December 14, 1984

Docket No. 50-602

MEMORANDUM FOR: David B. Matthews, Acting Chief
Emergency Preparedness Branch
Division of Emergency Preparedness
Office of Inspection and Enforcement

FROM: Cecil O. Thomas, Chief
Standardization and Special
Projects Branch
Division of Licensing
Office of Nuclear Reactor Regulation

SUBJECT: TECHNICAL ASSISTANCE REQUEST - EMERGENCY PLAN FOR THE UNIVERSITY OF TEXAS

Your assistance is requested in reviewing the enclosed emergency plan for the University of Texas submitted with their application for construction permit and operating license dated November 9, 1984.

In your evaluation please specify the regulations and the criteria against which this submittal was reviewed and determined to be acceptable.

The requested completion date for this review is February 9, 1984. If you will be unable to meet this date, please notify the Project Manager, Angela Chu, at 29798 within 10 days of the date of this TAR. All time spent on this review should be charged to the Docket Number.

Original signed by
Cecil O. Thomas, Chief
Standardization and Special
Projects Branch
Division of Licensing
Office of Nuclear Reactor Regulation

Enclosure:
As stated

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

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EMERGENCY PLAN
for the
UT TRIGA MARK II
REACTOR FACILITY

Nuclear Engineering Teaching Laboratory
University of Texas at Austin
Balcones Research Center

September 1984

Emergency Plan

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Preface

Emergency Plan

UT TRIGA MARK II

This document describes the Emergency Plan applied to The University of Texas TRIGA Mark II reactor. The plan includes a classification system of anticipated emergency conditions. The purpose of this plan is to identify emergency organizations and responsibilities, establish communication and notification requirements, define accident assessment and protective actions, specify emergency facilities and equipment, and maintain emergency preparedness. The plan consists of six sections and three appendices. The appendices contain letters of agreement with other organizations, and emergency procedures that implement the plan.

Enclosed descriptions and details of the plan are based on a design proposal that is subject to modification. Significant modifications are not expected to alter substantially the intent of the plan as described. The plan will be revised, as appropriate, to include significant changes.

EMERGENCY PLAN

1.0 Introduction

A research nuclear reactor of the TRIGA type is to be operated at The University of Texas at Austin Balcones Research Center. The TRIGA reactor facility and other related equipment are a part of the Nuclear Engineering Teaching Laboratory Program. Reactor power levels of 1000 kW steady-state and 1200 MW pulsed are to be limiting operational values. The fuel is to be standard TRIGA fuel of zirconium hydride (Zr/H ratio of 1.6) with 8.5% by weight uranium of 20% enrichment. An above ground reactor shield structure and pool provide access to reactor neutrons via in pool facilities or beam tubes through the shield structure. Operation schedules are expected to vary with a normal 40 hour, single shift, work week with an estimated annual average energy production of up to 20 Megawatt days.

Other major equipment maintained by the laboratory includes an in pool cobalt-60 irradiator (designed for 8000 Curies), a subcritical assembly and reflectors with 470 grams of uranium-235, isotopic neutron sources of plutonium beryllium and californium-252, and a 14 MeV neutron producing accelerator. Additional radioactive materials and equipment typically associated with calibrations, detection and measurement of nuclear radiations for education and research applications are maintained by the laboratory.

Functions of the laboratory consist of three major activities. Education activities of the laboratory supplement the educational experience of engineers by demonstration and measurement of reactor characteristics, extend the technical experience of engineering and science students with nuclear technology applications and provide assistance to other education activities. Research activities of the laboratory support nuclear analysis methods such as neutron activation and neutron radiography as evaluation tools available to other university research programs. Service activities of the laboratory provide a source for production of radioisotopes or analytical measurements with laboratory equipment.

The reactor facility is to be a building containing other related laboratories, office and support areas, plus the specifically designed reactor bay and reactor shield structure. Location of the building is to be south of the Bureau of Economic Geology administration building on the Balcones Research Center in north Travis county. The reactor facility and research center site are bounded by Braker Lane on the north, the Missouri Pacific Railroad on

the west and Farm to Market Road 1325 on the east. Approximately seven miles toward the center of the City of Austin is The University of Texas at Austin main campus. Appendix A illustrates the location of the reactor site to the City of Austin Balcones Research Center, and Nuclear Engineering Teaching Laboratory.

1.1 Definitions

1.1.1 General Definitions

Action levels. Action levels are specific readings, or observations; radiological dose or dose rates; or specific contamination levels of airborne, waterborne, or surface-deposited radioactive materials used as thresholds for establishing emergency classes and initiating appropriate emergency measures.

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

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

Emergency planning zone. An emergency planning zone is an area for which offsite emergency planning is performed to assure that prompt and effective actions can be taken to protect the public in the event of an accident. The emergency planning zone shall be the reactor operations boundary.

Maximum permissible concentrations (MPC). Maximum permissible concentrations are allowable concentrations of radioactive effluents that may be released to the environment as specified by applicable regulations.

