be operated in accordance with RSD Instruction 5-5.

(5) The lifting yoke will be attached to the cask and the cask lifted to the Reactor Room.

(6) The lid to the cask will be removed. The cask will be monitored by the Health Physics Division representative while the lid is being removed, to insure that no radioactive material is inside the cask.

(7) The inside of the cask will be smeared for gross alpha and beta contamination.

(8) The inside of the cask will be vacuumed. The inside and outside of the cask will be washed down. The water drain line on the cask will be checked to insure that it is not blocked. Also verify the operability of the pressure relief valve and the temperature sensing thermocouple.

(9) If more than seven elements are to be loaded into the cask, it will be necessary to verify that a thermal neutron poison is present in the cask to prevent the loading of a critical mass.

(10) Move the cask by crane from the reactor deck and position the cask in the reactor pool.

d. Load the cask with up to as many fuel elements as allowed by the license for the cask. If grid index markings are present in the cask, record which fuel element is placed in which grid position.

e. Lower the lid to the cask into the pool, place the lid on the cask, and secure the lid.

f. Raise the cask from the pool, drain the water from the cask into the pool, and then dry the cask off. The cask will be monitored while being removed from the pool to insure that no radiation hazard exists as a result of a weakness in the shielding in the cask. The cask will be smeared for gross alpha and beta contamination.

g. An air sample will be taken from the cask to measure the activity of the air. The data from all radiological surveys will be recorded.

h. After the air sample has been taken, observe the temperature and pressure inside the cask until the temperature and pressure reach an equilibrium.

i. Label the cask accordingly and complete the appropriate paperwork either for temporary storage or for transporting.

j. Move the cask to either a temporary storage area or to the truck for transporting. If the cask is to be placed in temporary storage, a criticality monitor must be available in accordance with 10 CFR 70.

JOSEPH A. SHOLPIS, JR.
CAPT, USAF
Reactor Branch Chief and Physicist-In-Charge
(effective 13 Oct 1981)

RONALD R. SMOKER
MAJ, EN, USA
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RADIATION SOURCES DIVISION
INSTRUCTION NUMBER 5-9

4 January 1982

CHECKLISTS: REACTOR STARTUP,
REACTOR SHUTDOWN, WEEKLY NUCLEAR
INSTRUMENTATION SURVEILLANCE

1. Purpose. To set forth and document the current procedures for reactor startup, reactor shutdown, and instrumentation surveillance via the use of checklists.

2. Applicability. The provisions of this Instruction pertain to the Reactor Branch staff.

3. Cancellation. This is the initial version of this Instruction, therefore, cancellation of a previous version does not apply.

4. General. Checklists/procedures for reactor startup, reactor shutdown, and nuclear instrumentation surveillance have been utilized over the operational lifetime of the AFRRI Reactor. This Instruction provides a means of documenting current checklist items and procedures for reactor startup, reactor shutdown, and weekly nuclear instrumentation surveillance.

5. Checklists. Checklists illustrating the current items and procedures for reactor startup, reactor shutdown, and weekly nuclear instrumentation surveillance are attached as Enclosures 1, 2, and 3, respectively. Modified or new checklists, upon approval by the PIC and CSO, will be appropriately attached to this Instruction and the superseded checklist will be removed and filed for reference.

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CAPT, USAF
Reactor Branch Chief and Physicist-In-Charge

RONALD R. SMOKER
MAJ, EN, USA
Chief, Radiation Sources Division

Date Approved: 3 Sep '81 chgs. 15 Jul '82

PIC/CSO Initials: JWA JWA

DAILY START-UP CHECKLIST FOR AFRRI-TRIGA REACTOR
(RSD INSTRUCTION No. 5–2)

CHECKLIST No. _____ *DATE* _____

SUPERVISOR-IN-CHARGE _____ *PERFORMED BY* _____

OPERATORS _____ *APPROVED BY* _____

TIME COMPLETED _____

I. EQUIPMENT ROOM (Rm-3152)

1. Stack gas monitor pump and cooling air blower "ON" ..... _____
2. Air compressor pressure (psi) ..... _____
3. Air compressor water traps DRAINED ..... _____
4. Doors 231, 231A, 3152 and roof hatch SECURED ..... _____

II. LOBBY AREA

Lobby audio alarm turned "OFF" ..... _____

III. EQUIPMENT ROOM (Rm-2158)

1. Prefilter Differential Pressure ..... _____
2. Primary discharge pressure (psi) ..... _____
3. Demineralizer flow rates set to 6 gpm ..... _____
4. Stack roughing filter D.P. (inches of water) ..... _____
5. Stack absolute filter D.P. (inches of water) ..... _____
6. Door 2158 SECURED ..... _____
7. Visual inspection of area ..... _____
8. Air compressor water traps drained ..... _____

