

RADIATION SAFETY MANUAL

CAUTION



RADIATION

CALIFORNIA STATE UNIVERSITY, FRESNO
ENVIRONMENTAL HEALTH AND SAFETY

June 2014

FOREWORD

The California Department of Public Health, hereinafter referred to as the "Department," under Title 17 of the California Code of Regulations (California Radiation Control Regulations) has the responsibility to approve or disapprove each proposed use of radioactive materials subject to its specific licensure. For the administrative convenience of the Department and California State University, Fresno, the Department has issued a Radioactive Material License to California State University, Fresno. This license delegates to California State University, Fresno the authority and responsibility for licensing individual uses of radioactive material. The license also contains certain special requirements that California State University, Fresno must satisfy.

This document is intended to serve as a reference and guide to all radioisotope and ionizing radiation users on the California State University, Fresno campus and to ensure that all requirements and regulations of the Department and Title 17 are met. The Department has adopted (Title 17 CCR Section 30253), where applicable, the regulations contained in Title 10 Code of Federal Regulations Part 20 to govern the use of radioactive materials for its licensees. The applicable code sections are cited in this manual. The rules, procedures, and limits presented here should satisfactorily treat most local radioisotope or radiation usage problems. For unusual experiments, the user should consult the California State University, Fresno Radiation Safety Committee and other documents more comprehensive than this manual.

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ATTACHMENTS

1. User Registration Form
2. Project Approval Form
- 2A. Project Renewal Form
3. Radiation Safety Hazard Analysis Form
4. Radioisotope Use Training Form
5. Radioactive Material Transfer Request
6. Quarterly Radioisotope Inventory Form
7. Appendix C to Title 10 CFR Sections 20.1001-2401
8. Radioisotope Laboratory Facility Selection Guide
9. Leak Testing Procedures
10. Survey Meter Calibration Form

Section 1. Radiological Safety Organization and Program

1.10 Radiation Safety Committee

The Radiation Safety Committee will be composed of at least five members who will meet regularly on a quarterly or more frequent basis to review applications for radioisotope and ionizing radiation use and to develop policies which assure the safe use of radioisotope and radiation equipment. A quorum shall consist of a majority of the membership of the committee and must include the Radiation Safety Officer or his designated alternate. If there is no significant business to transact, a regular quarterly meeting may be canceled by the Chairman of the Committee with the approval of a majority of the members.