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

Shall, should and may. The word "shall" is used to denote a requirement; the word "should" to denote a recommendation; and the word "may" to denote permission, neither a requirement nor a recommendation.

1.1.2 Specific Definitions

Facility. The facility is the engineering building in which The University of Texas TRIGA reactor is located (the Nuclear Engineering Teaching Laboratory).

Operations boundary. The operations boundary is the area that encloses the reactor room and control room areas of the facility.

Offsite. Offsite is the geographical area beyond the research center grounds.

Onsite. Onsite is the geographical area within the research center grounds.

Research center. The research center is the Balcones Research Center operated by the University of Texas at Austin.

Research reactor. The research reactor is the TRIGA reactor operated as a utilization facility for research and development activities.

Site boundary. The site boundary is that boundary that encloses the area of the University of Texas at Austin Balcones Research Center east tract.

1.2 Emergency Classification System

Potential emergency situations are categorized in two classes. One class, non-reactor specific events, is for non-reactor specific conditions of either an individual nature or awareness of conditions that may represent an impending peril. The other class, notification of unusual events, consists of events that could lead to or create radiation hazards or radioactive releases from the reactor room. This class of accident is a category of emergency recognized by the Federal Emergency Management Administration and requires notification of licensing authorities. Credible accident conditions are not postulated to cause an emergency classification more severe than a notification of unusual events.

1.2.1 Non-reactor specific events

Non-reactor specific events are expected to be of two types, both of which rely on visual observation and subjective judgement to classify the emergency condition. Events of this class are either events that affect individual personnel or conditions that should cause an awareness of the potential for occurrence of the alternate emergency class. Classification of a non-reactor specific emergency is separate from reactor operation and does not

necessarily indicate a change in reactor status. The reactor may be shutdown to reallocate personnel or because of injury to key personnel. Advisories to university police or safety officials may be warranted and conditions may require medical services. Radiological consequences of this class should not affect areas beyond the facility or operations boundary.

1.2.2 Non-reactor specific action levels

Emergency action levels for non-reactor specific events are the following:

a. An individual inflicted with serious physical or mental injury.

b. Report of severe natural phenomenon that is affecting the areas adjacent to the reactor site, such as earthquake, flooding or tornadic winds.

c. Fire in the reactor room lasting fewer than 15 minutes or sustained fire in other parts of the building.

d. Localized radioactive spill or contamination of personnel.

1.2.3 Notification of unusual events

A combination of visual observations and recognition of specific facility parameters are applied to classify events that are likely to affect directly the safety of reactor operations. Reactor operations shall be altered to mitigate the impact of the emergency and allow the reallocation of reactor operations staff to the procedures of emergency response. Notifications to appropriate onsite and offsite emergency response organizations shall be warranted as conditions indicate. Events of this class may have a radiological impact beyond the facility or operations boundary. Radiological impact beyond the site boundary is expected to be less than the levels projected by protective action guides and emergency action levels.

1.2.4 Notification of unusual events emergency action levels

Emergency action levels for notification of unusual events are the following:

a. Severe natural events being experienced that are causing observable damage to reactor systems.

b. Sustained fire in the facility that might affect reactor safety systems or radioactive material storage areas.

c. Bomb threats or civil disturbances directed toward the reactor facility, or threats to or breaches of physical security.

d. Damage to reactor cooling system allowing leakage outside the confinement area.

e. Abnormal loss of core coolant at a rate that exceeds makeup capacity.

f. Single fuel element damage that could release radionuclides to the confinement area.

g. Multiple fuel element damage that releases significant quantities of fission products to the confinement areas.

h. Actual or projected radiological effluents at the site boundary exceeding 10 MPC for unrestricted areas averaged over 24 hours or 15 millirem whole body dose accumulated in 24 hours.

i. Measured dose rates, at or near the operations boundary, of 20 millirem per hour from an unknown source.

j. Measured particulate activities, within the operation boundary, of 10 MPC from a fixed filter air sample.

2.0 Organization, Responsibilities and Communication

The emergency organization for The University of Texas TRIGA reactor facility consists of three functional groups. A block diagram of the organization is presented in Figure 2.0. One group is the reactor facility personnel, including staff, faculty and researchers. Responsibilities of facility personnel are to maintain emergency awareness, classify emergency conditions, initiate emergency responses, manage response actions and provide for recovery operations. A second group of personnel from other university departments supplement the laboratory facility emergency response organization. Responsibilities of some university support groups include security services for area control and supplemental communications, and safety services for consultation and supplemental equipment. The third group of emergency response personnel comprise all non-university organizations.

Responsibilities of these groups are to provide specialty functions such as medical services, fire control, or additional law enforcement activities. Letters of agreement with the major response groups are contained in Appendix B. The recovery organization will consist of reactor facility personnel and other university personnel such as safety office personnel as required. Communications within the reactor facility are possible on a verbal basis because of the limited facility size. Both intercom and telephone line communications between the reactor room, control room, and adjacent laboratory facilities will normally be available. Communications with other personnel of the research center site depend on a University maintained telephone system as does communication with personnel or the University main campus. A messenger may

also provide communication within the research center site. Offsite organizations shall be notified by telephone, with radio communications possible via University safety or security personnel.

