

# CHAPTER 1

## RADIATION PROTECTION PROGRAM

### I. INTRODUCTION

In view of increased utilization of ionizing and nonionizing radiation at the University of Florida, a university-wide radiation control program was established in September, 1960. The primary responsibilities of the radiation control program are to assure radiological safety of all University personnel and the public, to guarantee that ionizing and nonionizing radiation sources are procured and used in accordance with Federal and State regulations, and to assure that radiation exposures are as low as reasonably achievable.

This Guide sets forth policies, regulations, and procedures approved by the University's Radiation Control Committee. The regulations and procedures outlined in this Guide are intended to protect all individuals with a minimum of interference in their activities and are consistent with regulations of the U.S. Nuclear Regulatory Commission (NRC) and the Florida Department of Health (DOH). The regulations set forth are applicable to all facilities utilizing radioactive materials or radiation producing devices under the administration of the University of Florida. Several areas and uses, such as the training reactor, human use, nuclear gauge, and irradiators, require more specific regulations. Business Affairs Memorandum No. 22 of May 24, 1974, structures a Radiation Control and Radiological Services (RC&RS) Department, headed by the Radiation Control Officer, under the Environmental Health and Safety Division.

The following specific responsibilities of the Radiation Control Committee and the Radiation Control Officer were set forth in a memorandum from the Office of the President on September 23, 1960 and have been revised as the Radiation Control Program has evolved.

- A. Radiation Control Committee
  - 1. Review and grant permission for, or disapprove, the use of radioactive material or radiation producing devices within the institution from the standpoint of radiation safety.
  - 2. Prescribe special conditions and requirements which may be necessary to ensure radiation safety (e.g., physical examinations, additional training, designation of limited areas or locations of use, disposal methods, etc.).
  - 3. Prepare and disseminate information on radiological safety (including University, State and Federal regulations governing ionizing radiation), for use and guidance of students and staff.
  - 4. Pass judgment on the adequacy of safety measures for safeguarding University research workers. Committee approval of health and safety measures must be obtained before initial use of radioactive materials or other sources of ionizing radiation is undertaken or before substantially different uses from those originally approved by the Committee are undertaken.

5. Keep records of the actions taken in approving the use of radioactive materials and other sources of ionizing radiation and other transactions, communications and reports involved in the work of the Committee.
6. Delegate to the Radiation Control Officer the authority to act for the Committee between meetings. His actions will be reported to the Committee for review at appropriate intervals.
7. Review plans for all new buildings and modifications of existing structures where radioactive material or radiation producing devices are to be used.
8. Recommend and implement procedures for radioactive waste disposal.
9. Periodically review actions of the Reactor Safety Review Subcommittee.
10. Review at least annually from a radiation safety standpoint, the activities of the Committee on Human Use of Radioisotopes and Radiation.
11. Review all ongoing projects at timely intervals.
12. Provide advice to research groups, departments and investigators.

B. Radiation Control Officer (RCO)

1. Administer the overall day-to-day programs of the University's Radiation Control Office.
2. Approve all University procedures which might conceivably involve radiation exposure and all changes in such procedures. By agreement, the University maintains exclusive control over, and responsibility for, the use of radioactive materials and radiation producing devices at all Shands facilities. Approval by the RCO of the policies and procedures at these facilities, from the radiation safety standpoint, is performed at the respective department level.
3. Act in a supervisory capacity in all aspects of radiation measurement and protection activities, such as personnel monitoring, maintenance of exposure records, survey methods, waste disposal and radiation safety practices.
4. Consult with potential radioactive material users and advise on radiation safety practices.
5. Suspend any operation causing excessive radiation hazards as rapidly and safely as possible. In carrying out this duty the Radiation Control Officer will report directly to the Director, EH&S, and inform the Chairman, RCC.