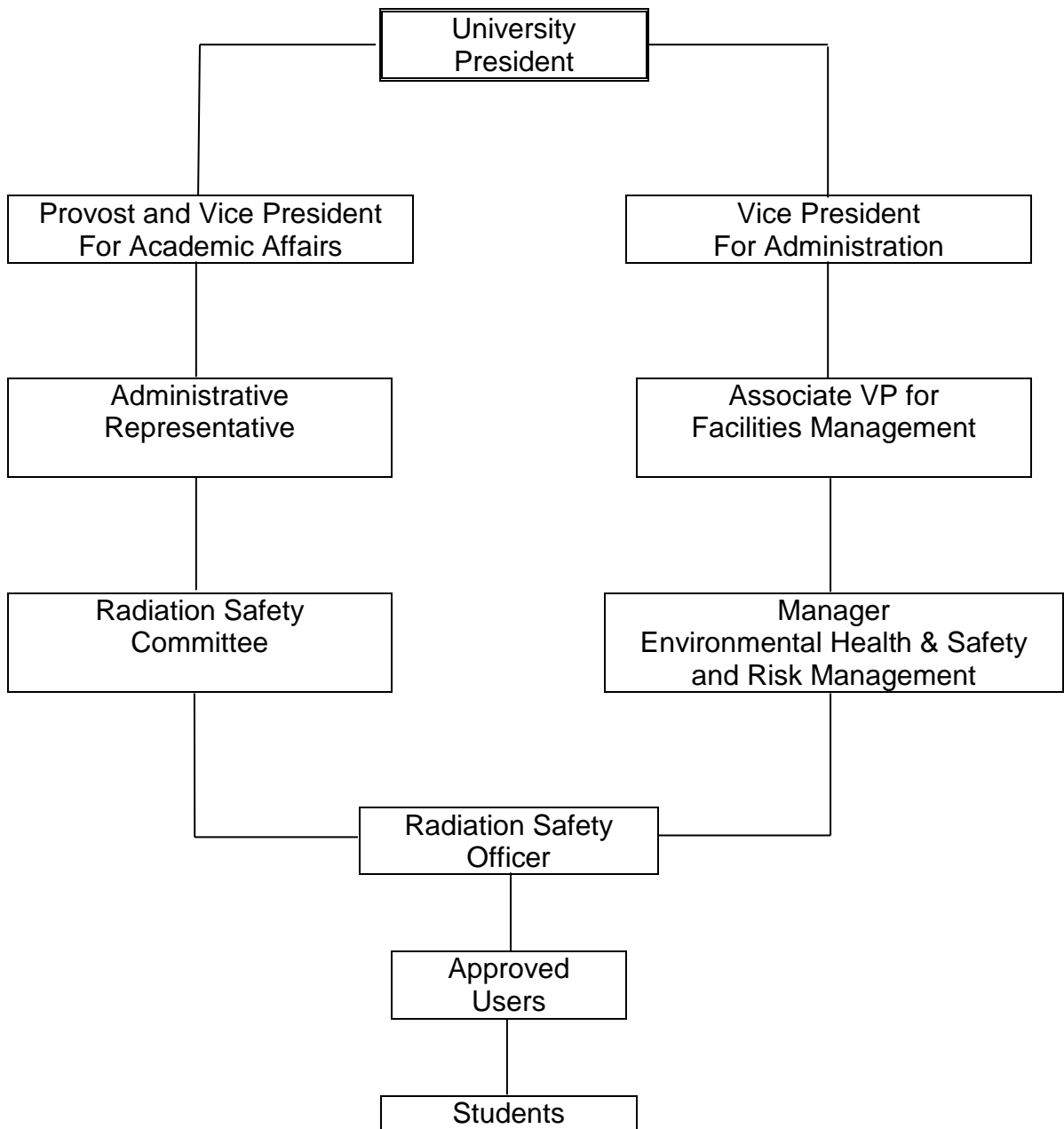
1.11 The Radiation Safety Committee will consist of the Radiation Safety Officer, an administration representative and representatives from operating groups for a total membership of at least five. All members of the Radiation Safety Committee, except for the administration member, must be qualified as users as defined in Section 3.21.

1.12 The Radiation Safety Committee derives its authority from the President of the University through the President's Administrative Representative. The Committee members are appointed by the Radiation Safety Committee and approved by the Administrative Representative, who authorizes the committee to make and enforce regulations pertaining to the use of radioactive materials and ionizing radiation on the California State University, Fresno Campus. (see Figure 1)

1.13 The Committee will every two years elect a Chairman and a Recording Secretary from among its members at the last meeting of the academic year.

FIGURE 1

Organizational Structure – Radiation Safety committee – RSO



1.20 Radiation Safety Officer

1.21 The Radiation Safety Officer (RSO) shall be appointed by and will be responsible to the Radiation Safety Committee. The RSO must be qualified as a user and shall have extensive training in all phases of radioisotope and ionizing radiation work.

1.22 The duties of the RSO will include: advising the Radiation Safety Committee regarding implementation of the program, inspection of on-going projects, conducting laboratory surveying and monitoring, disposing of radioactive waste, maintaining record keeping, and performing all other functions related to Radiation Safety.

1.23 The authority of the RSO is derived from the Radiation Safety Committee, and the provisions of the Radioactive Materials License and the Radiation Safety Manual.