IV. PREPARATION AREA

Visual inspection of area ..... _____

V. REACTOR ROOM (Rm-3161)

1. Transient rod air pressure (psi) ..... _____
2. Shielding doors bearing air pressure (psi) ..... _____
3. Tank water level below full mark (inches) ..... _____
4. Shielding doors open or closed ..... _____
5. Visual inspection of core and tank ..... _____
6. Number of fuel elements and control rods in tank storage ..... _____
7. Door 3162 SECURED ..... _____
8. Continuous air monitor
   - (a) Operating and tracing ..... _____
   - (b) Alarm test completed ..... _____
   - (c) High Rad air indication on annunciator panel ..... _____
9. Temp. chart recorder dated ..... (M. Rm. 3160) JWA 15 Jul 82 _____
10. Turn temp. chart recorder "ON", ~~[illegible] RECORD~~ (M. Rm. 3160) JWA 15 Jul 82 _____

AFRRI FORM 61 (PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.)
3 SEP 81

Enclosure 1 to RSD 5-9

VI. REACTOR CONTROL ROOM

1. Emergency air system RESET ..... _____
2. Console recorder DATED ..... _____
3. Stack gas monitor DATED ..... _____
4. Logbook DATED and REVIEWED ..... _____
5. Water monitor box
   (a) Background activity (ma) ..... _____
   (b) Alarm test completed and alarm reset to 0.5 ma ..... _____
   (c) Water monitor box conductivity. List resistivity in MΩ –cm (must be >.5 MΩ · cm) ..... _____
   (d) DM1 conductivity. List resistivity in MΩ · cm (must be >.5 MΩ · cm) ..... _____
   (e) DM2 conductivity. List resistivity in MΩ · cm (must be >.5 MΩ · cm) ..... _____
6. Stack gas flow rate (Kcfm) ..... _____
7. Stack gas monitor
   (a) Background (cpm) ..... _____
   (b) Alarm check ..... _____
   (c) High alarm set to 10^5 cpm ..... _____
8. Stack particulate monitor
   (a) Background (cpm) ..... _____
   (b) Alarm check ..... _____
   (c) High alarm set to 2×10^3 cpm ..... _____
9. Radiation Monitors

MONITOR	ALARM POINTS FUNCTIONAL	READING (mR/hr)	ALARM SETTING (mR/hr)
(a) R-1	_____	_____	500
(b) R-2	_____	_____	10
(c) R-3	_____	_____	10
(d) E-3	_____	_____	10
(e) E-6	_____	_____	10
(f) S	_____	_____	100
(g) NMC	_____	_____	50

10. Timer "ON" ..... _____
11. TV monitors "ON" ..... _____
12. Source level on log channel ≳ .5 cps ..... _____
13. Core dolly position (units) ..... _____
14. Time delay OPERATIVE ..... _____
15. OPERATIONAL CHANNELS

Cal Log Switch Pos No.	Range Switch	% Linear	% Log
1	0.3 watt	_____	_____
2	30 watt	_____	_____
3	300 watt	_____	_____
4	1 kw	_____	_____
5	10 kw	_____	_____
6	3 meg watt	_____	_____

16. Rod raising interlock for Mode I ..... _____
17. Rod raising interlock for Mode III ..... _____
18. Zero power pulse ..... _____
19. SCRAM CHECKS (insure each rod is checked with at least one scram)
   (a) Carriage movement ☐ (f) Fuel temp 2 ☐
   (b) Fuel temp 1 ☐ (g) Safety flux 2 ☐
   (c) Safety flux 1 ☐ (h) Timer ☐
   (d) Manual ☐ (i) Emergency stop ☐
   (e) Pool H_2O level ☐ (j) Reactor key ☐
20. Water temperature (bulk) ..... _____
21. Comments:

Date Approved: 3 Sep 81 Rev 15 Jul 82
PIC/CSO Initials: JHB JHB

DAILY SHUT-DOWN CHECKLIST FOR AFRRI-TRIGA REACTOR
(RSD INSTRUCTION No. 5–2)

CHECKLIST No. _____ DATE _____

OPERATORS _____ PERFORMED BY _____

TIME COMPLETED _____

I. REACTOR ROOM (RM-3161)

1. All rod drives DOWN ..... _____
2. Carriage lights OFF ..... _____
3. Temp. chart recorder ~~OFF~~ "ON" 15 Jul 82 (IN Rm 3160) JHB ..... _____
4. Door 3162 SECURED ..... _____
5. Door 3161 locked with key ..... _____

II. EQUIPMENT ROOM (RM-3152)

1. Distillation unit discharge valves CLOSED ..... _____
2. Millipore coupling OPEN ..... _____
3. Air dryer ON or OFF ..... _____
4. Doors 231, 231A, 3152 and Roof Hatch SECURED ..... _____

III. EQUIPMENT ROOM (RM-2158)

1. Primary discharge pressure (PSI) ..... _____
2. Demineralizer flow rates set to 6 gpm ..... _____
3. Visual inspection for leaks ..... _____
4. Door 2158 SECURED ..... _____