Reports to regulatory agencies shall be provided by telephone or mail according to regulatory reporting requirements and the severity of the emergency. The Reactor Supervisor or his designated alternate is responsible for notifying regulatory agencies.

Information officially available to the public will be provided through the University News and Information Service (NIS). The Emergency Director or his designated representative of the laboratory management will inform the University (NIS) of data for news release.

2.1 Facility Personnel

2.1.1 Emergency Director

The Reactor Supervisor will be the Emergency Director. The emergency director shall be responsible for assuring the facility is placed in a safe shutdown condition, terminating or minimizing the release of radioactive materials, protecting facility personnel and visitors, and assessing the onsite and offsite health and radiological conditions of an emergency event. In the event that the Reactor Supervisor is not available the Senior Reactor Operator on duty will be the Emergency Director. Should none of the above personnel be able to respond to an emergency a licensed reactor operator may assume the role of emergency director and immediately request assistance from the University Radiation Safety Office. When senior personnel arrive at the scene an exchange of emergency director responsibilities shall occur only after personal communication and briefing of the emergency status.

The Reactor Supervisor, in addition to having the responsibility of Emergency Director, shall be responsible for maintaining emergency preparedness by training personnel, reviewing the emergency plan's function, establishing procedures for recovery operations after an emergency, and providing notifications to appropriate regulatory agencies.

Prior to termination of an emergency, the emergency director shall conclude that there exists no forseeable subsequent events that could cause damage to the reactor or render its operation unsafe. The Emergency Director shall verify that areas open to personnel or the general public meet regulatory requirements. The Emergency Director shall also confirm that areas restricted to entry or controlled access areas are appropriately posted. Precautions for

reentry and authorization to reenter the reactor room after an evacuation shall also be the responsibility of the emergency director.

Authorization for radiation exposure to personnel involved in an emergency response function that are in excess of normal occupational doses shall be the responsibility of the Emergency Director with the concurrence of the Radiation Safety Officer.

2.1.2 Reactor Operator

The Reactor Operator is the current person responsible for the controls of reactor operation. This person may not be available under certain situations where the reactor is already secured, or he may be the same person as the designated Emergency Director when a senior operator is assuming control of reactor operation. The Reactor Operator is responsible for safe shutdown and securing of the reactor in emergency situations. He shall observe the status of emergency action levels and take immediate action in case of possible reactor damage or an uncontrolled radioactive release.

2.1.3 Other Facility Personnel

Faculty, staff, and researchers with routine access to the reactor facility shall be instructed in basic radiation safety and emergency procedures. Facility personnel may be assigned responsibilities during the course of an emergency event that are commensurate with that individual's training or experience. All activities of facility personnel shall be under the direction of the Emergency Director or a Senior Reactor Operator.

2.2 University Personnel

2.2.1 University Safety Office

Personnel in the University Safety Office provide several services to campus facilities through the actions of a Safety Manager, Fire Marshall, Radiation Safety Officer, and technicians. The responsibility of these personnel in an emergency are to provide consultation to reactor facility staff and assist during emergencies that threaten areas outside the reactor operations boundary.

2.2.2 University Police Department

Personnel associated with the University Police Department are to provide security assistance, escort for emergency vehicles, emergency communications, traffic control and crowd control outside areas of the operations boundary.

2.2.3 University News and Information Service

The University News and Information Service will handle all official information releases concerning emergency situations at The University of Texas TRIGA reactor facility.

2.2.4 University Health Center

The University Health Center maintains an area designated to handle individuals that may be contaminated with radioactivity but does not maintain the capability to treat major trauma. Services of the health center will thus be available as an alternate or temporary area to control radioactive contamination of individuals as warranted by circumstances of injury or availability of primary medical facilities.

2.3 Offsite Response Group

2.3.1 Austin Fire Department

The City of Austin Fire Department provides fire fighter services and several other emergency response functions. Fire department personnel will provide the functions of first response, extraction and rescue, as well as the capabilities of fire control and handling of hazardous materials.

2.3.2 Emergency Medical Services

Medical transport and emergency medical assistance are provided by a service operated by the City of Austin. The ambulance personnel, emergency medical technicians and emergency service supervisors will furnish emergency aide and transport to local medical facilities for laboratory personnel requiring medical attention. Treatment and transport of contaminated victims will be assisted by emergency medical supervisors and laboratory staff.

2.3.3 Brackenridge Hospital

The City of Austin maintains Brackenridge Hospital, a public facility, with extensive services for treatment of emergency and other medical conditions. Care of individuals suffering from acute radiation exposure, injuries with radioactive contamination, and other medical injury trauma will be treated by the hospital and its staff.