1.30 Projects Under the Jurisdiction of the Radiation Safety Program

1.31 All projects and personnel engaged therein which utilize any material or device capable of producing ionizing radiation come within the scope of the Radiation Safety program. Exceptions to this regulation may be granted by the Radiation Safety Committee in the case of certain analytical chemical reagents used in small quantities and for devices emitting no significant radiation externally. Projects and personnel utilizing ionizing radiation under the following conditions are subject to this section:

- A. The work is carried out on University owned or controlled property whether by University personnel or not.
- B. Projects or personnel supported by University funds or as part of contracts administered by the University, wherever the work is conducted. In such cases, monitoring, issuing of personnel monitoring devices, and supervision of radiation safety regulations are the

responsibility of the Radiation Safety Committee. In some contract or off-campus projects, responsibility may be delegated to an agent, a user, approved by the Radiation Safety Officer acting for the Radiation Safety Committee.

- 1.32 University personnel working with ionizing radiation on their own initiative and without direction from the University at another institution, where that institution supplies the radioactive material or radiation producing device and the working facilities, do not come within the scope of the University Radiation Safety program. It is considered that they are not acting as agents of the University, and that monitoring and other radiation safety measures are the responsibility of the other institution.

Section 2. Use of Radioactive Materials and Equipment Producing Ionizing Radiation

2.10 Project Approval Procedure

2.11 An approved "Registered User" registration form (Attachment 1) must be on file with the Radiation Safety Committee for each person wishing to have a project approved.

2.12 A Project Approval Form together with the related Radiation Safety Hazard Analysis Form and the Radioisotope Use Training Form (Attachments 2, 3 and 4) must be submitted to the Radiation Safety Committee for approval of all new projects. The project description should delineate potential problems and safety precautions. The applicant may be asked to meet with the Radiation Safety Committee. Applications will normally be approved for a one year period, except for certain one semester courses.

2.13 A Project Renewal Form (Attachment 2A) must be submitted to the Radiation Safety Officer annually for approval of continuing projects by a date determined by the RSO but in no case later than October 15. If a project has been concluded, a cancellation notice must be filed with the RSO at the termination of the project.

2.14 Applications for radioactive material work in other than University facilities must be accompanied by authorization for said work by the host institution.

2.20 Procurement of Radioactive Materials and/or Ionizing Radiation Equipment

The application procedure described in Section 2.10 will be followed regardless of the source of the radioactive materials and/or devices, i.e., whether procured by purchase, loan, or gift.

2.21 Purchase of radioactive materials and/or of devices producing ionizing radiation will be through normal University purchasing channels. However, the "requisition form" submitted to the Purchasing Department must be approved and signed by the Radiation Safety Officer. The user shall specify

on the purchase requisition that the material to be ordered is radioactive material or that the device produces ionizing radiation. The RSO will approve all purchase requisitions for radioactive materials and/or devices for projects which have been approved by the Radiation Safety Committee. The RSO will add to the purchase requisition, the California State University, Fresno Radioactive Materials License Number. This approval informs the University Purchasing Department that the authorization for radiation use has been obtained, and confirms that the individual is a "Registered User" of radioactive materials and/or devices producing ionizing radiation.

2.22 Purchase requisitions shall state that ordered material is to be delivered to the campus Radiation Safety Officer. This will facilitate record-keeping and also allow the RSO to check for leakage prior to delivery to the user.

2.30 Transfer of Radioactive Materials Within the University

Transfer of radioactive materials from one Department or project to another within the University must have prior approval of the Radiation Safety Committee. The form "Transfer of Radioactive Material," supplied by the Committee, will be completed in each case (Attachment 5). Unauthorized transfers may result in termination of approval for radioactive materials work by the offending parties.

2.40 Shipment of Radioactive Materials

Shipment of radioactive materials off-campus must conform to appropriate state and federal transportation regulations. The Radiation Safety Officer must be informed prior to any shipment of such materials from the University in order to ensure compliance with California Radiation Control Regulations and federal Department of Transportation Regulations.