6. Maintain a list of employees who work with radioactive materials and radiation producing devices.
7. Prescribe routine radiation surveying and personnel monitoring.
8. Establish standardized procedures for the procurement of radioactive material, receiving and opening packages of radioactive material, storing radioactive material, inventory record of radioactive material, use radioactive materials safely, take emergency action if control of radioactive material is lost, perform periodic radiation surveys, perform checks of survey instruments and other safety equipment, dispose of radioactive materials, train personnel who work in or frequent areas where radioactive material is used or stored , maintain a copy of all records and reports required
9. Serve as ex-officio member of all radiation safety committees constituted at the departmental, college, experiment station, clinic or university levels.
10. Additional duties and responsibilities for the Radiation Control Officer are specified in 64E-5.605, F.A.C., and 64E-5.1305, F.A.C.

C. Responsibilities of Principal Investigator

The Principal Investigator also shares the responsibility for the safe use of radioactive materials and radiation producing devices, specifically:

1. Administer and enforce safety rules and regulations as stated in the Radiation Control Guide which are necessary to the radiation control program in all areas within the scope of their authority.
2. Inform all employees of potential health hazards and the necessary safeguards which are established to guard against them.
3. Ensure that all employees working with, or in the vicinity of, radioactive materials or radiation producing devices are properly trained and monitored.
4. Inform the Radiation Control Office of all changes in personnel working with radioactive materials or radiation producing devices and changes in facilities or use locations.
5. Maintain control over radioactive material and maintain adequate inventory and utilization records. Perform weekly contamination surveys when radionuclides are in use.
6. Ensure that all radioactive waste is received by the Division of Environmental Health and Safety for ultimate disposal.
7. Ensure safe and secure storage of all radioactive material.

- D. The Radiation Control Officer and/or Radiation Control Committee may disapprove or terminate any project involving serious or continued violation of the standards set forth in this Radiation Control Guide.

## II. ALARA POLICY

A primary goal of the radiation protection program is to reduce radiation doses wherever and whenever reasonably achievable, thereby reducing the health risk that is assumed to be proportional to the radiation dose. The As Low As Reasonably Achievable Policy ([ALARA Policy, Appendix I](#)) adopted by the University describes the commitment to keep radiation doses ALARA, the actions to be taken and radiation dose guidelines. The ALARA Policy for the JHMHC, and Shands Health Care Facilities is available from the Radiation Control Office.

## III. OCCUPATIONAL DOSE LIMITS

### A. Occupational Dose Limits for Adults

Occupational dose limits for adults are specified by Federal regulations as set forth in the Code of Federal Regulations, Title X, Part 20, "Standards for Protection Against Ionizing Radiation," and by the Florida Department of Health, "Control of Radiation Hazard Regulations", Chapter 10D-91 (as amended July 1997). These limits are listed in [Appendix D](#).

Since any radiation exposure is undesirable, it is important that all exposures be kept as low as reasonably achievable. The permissible ALARA radiation dose levels used at the University of Florida are more conservative than the State or Federal Regulations and are listed below.

Investigation Levels for Radiation Exposure (per calendar quarter) <sup>1</sup>			
	Level I	Level II	Level III
Total Effective Dose Equivalent (whole body); or	125 mrem (1.25 mSv)	375 mrem (3.75 mSv)	1250 mrem (.0125 Sv)
Sum of the deep-dose equivalent and the committed dose equivalent to any organ of tissue other than the lens of the eye	1250 mrem (0.0125 Sv)	3750 mrem (0.0375 Sv)	12500 mrem (0.125 Sv)
Lens of the eye (eye dose equivalent)	375 mrem (3.75 mSv)	1125 mrem (0.01125 Sv)	3750 mrem (0.0375 Sv)
Skin (shallow dose equivalent or to any extremity)	1250 mrem (0.0125 Sv)	3750 mrem (0.0375 Sv)	12500 mrem (0.125 Sv)

<sup>1</sup> Bi-monthly Investigation levels are 2/3 of the quarterly levels

Specific approval to operate under the more liberal State or Federal regulations must be obtained for any such occasion from the Radiation Control Committee and/or Human Use of Radioisotopes and Radiation Committee by submitting a written proposal through the Radiation Control Officer.