IV. PREPARATION AREA

1. ER 2 plug door CONTROL LOCKED; door CLOSED and handwheel PADLOCKED ..... _____
2. ER 2 lights ON and rheostat at 10% ..... _____
3. ER 1 plug door CONTROL LOCKED; door CLOSED and handwheel PADLOCKED ..... _____
4. ER 1 lights ON and rheostat at 10% ..... _____
5. Visual inspection of area ..... _____

V LOBBY AREA

Lobby alarm audio ON ..... _____

Enclosure 2 to RSD 5-9

VI REACTOR CONTROL ROOM (RM-3160)

1. Reactor tank lights and reactor room lights OFF ..... _____

2. Timer OFF ..... _____

3. TV monitors OFF ..... _____

4. Console LOCKED ..... _____

5. Diffuser and secondary pumps OFF ..... _____

6. Purification and primary pumps ON ..... _____

7. Radiation monitors:

MONITOR	READING (mR/hr)	HIGH-LEVEL ALARM SETTING (mR/hr)
(a) R-1	_____	20
(b) R-2	_____	N/A
(c) R-3	_____	N/A
(d) E-3	_____	N/A
(e) E-6	_____	N/A
(f) S	_____	N/A
(g) NMC	_____	20

8. COMMENT:

Date Approved: 3 Sep '81 ; 4 Jan 82

PIC/CSO Initials: JGH. JGH.

WEEKLY NUCLEAR INSTRUMENT CHECKLIST

CHECKLIST No. _____ DATE _____

PERFORMED BY _____ REVIEWED BY _____

SATISFY OPERATING CONDITIONS

I. SAFETY CHANNEL ONE

A. Raise rod ~2%, depress and release switch marked HV # 2 in left hand drawer, observe and reset scram . . _____

B. Rotate operate switch to zero, check meter for zero, reset scram . . . . . _____

C. Rotate operate switch to calibrate, check meter for 100 %, reset scram . . . . . _____

II. OPERATIONAL CHANNEL HIGH VOLTAGE

Depress and hold in switch HV # 1 in left hand drawer. Attempt to raise control rod . . . . . _____

III. SAFETY CHANNEL TWO

A. Raise rod ~2%, depress and release switch HV trip test in right hand drawer. Observe and reset scram . . . . . _____

B. Rotate operate switch to zero, check meter for zero, reset scram . . . . . _____

C. Rotate operate switch to calibrate, check meter for 100 %, reset scram . . . . . _____

IV. NV-NVT

4 Jan 82 JGH. 0.50

Set pulse timer on ~~0.100~~ sec., satisfy conditions to fire pulse. Insure all rods are down. Using the safety channel two trip test, achieve indicated percent power to check linear (blue) chart recorder as follows :

1. *In manual mode set 20% on safety channel # 2 high flux meter, switch to pulse HI read 20% on recorder. Repeat for 40 %, 60 %, 80 % and 100 %. Check scram at 110 % NV reading, reset scram* . . . . . _____

2. *Check NVT by connecting digital volt meter to board # 9 at TP3 (POS) and TP2 (GD) and obtaining reading of ~~0.200 ± .005~~ VDC in manual mode. Switch to pulse mode, insure all rods are down, fire zero power pulse. Read ~~26.6 ± 0.5~~ MW-sec on NVT meter. Reset timer to 0.500 sec and return to manual mode. Return trip test to zero* . . . . . _____

Jan 82 JGH. 1.58 ± 1 mVDC 29.5 ± .5 MW-S

V. FUEL TEMPERATURE No. 1

Rotate switch to calibrate position observe 100 %, reset scram . . . . . _____

VI. FUEL TEMPERATURE NO. 2

Rotate switch to calibrate position observe 100 % on meter, reset scram . . . . . _____

VII. WATER LEVEL INDICATOR

Raise any rod 2%.

1. *In pool, east side, depress float on water level indicator* . . . . . _____
2. *Observe scram on console, (scram indication should reset automatically).* . . . . . _____

VIII. WATER MONITOR BOX

Check conductivity at the following points .

1. *Cell Number 1 (Water Box) List resistivity in MΩ - cm* . . . . . _____
2. *Cell Number 2 (DM # 1) List resistivity in MΩ - cm* . . . . . _____
3. *Cell Number 3 (DM # 2) List resistivity in MΩ - cm* . . . . . _____

Conductivity should not be more than 2.0 μmhos/cm, i.e. resistivity should not read < 0.5 MΩ - cm

IX. RADIATION MONITOR

A. Test alarm functions for high level and failure

Monitor	*Failure Alarm Functional*	*HIGH - Level Alarm Functional*
R-1	_____	_____
R-2	_____	_____
E-3	_____	_____
E-6	_____	_____
S	_____	_____
NMC	_____	_____

B. Reset Alarms . . . . . _____