2.50 Administration of Radioactive Materials to Animals

- 2.51 Animals given radioactive materials should be caged separately from other animals.
- 2.52 Cages shall be labeled with appropriate radiation warning signs. The nuclide, quantity and date of administration, as well as the name of the person responsible for the experiment, should be specified on the cage labels.
- 2.53 If the excreta might be radioactive, arrangements must be made (in planning the experiment) for its collection in such a manner as to minimize contamination of cages and surrounding areas.
- 2.54 If the nuclide form is such that significant quantities of radioactivity may be released during animal respiration, metabolic type cages fitted with suitable filters or scrubbers may be specified by the Radiation Safety Officer.
- 2.55 Handling and disposal of radioactive excreta and animal carcasses or tissues shall be as specified by the Radiation Safety Officer. Disposal may be by release into sanitary sewer systems if the level of activity is such that such a release conforms with Title 10 CFR Section 20.2003. Higher level carcasses (see Section 2.73) shall be sealed in plastic and frozen until such time as disposal may be made to a licensed carrier.
- 2.56 Applicants are responsible for assuring that caretakers and custodians are aware of potential hazards and suitably trained in the necessary precautions.
- 2.57 Administration of radioisotopes to animals which are not the property of the University is not authorized.

2.60 Administration of Radioactive Materials to Humans

At the present time, the University is not authorized to approve any project involving the administering of radioactive materials to humans.

2.70 Radioactive Wastes

In planning a project using radioactive materials, consideration shall be given to the nature, quality, degree of contamination and generation of radioactive wastes which may result. The Radiation Safety Officer shall specify means of handling and treating such wastes. Liquid wastes and animal carcasses or tissues may require special treatment.

In all cases, radioactive waste must be sealed in as small a container as safety permits and placed in a secure location. In addition, the container must be labeled as to type and amount of isotope, chemical form of isotope, storage date and outside surface radiation level (if applicable) in millirems/hour.

Short-lived materials shall be separated from long half-life material. In some cases, the short-lived materials may simply be stored for a suitable time and then disposed of as non-active. In all cases, the RSO is to be notified when radioactive waste is to be disposed of.

2.71 Users are required to maintain an up-to-date log of all non-exempt radioisotopes under their control. The log shall specify the portion used and unused, the amount of waste accumulated and shall account for losses: e.g., by vaporization, respiration, decay, disposal, etc. The quarterly radioisotope inventory form (Attachment 6) shall be submitted to the RSO. The Radiation Safety Committee may require more or allow less frequent inventory reporting at its discretion.

2.72 As specified in Title 10 CFR Section 20.2003, some wastes may be released to the sanitary sewer system --- refer to Section 20.2003 for requirements governing permissible releases. Note: the California State University, Fresno campus releases in excess of 250,000 gallons/day of sewage.

2.73 As specified in Title 10 CFR Section 20.2005, radioactive waste containing (only) H-3 and/or C-14 may be disposed of as (non-radioactive) hazardous

(toxic) chemical waste at total concentrations of less than 0.05 microcuries/gram. Only liquid scintillation media or animal carcasses may be disposed of in this manner and all radioactivity labeling must be removed and destroyed. Only a licensed disposal agent may be employed to receive hazardous (chemical) material of this nature.

2.80 Storage of Radioactive Materials

When not in use, radioactive sources shall be stored in a secure area with sufficient radiation shielding to ensure compliance with Sections 4.12 and 4.14. Note that H-3 (18.6 keV) and C-14 (156 keV) are soft beta emitters and are adequately shielded by almost any container (0.005 mm and 0.24 mm of Lucite, respectively). P-32 (1.71 MeV) is a hard beta emitter and although the betas are easily stopped, (6.44 mm of Lucite), bremsstrahlung production can sometimes be a problem and should be controlled with a lead outer container and an inner container of a low Z material.

2.81 Posting of Storage or Usage Areas

Under Title 10 CFR Section 20.1902 any area in which there is stored or used more than ten times the quantity specified in Appendix C to Title 10 CFR Sections 20.1001-2401 (Attachment 7) must be posted with a magenta and yellow CAUTION RADIOACTIVE MATERIAL sign carrying the familiar three-bladed symbol.