2.3.4 Non-university Law Enforcement Agencies

The City of Austin Police Department, Travis County Sheriff's Office and Texas Department of Public Safety will provide, if necessary, traffic and crowd control within

their jurisdiction at and beyond the research center boundaries. Requests for assistance and coordination with these agencies will be through The University of Texas Police Department.

2.4 Coordination and Notification of Government Agencies

The postulated credible accidents associated with operation of The Univesity of Texas TRIGA reactor facility are not projected to result in a radiological hazard affecting the public health and safety. These emergency events should not require the direct involvement of local, state or federal agencies.

2.4.1 United States Nuclear Regulatory Commission

Notification of an incident to the U.S. Nuclear Regulatory Commission will be in accordance with the requirements of 10CFR20. Additional information will also be transmitted as required by Technical Specifications or license conditions of 10CFR50.

2.4.2 Texas Department of Health Division of Occupational Health and Radiation Control

Notification of an incident to the Texas Department of Health, Austin, Texas will be in accordance with the regulations specified for state radioactive material license TDH 6-485.

2.4.3 Local Government Agencies

The City of Austin and Travis County may be notified of an incident which may have caused or threatens to cause an uncontrolled release of radioactive materials that result in substantial projected offsite doses. Projected offsite doses are not expected to represent levels significant enough to require notification.

3.0 Emergency Response

An emergency response is initiated by reactor operations staff when conditions specified by the emergency action levels are existing. The emergency shall be classified and the emergency director identified. Immediate notification of facility personnel will occur by oral communication or intercom network. As required by emergency conditions, other onsite organizations will be notified by telephone or messenger. Requests for offsite response support will be by telephone or radio as conditions allow. Emergency call lists with personnel titles, locations and telephone numbers

shall be maintained by the Reactor Supervisor, and shall be available at the facility entrance and at the reactor control console. Checks of the list shall be made annually by the Reactor Supervisor to assure appropriate changes are periodically incorporated.

Detection of an emergency by onsite personnel during periods when the reactor facility is unattended or when a person designated to act as an Emergency Director is not present shall require immediate notification of reactor facility and safety office personnel. Emergency call lists that include persons to be designated as an Emergency Director will be provided to the University Police Department. A brief list is posted at the facility and operations boundary. The University Police provide 24 hour campus surveillance. Reactor facility personnel and safety office personnel are on call on a 24 hour basis. Lists are checked annually to update appropriate changes.

Reporting of an emergency to onsite, offsite or regulatory agencies shall be a message containing the following information:

a. Name, title and telephone number of reporting person,
b. Location, classification and description of event,
c. Date and time event commenced,
d. Types of radioactive release expected and and duration time expected (for example: airborne, waterborne, surface contamination or no release; instantaneous, continual or limited release),
e. The quantity and identity of radionuclides expected to be released, and
f. Projected or measured doses outside the operations boundary.

The agency notified shall be asked to acknowledge receipt of the initial message and that it is authentic.

3.1 Emergency Response for Non-Reactor Specific Events

Activation of the complete emergency organization is not anticipated for this emergency class. The Emergency Director will activate those portions of the onsite and offsite emergency organizations necessary to respond to the specific emergency event. The facility management will be notified.

3.1.1 Assessment Actions for Non-Reactor Specific Events

For personal injury, the Emergency Director will assess, by observing and consulting the victim, the extent of the injury. A determination of the possibility or extent of radioactive contamination associated with the victim

shall consider knowledge of the victim's activities and/or monitoring with portable radiation survey equipment. The assessment shall determine the nature of the injury, whether contamination is possible, the type of first aid required, and the need for emergency medical service.

Fires, or other chemical related events (such as explosions, toxic agents or caustic agents) shall be assessed by visual observation of the magnitude of the event and the potential for certain escalation versus prompt control of the event. Portable radiation survey equipment or fixed area radiation monitors combined with knowledge of radioactive material storage areas and current laboratory activities will allow assessment of the involvement of radioactive materials.

Reports of severe natural phenomenon rely on personal observation and reports broadcast by news service or provided by other organizations that monitor these conditions. Assessment of the state of natural phenomena shall consider any source of information judged to be reliable.

3.1.2 Corrective Actions for Non-Reactor Specific Events

In the case of personal injury, the Emergency Director will ascertain that medical assistance is provided in the form of first aid and/or a request for emergency medical support. If the injury involves radioactive contamination, decontamination will be attempted only if the procedure will not aggravate the injury. The contaminated individual will be transported using contamination control and isolation methods. Facility management will be notified.

For fires or related hazardous chemical events that do not affect the reactor or its control systems, control measures shall be taken immediately, non-essential persons removed from the vicinity, and a request for assistance formulated. Fire extinguishers or other devices that control the event will be applied to alleviate the emergency conditions. Other actions such as relocation or removal of hazardous materials will be attempted if the action does not involve substantial risk to personnel and does mitigate the conditions of the emergency. A request for assistance will be made as soon as the safety or condition of each person in the facility has been determined and the scope of the emergency is identified. Actions will be taken to confine radioactive releases to areas within the facility or operations boundary. The facility management will be notified.