B. Occupational Dose Limits to Minors

Occupational exposure to any individual who is under the age of 18 is permitted only if their exposure is limited to ten percent or less of the limits specified above for adult workers. For this reason, it is recommended that minors not be employed as full-time occupationally exposed workers.

C. Dose to an Embryo or Fetus for Women Who Have Declared Pregnancy

The dose to an embryo or fetus during the entire pregnancy from occupational exposure of a declared pregnant woman shall not exceed 0.5 rem (5 mSv). It is recommended that not more than 0.05 rem (0.5 mSv) be received by the embryo or fetus in any one month.

Approved users at the University of Florida should be aware of the fact that the Nuclear Regulatory Commission (NRC) and the State of Florida require instruction of occupational workers in the hazards associated with radioactive material and radiation, and in the precautions and safety measures to be followed to minimize radiation exposure. These basic requirements are contained in 10 CFR 19.12., and 64E-5.902.

The NRC and State has advised its licensees that such instruction must include special instructions to females of childbearing potential, regarding the risks to the unborn fetus associated with prenatal radiation exposure. In addition to the instruction requirement, the NRC and State require that special efforts be made to limit any exposure to the developing fetus.

The NRC has issued a regulatory guide to assist licensees in achieving compliance with this requirement. The regulatory guide requires that:

1. Women in jobs involving radiation exposure must be explicitly advised of the risk associated with prenatal exposure.
2. Particular efforts must be made to keep the radiation exposure of the embryo or fetus to the very lowest practical level during the entire gestation period in accordance with the National Council on Radiation Protection (NCRP), a recommendation adopted by the NRC and State.
3. Female employees must be advised that the NRC and State have regulations to ensure that the dose to an embryo or fetus during the entire pregnancy from occupational exposure of a declared pregnant woman does not exceed 0.5 rem (5 mSv).

The requirements of 10 CFR 19, 64E-5 and the Regulatory Guide have been reviewed by the Radiation Control Committee and the following policies have been established:

1. An employee information packet (see [Appendix E](#)) has been prepared by the Radiation Control Office and distributed via the Principal Investigator, to all women who work with radioactive material and/or radiation producing devices or who have access to such areas.
2. Each woman receiving the information packet should be given the opportunity to ask questions regarding the regulations.

3. An attempt to selectively apply this requirement to certain women would necessitate soliciting personal information regarding fertility, intentions with respect to pregnancy, etc. Such questions are and would most certainly be so regarded as an invasion of privacy. Consequently, at the University of Florida, the information about risks of prenatal radiation exposure will be made available to all female employees and students.
4. As an approved user and supervisor, the Principal Investigator is responsible to ascertain that all female occupational workers are apprised of the risks of prenatal radiation exposure. He/She must also take steps to minimize exposure to female employees who are or who may be pregnant; make the information packet available to all women who work with radioactive material and/or radiation producing devices or who have access to such areas under his/her supervision, and provide all current and new women employees with an opportunity to ask questions concerning the regulations, the information packet and the levels of radiation exposure likely to be received as a result of current or future job assignments he/she have made or may wish to make.

While the information packet may appear to be directed only to "employees", it must be noted that female undergraduate and graduate students, as well as faculty members and research assistants, must receive these instructions. It should be understood that this instruction packet is intended to apply equally to all occupational workers including users of x-ray diffraction units and x-ray machines, as well as radionuclide users.

In order to assist you, the following steps have been taken:

1. Arrangements have been made with the appropriate University offices in order to insure that applicants are advised that the positions in which they are interested involve work with radioactive materials and/or radiation producing devices or access to such areas prior to the supervisory interview. Thus, it is important that you inform appropriate offices on all future personnel requisitions initiated to fill positions for occupational workers and for others whose duties require frequent access to such areas. Correspondence for new staff and the requisitions for employees filed with the Division of Human Resources, Student Employment Office, or the Dean of the Graduate School, should contain an explicit and clear comment, i.e., "This position requires work with radioactive materials and/or radiation producing devices or access to such areas". In order to insure that prospective occupational workers are fully informed prior to acceptance of your position, the employee or the student orientation obviously must include a discussion of the possible fetal radiation exposure risk involved and the duties, activities and job assignments you have or will establish for the position.