Section 3. Personnel Safety

3.10 Supervision

All operations involving actual or potential exposure to ionizing radiation shall be under the direct supervision of a qualified "registered user" approved by the Radiation Safety Committee.

3.20 Instruction of Personnel

Section 30255 of the California Radiation Control Regulations requires that a licensee instruct personnel regarding health and safety rules and the problems attendant to the use of sources of radiation.

3.21 Faculty, staff members or graduate students who wish to become qualified as registered users must have the following:

- A. A college degree or the equivalent in the physical or biological sciences; and
- B. At least 40 hours of training or practical experience in the characteristics of ionizing radiation, and radiation dose quantities, radiation detection instrumentation, and the biological hazards of exposure to radiation appropriate to the types and forms of radiation sources to be used. This requirement may be satisfied by completing the first five weeks of Physics 137.

3.22 Persons who may be required to take a radiation safety course are the following:

- A. Any employees who may come in contact with radioactive materials in the performance of their duties; or
- B. Any students working with radioactive materials who are not under the direct supervision of their instructor.

Such persons are either required to attend a radiation safety class conducted by the RSO or demonstrate having received equivalent training.

3.23 Students are not required to take a radiation safety course provided:

- A. They are enrolled in a regular University class; and
- B. The instructor is a registered user and classroom usage of radioactive materials and/or radiation producing devices under the supervision of the instructor has been authorized by the Radiation Safety Committee. It is the responsibility of the instructor to provide any necessary safety training.

3.30 Equipment and Facilities

Registered users are responsible for assuring that equipment and facilities available are adequate for protection of personnel and property. The quantities of radioactive materials and the type of work place required for project approval will follow the guide given in Attachment 8. It is generally recommended however, that a chemical fume hood be used whenever working with unsealed radioactivity. All equipment and facilities are subject to inspection by the Radiation Safety Officer.

3.40 Exercise of Proper Precautions

Unnecessary or unauthorized exposure and the careless or intentional omission of protective devices is prohibited. The Radiation Safety Committee shall deny permission to engage in radiation work to any individual who does not exercise due and proper health and safety precautions.

3.50 Personnel changes

Registered users are responsible for informing the Radiation Safety Committee before personnel additions are made to a project or after personnel terminations on any project using radiation.

Section 4. Radiation Exposures

4.10 Maximum Permissible Exposures

All recommendations as to permissible radiation exposures should be interpreted in terms of the viewpoint that any radiation exposure, except as required by medical necessity, is undesirable. There is a certain amount of background radiation present in our environment which is unavoidable. The only valid philosophy of radiation safety, based on present knowledge, is to reduce all radiation exposures above background levels to the lowest practical level. Thus maximum permissible exposures, such as those stated below, are to be used only as general guides. It should not be assumed that these are tolerable exposures, but rather that they represent upper limits which should be reached only infrequently, if ever.

4.11 The regulations in Title 10 CFR Part 20 Subpart C, recommend the following maximum permissible exposures. These values are adopted for University use subject to the limitations of the above paragraph.

4.12 Occupational Dose Limits from External Exposure

A faculty or staff member or student of age 18 or older who is routinely subjected to work involving radiation is an occupational worker.

A. No user shall possess sources of radiation in such a manner as to cause:

- (1) Any individual 18 years of age or older, as specified in Title 10 CFR Section 20.1201, to receive an occupational dose in excess of the limits specified in the following table; or
- (2) Any individual under 18 years of age, as specified in Title 10 CFR Section 20.1207, to receive an occupational dose in excess of 10% of the limits specified in the following table:

| | Dose per calendar year |
|--|------------------------|
| Whole Body | 5 Rem (0.05 Sv) |
| Any organ other than the lens of the eye | 50 Rem (0.5 Sv) |
| The skin or the extremities | 50 Rem (0.5 Sv) |
| The lens of the eye | 15 Rem (0.15 Sv) |

B. Each user shall require any individual, prior to first entry into any controlled area maintained by the user where internal dose assessment or personnel monitoring is required to disclose in a signed statement, either:

- (1) That the individual had no prior occupational radiation exposure during the current calendar year; or
- (2) The nature and amount of any occupational radiation exposure which the individual may have received during that current calendar year.