After a report of the threat of natural phenomena to the reactor facility corrective actions shall be taken to lessen the potential consequences of the impending emergency. Primarily these actions include securing experiments or radioactive materials, identifying facility structures that are at risk, and shutting down the reactor as soon as is necessary to take actions required to minimize hazardous conditions that may occur during the projected emergency.

3.1.3 Protective Action for Non-Reactor Specific Events

Protective actions for personal injury consist of removing the conditions that caused the injury or controlling access to the area to prevent additional injury. For the case of radioactive contamination, the contaminated area will be identified and marked by ropes and signs.

Protective actions for fire and other hazardous events of a chemical nature will require removal of all non-essential personnel from the immediate area. In the case that radioactive materials are involved, a survey by portable monitors will be used to ascertain that persons leaving the facility are not contaminated.

Protective actions for events caused by natural phenomena are indistinguishable from corrective actions. These actions may include evacuation of visitors, experimenters, and staff in accordance with the anticipated impact of the emergency.

In each case, the Emergency Director or his designated alternate shall assure that all personnel requested to leave the area have in fact left and that each of the remaining individuals is accounted for and aware of the current emergency situation.

3.2 Emergency Response for Notification of Unusual Events

The Emergency Director will activate the emergency response and delegate duties to affect evacuation when needed, control access and summon emergency support. Procedures shall identify evacuation radiation levels, routes and assembly areas. It is anticipated that several groups of the onsite and offsite organization may be requested to respond to this class emergency. The facility management and regulatory agencies will be notified.

3.2.1 Assessment Actions for Notification of Unusual Events

Indication of fuel damage, experiment failure or any event manifested by unusual radiation or radioactivity levels within the reactor area or at the operations boundary shall be assessed immediately by the Emergency Director. The assessment of radiological conditions will depend on measurements by fixed area gamma monitors, an air particulate monitor, portable survey equipment, pocket dosimeter or thermoluminescent detectors, and swipe samples. Observation will determine the extent of facility damage, damage to reactor core, control or cooling systems, shield, and breaches of physical security. Threats to physical security will be assessed by the Emergency Director according to information from the threat source. Assessment of situations that cause the evacuation of the reactor room will be supplemented by radiation and contamination measurements performed by the Radiation Safety Officer.

Assessment to evacuate the facility will depend on the combination of observed radiation levels, observations of physical damage, and knowledge of projected conditions.

3.2.2 Corrective Actions for Notification of Unusual Events

Non-essential personnel shall be removed from the reactor room. Remaining facility personnel shall be informed of conditions and take immediate corrective actions. Normal reactor operations will be discontinued. The emergency director shall account for all personnel.

In the event that radiological measurements are the cause of the evacuation, personnel will assemble at the prescribed emergency assembly area. If possible, portable survey monitors will be removed from the reactor room to the emergency assembly area. Measurements of the radiation dose rates at the operation boundary shall be made with portable equipment. The integrity of the operation boundary to prevent radioactive releases will be examined visually, and ventilation equipment in the reactor room will be shutdown. The extent of personnel contamination will be determined by portable survey monitors.

Corrective actions for threats against reactor room physical security will depend on the nature of the threat. Personnel shall be removed from the reactor room and a rapid visual inspection shall be performed. A material inventory may be necessary as conditions warrant.

3.2.3 Protective Actions for Notification of Unusual Events

The Emergency Director shall establish control of access areas to the reactor room by facility personnel or other onsite personnel. Removal of personnel to an

alternate assembly area and evacuation of other adjacent areas onsite will proceed according to the assessment of radiological measurements. Contaminated individuals will be segregated at the emergency assembly area for decontamination. The Radiation Safety Officer will be notified and consulted regarding subsequent radiological measurements and actions of emergency personnel. Portable thin window geiger detectors will provide data on personnel contamination. Swipes will be used to measure the extent of surface contamination. Personnel dosimetry for persons entering radiation areas will be performed with pocket ionization type dosimeters or thermoluminescent detectors. Film badges may be used for additional data for later analysis. Radiological data will be recorded by an individual assigned the task by the Emergency Director. Supplemental data to be analyzed by the safety office personnel will be provided by messenger and results reported to the Radiation Safety Officer.

Since almost all events of this emergency class are considered capable of leading to a radiological release, the extent of protective actions beyond evacuation and access control at the operation boundary shall depend on the results of radiological data or projected emergency conditions.

3.3 Protective Action Values

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

Levels of removable beta-gamma contamination outside the operations boundary applied to assessment, corrective and protective actions shall be 2000 dpm/100 cm2. Immediate actions to isolate the area or decontaminate personnel shall be applied. Remedial action for levels between 200-2000 dpm/100 cm2 shall be applied to control contamination. No action will be necessary for levels below 200 dpm/100 cm2.