As an approved user and supervisor, the Principal Investigator bears the ultimate responsibility to make certain that all female occupational workers have received the information packet and that they have acknowledged receipt thereof.

2. The Radiation Control Office is prepared to assist you in explaining this requirement to small groups (up to 10 persons), as arranged by the department and with the participation of the approved users.

The operation of this program will obviously require the careful and timely review of radiation exposure reports and appropriate action taken. If the radiation exposure reports are sent to a designated departmental contact rather than the approved user, as is sometimes done as a convenience to the department, the Principal Investigator must take steps to insure that the contact keeps him informed of the exposure to their personnel. It will also require that the Radiation Control Office be kept informed of the names of those persons who are using radioactive materials or radiation producing devices under the Principal Investigator's supervision.

D. Maximum Permissible Exposures to Concentrations of Radioactive Material in Restricted Areas

No Principal Investigator or approved user shall possess or use radioactive materials in such a manner as to result in an individual being present in an area where airborne radioactivity is present. In the event airborne radioactivity is suspected, the Radiation Control Office should be contacted immediately.

E. Reporting Overexposures

In the event an exposure occurs which is suspected to exceed the University's permissible exposure limits (Page 4), the Radiation Control Officer is to be notified immediately.

The Principal Investigator responsible for the area in which a radiation exposure equal to or exceeding the University's permissible exposures occurs shall provide the Radiation Control Office with written details of the exposure and describe procedures which will be followed to prevent recurrence of such an exposure.

#### **IV. RADIATION SAFETY CRITERIA VIOLATION ENFORCEMENT POLICY**

A. Introduction

The Radiation Control Committee recognizes the good working relationships between the RCO and Principal Investigators (P.I.) and that continued noncompliance with established safety rules is a rare occurrence. The Committee recognizes the possibility of a problem and has established a three stage follow-up enforcement program. The policy outlined below retains the initial follow-up authority with the RCO but establishes a more formalized procedure with deadlines. If the initial efforts of the RCO are unsuccessful, the Radiation Control Committee will involve itself and take steps as appropriate to obtain compliance.

## B. Enforcement Follow-up Procedures

### *Initial Follow-up*

Following the identification of a deficiency in radiation safety criteria, the RCO and/or his designee will notify the P.I. in writing. A suggestion of how compliance with University requirements can be achieved will be included and the P.I. will be asked to notify the Radiation Control Department within 10 days of the status of his efforts to make the correction. To facilitate compliance on the part of the P.I., a standard Action Taken Form (ATF) will be utilized on which the violation will be identified with space to identify the correction carried out.

If the violation is of a major nature, the laboratory will be scheduled for a follow-up inspection.

### *Department Head Notification*

If the RCO and/or his designee is not able to achieve compliance through the initial efforts outlined above, the status of the situation will be brought to the attention of the P.I.'s department head. The department head will be asked to assist the RCO and/or his designee in making the corrections. If for any reason this second stage does not achieve compliance, the Radiation Control Committee will intercede.

### *Radiation Control Committee*

If direct action of the RCO and the requested assistance of the department head has not achieved correction of a safety violation, the RCC will take direct action. The Committee will review the situation to determine the seriousness of the identified violation and the action of the investigator. The P.I. will be requested to meet directly with the Committee to outline why he has not complied. The Committee will take whatever action is appropriate to achieve compliance. The action may vary from situation to situation, but could be full support of the RCO's action to remove the P.I.'s approval to work with radioactive material.

Three ATF's received by a Principal Investigator within the past 12 months is considered to be continued noncompliance and results in direct intervention by the Chair of the RCC.