4.13 Occupational Dose Limits from Internal Exposure

Where required under the provisions of 10 CFR Section 20.1202, internal exposures (from inhalation and ingestion) shall be included when determining occupational doses. No user shall possess radioactive material in such a manner as to cause any individual to exceed the dose limits stated in Section 4.12 above via internal exposures.

4.14 Dose to an Embryo/Fetus (Declared Pregnant Women)

Each user, as specified in 10 CFR Section 20.1208, shall ensure that the dose to an embryo/fetus during the entire pregnancy, due to occupational exposure of a declared pregnant woman - who has voluntarily informed the user, in writing, of her pregnancy - does not exceed 0.5 rem (5 mSv).

4.15 Exposures to Members of the Public

Each user, as specified in 10 CFR Section 20.1301, shall conduct their operations so that:

- A. The total effective dose equivalent to individual members of the public from the authorized operation does not exceed 0.1 rem (1 mSv) in a year, and
- B. The dose in any unrestricted area from external sources does not exceed 2 millirems (0.02 mSv) in any one hour.

Section 5. Basic Radiation Safety Principles and Work Rules

Radiation sources can generally be divided into two groups when discussing physical principles for preventing or minimizing exposure to ionizing radiation.

These groups contain those sources which are external to the body and those sources which may be internally deposited within the body.

5.10 Control of External Exposure

External radiation exposure from a given radioactive source is controlled by the distance from the source, the exposure time, and shielding.

Increasing the distance from the source is frequently the most effective and economical means to reduce radiation exposure from gamma rays and other highly penetrating radiations. The radiation field varies inversely with the square of the distance from a small or "point" source. For this reason, tongs or other long-handled tools should always be used for manipulating radionuclide preparations emitting significant levels of radiation. Radioactive materials should never be picked up with the fingers. Low-level sources can be handled with short forceps which provide a large reduction in exposure when compared with direct skin contact.

Decreasing the time of exposure decreases the radiation dose proportionately. It is important to include "dry runs" with non-radioactive material for critical steps in preplanning of all work which may involve substantial radiation exposure.

Shielding the source of radiation will be necessary when the maximum distance and minimum time do not insure an acceptably low exposure to operating personnel. Shielding for gamma radiation is accomplished by interposing materials, preferably of high atomic number and high density, between the source of radiation and the area to be shielded.

An estimate of radiation dose is a fundamental aspect in preplanning for work with radioactive material.

External radiation from beta rays is rather simply controlled. A few millimeters of solid material is sufficient to totally absorb most commonly encountered beta radiations. Where radioactive material emits both beta and gamma radiations, shielding considerations will be controlled by the gamma radiation. One must also recall that beta rays produce penetrating X-rays called bremsstrahlung. The intensity of bremsstrahlung varies directly with the square of the energy of the beta radiation and the average atomic number of the shielding material. Low atomic number materials such as Lucite or glass should, therefore, be used for shielding of beta radiation whenever possible. When working with energetic beta emitters, care must be taken to avoid exposing hands above opened containers where the dose rate can be on the order of rads per minute for commonly used quantities of beta emitters such as Phosphorus-32.

5.20 Control of Internal Exposure

Distance, time and shielding are obviously not available for protection when the source of radiation may be internally deposited in the body. Incorporation of radioactive material into the body is most easily controlled by preventing exposure to unsealed sources of radioactive material. All significant quantities of unsealed radioactive material must be used inside properly designed and operating exhaust-ventilated enclosures.

In a well-designed low or moderate level laboratory, protective clothing consisting of laboratory coats and rubber or plastic gloves shall be worn when working with radioactive material.

A second reason for preventing radioactive contamination is based on interference with technical considerations, avoiding contamination of radiation measuring instruments and cross-contamination of experiments. If this technical

contamination is controlled, internal exposure of laboratory personnel will usually not be a serious problem.