4.0 Equipment and Facilities

4.1 Emergency Support Center

An emergency support center will be designated as the office area occupied by the facility receptionist, reactor supervisor and program director. These office areas adjacent to the facility entrance are easily accessible. The purpose of the support center will be to coordinate and direct emergency activities in the reactor room and in the emergency assembly area. Additional portable radiation survey instruments and emergency supplies will be obtained by the support center. The emergency assembly area shall be the Health Physics Laboratory on the entrance level of the facility. In the event that a toxic environment, physical damage, or radiation levels render the emergency assembly area hazardous, then the emergency support center shall serve as an alternate assembly area. The support center will maintain communication by telephone or radio with other emergency support organizations. Since emergency conditions may also exist in the area of the designated support center, an alternate area shall be set up temporarily in the exterior area to the southwest of the facility. The temporary center will consist of supervisory personnel and the university emergency response personnel. The University Safety Office shall function as part of the alternate emergency support center to provide supplies and communications. The University Safety Office is equipped for response to fire, chemical and radiation emergencies.

4.2 Assessment Facilities

The TRIGA reactor instrumentation allows rapid assessment of reactor parameters such as power, temperature, and coolant system conditions. Alarms monitor the status of pool water level, purification water conditions, heat exchanger differential pressure and bulk coolant temperature. Area radiological conditions are monitored by multiple fixed GM monitors (0.01-100 mRem/hr), a continuous air monitor (50-50,000 cpm) and portable survey equipment. Portable survey instruments are routinely located near the reactor room entrance. Two of the portable survey instruments are GM type devices for beta-gamma measurements (0-100 mR/hr). Portable air ionization chambers (0-300 mR/hr and 0-5 R/hr) are also available for detection and assessment of radiation doses. Special scintillation probes are available for alpha particle and neutron detection (0-400K cpm).

Additional laboratory equipment aids the assessment of personnel dosimetry and radionuclide identification. The normal film badge dosimeter is supplemented by ionization chamber pocket dosimeters or thermoluminescent detectors. Thermoluminescent detectors are sensitive to doses from 1mR to 100 R, while pocket dosimeters range from 0-200 mR and 0-600R. Several types of

radiation counting systems are generally available in adjacent laboratory areas to assess radionuclide samples. A gamma ray spectroscopy system, and an alpha-beta proportional counter provide radionuclide identification and analysis of contamination swipes. Other radiation counting systems may be assembled for particular conditions from standard nuclear electronic components. Most laboratory radiation counting equipment is located near or adjacent to the emergency assembly area.

Equipment such as emergency lighting, fire extinguishers (both dry chemical and carbon dioxide), and a first aid kit are located within the operations boundary and are provided for initial emergency response. Other emergency equipment stored in the emergency assembly area includes protective clothing, respiratory filters, radiation contamination control items and a radiation monitor.

Supplemental equipment and supplies are provided by the University Safety Office. The available equipment includes portable survey instruments, gas flow proportional counters, a multisample liquid scintillation counter and supplies to respond to fire, chemical, radiation and personal injury emergencies.

4.3 First Aid and Medical Facilities

A First Aid Kit is located within the operations boundary for initial treatment of major or minor injuries. Persons with major injuries with or without radioactive contamination will be transported to Brackenridge Hospital by the City of Austin emergency medical services. Fire Department personnel will assist victims if the conditions require extrication. Persons that are injured and contaminated shall be accompanied by a staff member of the facility or the safety office trained to use radioactive materials.

Decontamination of injured personnel shall take precedence only after life threatening conditions are controlled. Removal and control of contamination will depend on a judgement related to the victim's injuries. A localized area for contamination control shall be created as necessary to provide for contamination removal by rinse, wipe, wash and/or clothing replacement.

4.4 Communications

Routine communications within the laboratory facility utilize both intercom and telephone lines. Outside the facility area numerous university telephone lines are maintained in adjacent building areas because of the proximity of other university activities. Upon notification of campus security services or safety office, radio and

amplified communications are also available to supplement emergency response communications.

A safety shower will be maintained to aide in the decontamination of personnel. Other supplies that help in the control of contamination will also be available such as absorbant paper, plastic bags, tape, coveralls, shoe covers, gloves and quarter mask respirators.

5.0 Recovery

The Emergency Director shall terminate an emergency and initiate recovery actions when he has determined that conditions that caused the designation of an emergency class no longer exist or have stabilized such that recovery operations may be initiated safely. The Radiation Safety Officer or his designated alternate will be consulted regarding personnel dosimetry and decontamination procedures. If fire was involved, the University Fire Marshall will be consulted concerning recovery procedures. Other procedures required for hazardous conditions will be discussed with appropriate safety personnel. The individuals assessing recovery requirements shall consider the severity of the incident and review which reactor safety systems or health physics systems may have been affected adversel .