5.30 Work Rules

The following rules of good radiation protection practice shall be scrupulously observed by all radiation workers to prevent unnecessary radiation exposure and minimize contamination.

- a. **Do** wear lab coats and impermeable gloves when working with radioactive material.
- b. **Do** work with radioactive material in an exhaust-ventilated enclosure.
- c. **Do** store and transport containers of radioactive solutions on trays that will hold the contents of the primary container in the event of breakage.
- d. **Do** line trays and working surfaces with absorbent paper. Absorbent paper with an impermeable base is commercially available.
- e. **Do** keep radioactive solutions in sealed containers.
- f. **Do** clearly label all containers of radioactive material and post all radiation and storage areas with the standard radiation warning symbol. Labels on containers should bear the legend, "Caution - Radioactive Materials", an indication of the nuclide and quantity of radioactive material, and the date of assay. Placards for posting of radiation and storage areas should bear the legend, "Caution - Radiation Area" or " Caution - Radioactive Materials", respectively.
- g. **Do** conduct work with radioactive material in accordance with written radiation safety and operating procedures.
- h. **Do** carry out new procedures in a "dry run" with inactive materials before using radioactive material.

- i. **Do** monitor around work areas after each procedure where there is any possibility of contamination and otherwise on a regular periodic basis. Keep records of such surveys.
- j. **Do** clean up spills promptly.
- k. **Do not** eat, drink, smoke or apply cosmetics in areas where unsealed radioactive materials are used.
- l. **Do not** allow fingers or other objects in or near the mouth.

5.40 Reporting Overexposure and Contamination

In the event of actual or suspected overexposure to radiation, inhalation or ingestion of radioactive material, or contamination of person or facility, the Radiation Safety Officer must be notified immediately. The RSO is required to report incidents/overexposures, etc., to the California Department of Public Health.

Section 6. Radiation Accidents

6.10 External Radiation Exposure

A person receiving or suspected of receiving a significant exposure to external radiation; i.e., where the source of radiation remains external to the body, shall be removed promptly from the hazardous area, and the Radiation Safety Officer notified at once!

6.20 Radioactive Contamination - Area

6.21 Major Contamination Involving Potential Health Hazard

In the event of spreading or suspected spreading of radioactive contamination over a significant portion of a room or large area:

- 1) Vacate the area, leaving behind clothing and other articles which may be contaminated.
- 2) Have general ventilation systems turned off, where applicable.
- 3) Call the Radiation Safety Officer immediately.
- 4) If a suitable monitoring instrument is available, evaluate the degree of contamination of personnel.

6.22 Minor Contamination Involving No Significant Health Hazard

Minor radioactive contamination of work surfaces, floors, walls or equipment should be dealt with promptly but carefully. Where feasible the Radiation Safety Officer should be notified prior to effecting decontamination. Possible dangers include a person contaminating himself in cleaning up a spill or in creating a worse problem than existed before e.g., by flushing contamination deeper into porous material such as wood. The RSO must be notified, if not done in advance, of a decontamination procedure being carried out so that the affected area may be inspected for any residual contamination.

6.30 Radioactive Contamination - Personnel

6.31 Skin Contamination

Thorough washing with soap and water is the best general method for decontamination of the hands and other parts of the body, regardless of the contaminant. If the contamination is localized, it is often more practical to mask off the affected area and cleanse with swabs, before risking the danger of spreading the contaminant by general washing. Skin decontamination must continue until no removable contamination remains. In the event detectable fixed contamination remains, the RSO must be called before the affected individual may leave the premises.

6.32 Contaminated Wounds

Persons cut by glassware, injured by hypodermic needles or contaminated instruments, etc., shall wash the injured part under a strong stream of water immediately following the injury. If the material is unusually toxic a venous-return tourniquet may be applied (tightly enough to occlude the veins without stopping the arterial pulse). Do not delay in reporting the injury to the Radiation Safety Officer as any delay may greatly lessen the effectiveness of subsequent treatment.