Procedures shall be written for recovery operations if the operations require significant facility repairs or the actions of more than one person. The Emergency Director will determine the need for written procedures and approval of such procedures. The Reactor Supervisor shall assure compliance with 10CFR20, 10CFR50, license Technical Specifications and the required reports.

6.0 Emergency Preparedness

6.1 Training

Persons authorized to operate the TRIGA reactor are instructed in emergency procedures. Other personnel authorized access to the laboratory are instructed in the location and application of radiation survey equipment, location of the emergency assembly area, and general conditions for facility evacuation. Instruction on emergency procedures will be incorporated into the licensed operator requalification program.

Onsite personnel expected to respond to emergency conditions that extend beyond the reactor operations boundary are provided an annual orientation to the facility. Discussions are made of potential hazards, emergency procedures and response requirements. An onsite drill shall be conducted each year with response of facility personnel to exercise knowledge of emergency action levels, evacuation requirements, location and function of emergency equipment. Both the Reactor Supervisor and the Radiation Safety Officer shall be included in the drill as a participant, advisor and observer. Every two years the drill shall include a simulated call to one offsite organization to test communication procedures. City emergency services are all available through a single telephone number or separate telephone numbers.

Observations of the Reactor Supervisor and Radiation Safety Officer will be incorporated into discussions with personnel to improve future drills. Fundamental problems should be identified and provisions made to alter the plan or procedures.

6.2 Plan Review and Update

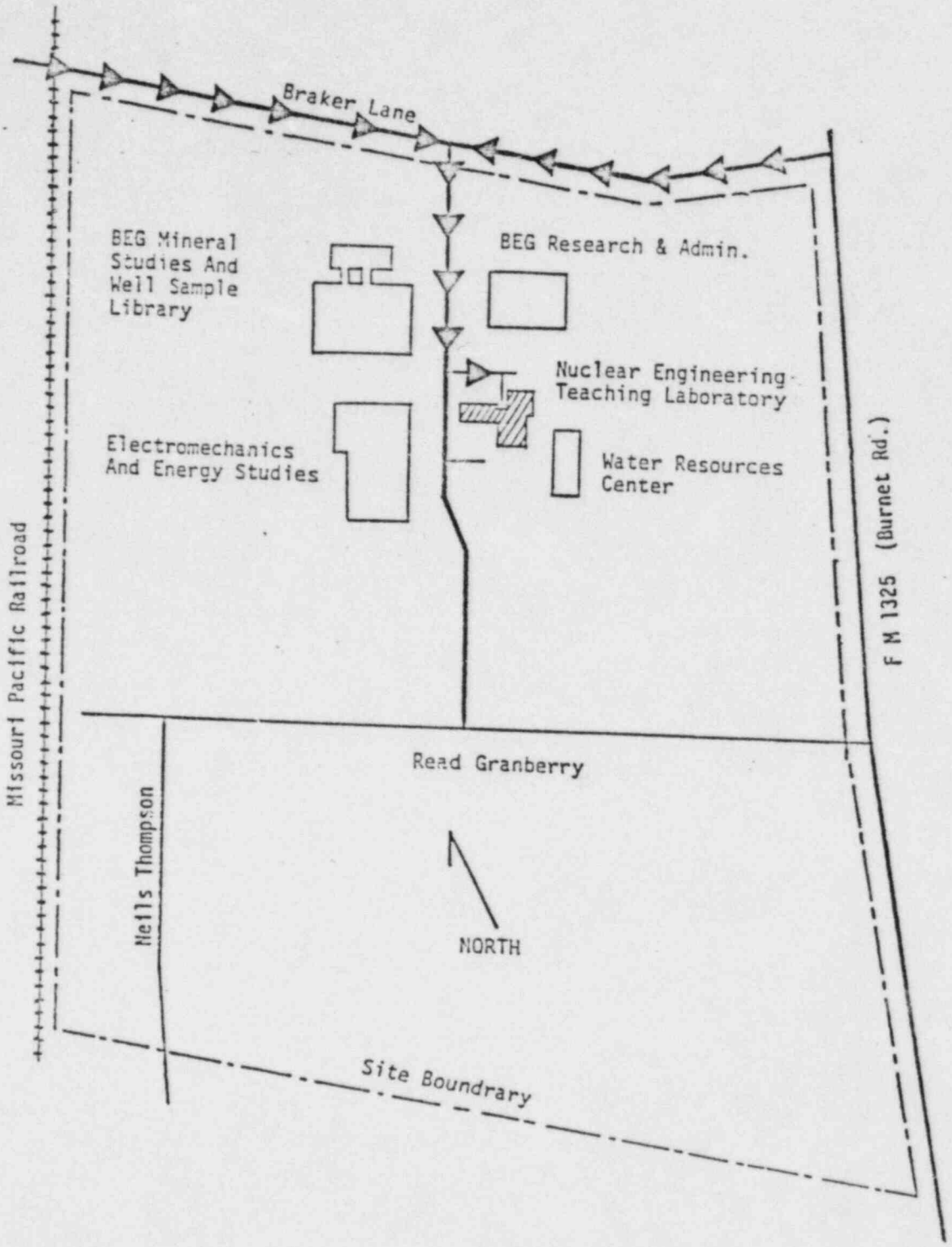
Each two years the plan shall be reviewed in conjunction with the observations of past drill results and other facility changes. Changes to the plan and updates will be provided to the Reactor Committee and Radiation Safety Committee for discussion along with critiques of emergency drills. Procedures will be updated as needed and noted by the Reactor Committee.