6.33 Ingestion

Persons swallowing radioactive material shall be handled as in acute poisoning of other types. Vomiting should be induced rapidly with large volumes of water and stimulation of the throat with the fingers. Mild emetics may be added to water. This should be repeated once or twice. It is imperative that the Radiation Safety Officer be notified without delay in order to arrange for prompt medical attention.

Section 7. Radiation Monitoring

7.10 Routine Surveys

The Radiation Safety Officer shall be responsible for making periodic surveys of all areas in which unsealed radioisotopes are used. Such surveys will be made as frequently as deemed necessary, usually at least once a month. In addition, registered users may be required to survey at the end of every work day or when finished, whichever ever one comes first, and to log each survey in a logbook.

7.20 Special Monitoring

Project leaders are responsible for notifying the Radiation Safety Officer in advance of an experiment or procedure which could involve a significant radiation hazard. The Radiation Safety Officer will provide special monitoring when necessary. When there is any doubt as to when the Radiation Safety Officer should be notified, this should be resolved in favor of notification.

7.30 Personal Monitoring

As required under Title 10 CFR Section 20.1502, each radiation worker shall wear the appropriate dosimetry and/or other personal monitoring instruments whenever there is the potential of receiving an exposure as specified below:

- a. 18 years of age or older

A dose in excess of 10% of the limits specified in
Section 4.12 A. (1).

- b. Under 18 years of age

A dose in excess of 10% of the limits specified in
Section 4.12 A. (2).

7.31 Dosimetry

Each department or group will be responsible for obtaining personnel dosimetry if required. All exposure reports must be returned to the Radiation Safety Officer from the dosimetry processor -- copies will then be forwarded to the appropriate group. Personal exposure records will be maintained for all monitored personnel.

7.40 Radiation Producing Machines

Registered users are responsible for notifying the Radiation Safety Committee of the purchase and installation or modification in the installation of any machine capable of producing ionizing radiation. A radiation survey shall be made by the Radiation Safety Officer or a duly authorized representative of the Committee prior to placing any such machine in service.

7.50 Sealed Radioactive Sources

Periodic leak tests of all sealed radioactive sources shall be made by the Radiation Safety Officer, as required by the California Radiation Control Regulations Section 30275. Each sealed source, other than those listed in Section 30275 as exempt from testing, shall be tested for contamination prior to initial use and for leakage at least every six months. Contamination tests shall be capable of determining the presence of 0.005 microcuries of removable contamination. Leak testing procedures are detailed in Attachment 9.

7.60 Laboratory Survey Instrumentation

All approved projects are required, where applicable, to have adequate radiation monitoring equipment available. The Radiation Safety Committee shall establish what constitutes adequate instrumentation at the time the Project Approval Form (Attachment 2) is submitted (see item #6 of the Project Approval Form). It shall be the responsibility of the registered user, through his/her department, to provide the necessary monitoring equipment.

7.70 Survey Meters

The RSO shall have the principal survey meter(s) [RSO's meter(s)] calibrated by an approved outside agency not less than annually. All other active radiation survey meters on campus shall also be calibrated by an approved outside agency not less than annually. It is the responsibility of the registered user to ensure that this calibration is done. In addition, all other active survey meters shall be cross-checked every three months against the principal survey meter, using a standard Cs-137 source (See Attachment #10) and re-calibrated if found to be necessary. Survey meters not in active service need not be cross-checked or re-calibrated. Before an inactive meter may be placed back in service, it must be re-calibrated by an approved outside agency if that has not been done within the past year.

Section 8. Radiation Safety Manual

8.10 Copies

All registered users are provided with a copy of the California State University, Fresno Radiation Safety Manual, and are responsible for adhering to its required provisions.

8.20 Review and Revisions

The Radiation Safety Officer will periodically review the Radiation Safety Manual to ensure that it complies with current California Radiation Control Regulations and other relevant state and federal regulations. Any revisions to the Radiation Safety Manual must be approved by the Radiation Safety Committee.