Letters of agreement with respect to arrangements with non-university emergency services by trained response groups shall be revised and reissued every other year.

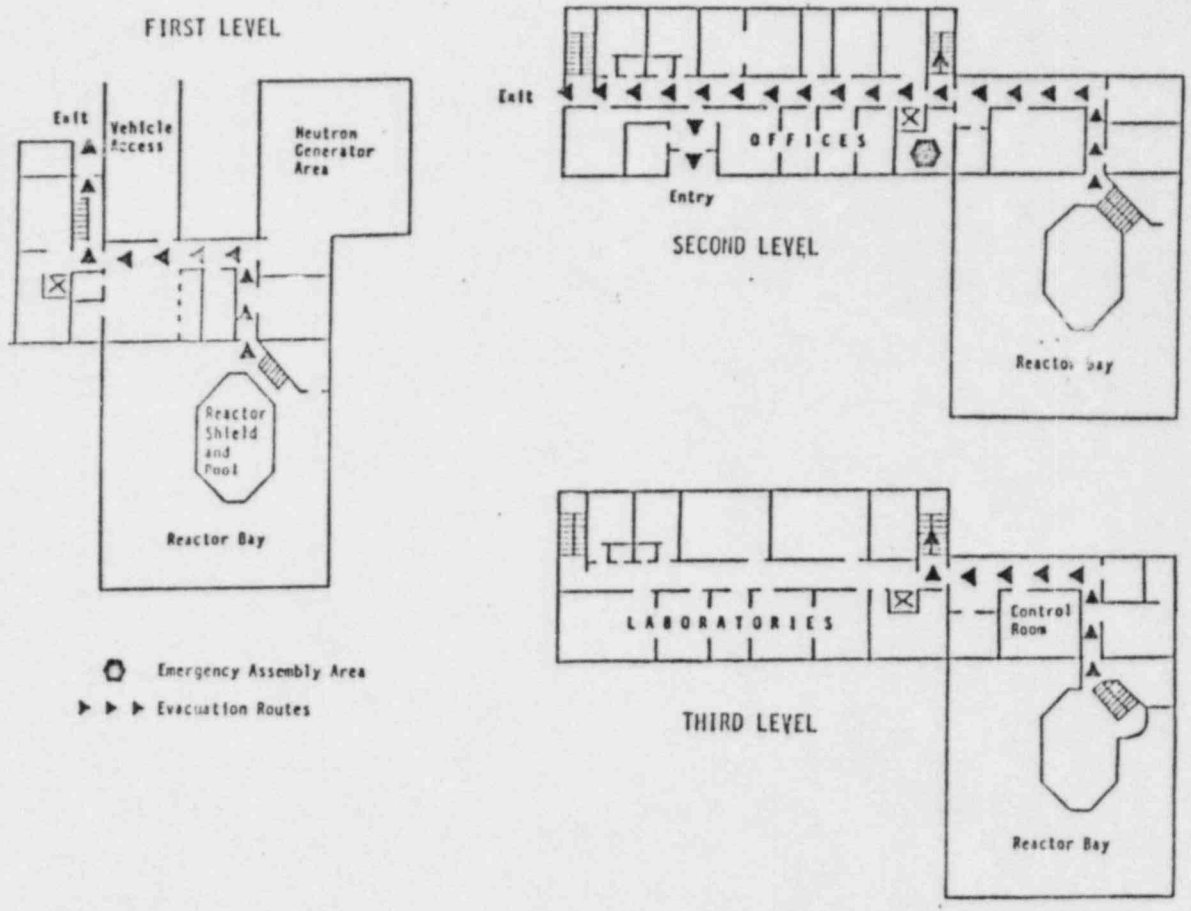
6.3 Emergency Equipment Maintenance

Emergency lighting and fire extinguishers are maintained on a periodic basis by university personnel. Reactor instrumentation coolant system alarms, area radiation monitors and portable survey instruments are maintained by calibration and functional check at semiannual intervals. Inventory of emergency supplies and first aid kit shall occur at least once each two years. Emergency call lists shall be checked annually for accuracy of information.

LOCATION OF THE UNIVERSITY OF TEXAS BALCONES
RESEARCH CENTER, AUSTIN TEXAS
Figure 1.



ACCESS ROUTES TO THE NUCLEAR ENGINEERING TEACHING LABORATORY, BALCONES RESEARCH CENTER
Figure 2.



FACILITY LAYOUT
Figure 3.