

## **THE UNIVERSITY OF TULSA RADIATION SAFETY PROGRAM**

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## I. PURPOSE OF THE RADIATION SAFETY PROGRAM

The Radiation Safety Program has been established to:

- A. Provide for the protection of students, employees and the public against radiation hazards associated with:
  1. The University's possession, use, transportation, and disposal of radioactive material
  2. The University's use of machines and equipment that emit ionizing radiation.
- B. Provide for the University's compliance with applicable Federal, State, and Local regulations.

## II. DEFINITIONS

- **ALARA:** "as low as is reasonably achievable", is the philosophy upon which the University of Tulsa Radiation Safety Program is based. This means that persons who handle radioactive sources must make every effort to keep radiation exposures and releases as far below the legal limits as is reasonably achievable.
- **ALL PERSONS:** includes authorized individuals, postgraduate, graduate and undergraduate students and technicians who work with radioactive materials and/or radiation emitting equipment.
- **AUTHORIZED USERS:** persons authorized by the State of Oklahoma under the University's radiation license to order and use radioactive materials. Authorized Users oversee and are responsible for the use and handling of radioactive materials in their possession and control. The license includes names of authorized persons, their experience handling radiation sources, the materials they wish to use and where the materials will be handled.
- **ODEQ CODE:** Oklahoma Administrative Code Title 252, Chapter 410 – Radiation Management. Administered by the Oklahoma Department of Environmental Quality.
- **CONTROLLED AREAS:** areas in which radioactive materials or radiation producing devices are used; they have sign requirements and restricted access. All other areas are termed non-controlled areas.
- **FILM BADGE:** a type of personnel monitoring equipment used to measure personal and area radiation exposure.
- **OCCUPATIONAL RADIATION DOSE:** the dose of radiation received as a result of work with radioactive materials. It may not exceed 3 rem to the whole body in a calendar quarter or 5 rem to the whole body in a single year.
- **RSO:** Radiation Safety Officer or his designate.

- **RADIATION:** means ionizing radiation including alpha and beta particles, gamma and X rays, neutrons, high speed electrons, high speed protons, and any other atomic particles producing ionization; does not include sound or radio waves, or visible, infrared or ultraviolet light.
- **RADIATION DOSE:** the quantity of radiation absorbed, in rads, per unit mass (or per unit mass per unit time) by any body tissue or whole body.

### III. SCOPE OF THE PROGRAM

The Radiation Safety Program applies to authorized users and all others who receive, possess, use, transport or dispose of radioactive materials or use radiation-producing devices.

### IV. DELEGATION OF AUTHORITY AND RESPONSIBILITY

#### 1. RADIATION SAFETY OFFICER (RSO)

- A. The Radiation Safety Officer (RSO) is authorized by the Office of the President through the Vice Provost for Research and is responsible for:
  1. Ensuring that all individuals who work with or in the vicinity of radioactive materials have sufficient training and experience to enable them to perform their duties safely and in accordance with ODEQ Code regulations and the conditions of the University license.
  2. Ensuring that all use of radioactive material is conducted in a safe manner and in accordance with ODEQ Code regulations and the conditions of the University license.
  
- B. To carry out his or her duties the Radiation Safety Officer shall:
  1. Be familiar with all pertinent ODEQ Code regulations, the terms of the license, and information submitted in support of the request for the license and its amendments.
  2. Review the training and experience of all individuals who wish to use radioactive materials to determine if they are qualified to perform their duties safely and in accordance with ODEQ Code regulations and the conditions of the license.
  3. Be responsible for monitoring the University's program to maintain individual and collective doses as low as reasonable achievable.
  4. Review annually occupational radiation exposure records of all personnel working with radioactive materials.
  5. Establish a table of investigational levels for occupational radiation exposure, which when exceeded, will initiate an investigation and consideration of action.
  6. Review and approve all requests for use of radioactive material within the institution.
  7. Prescribe special conditions for use of certain radioactive material such as requiring bioassays, physical examinations of users, and special monitoring procedures

8. Review the entire University Radiation Safety Program at least annually to determine that all activities are being conducted safely and in accordance with ODEQ Code regulations and the license conditions. The review shall include an examination of all records, reports from the inspection, written safety procedures, and the adequacy of the institution's management control system.
  9. Recommend remedial action to correct any deficiencies that are identified in the radiation safety program.
  10. Ensure that the radioactive materials license is amended, when necessary, prior to changes in facilities, equipment, policies, procedures, radioactive materials possession, possession limits, and personnel, as specified in the license.
- C. To assist in the day-to-day operation of the University Radiation Safety Program, the Radiation Safety Officer or his designate shall:
1. Develop and implement the Radiation Safety Program.
  2. Review training and experience of all individuals who seek approval to handle radioactive sources or radiation emitting equipment.
  3. Review and approve requests for purchase of radioactive material.
  4. Prepare amendments to the radioactive materials license.
  5. Maintain the inventory of radioactive materials; the inventory includes the names of persons responsible for each quantity of material, where materials will be used or stored, dates received and activity.
  6. Determine compliance with all aspects of the University Radiation Safety Program including license conditions and exposure regulations.
  7. Terminate projects determined to be a threat to health or property.
- D. Develop and implement the radiation film badge program.
1. Review film badge data as it is received.
  2. Maintain records and make records available to others as needed.
- E. Provide consulting service on radiation handling, shielding, disposal and transportation.
- F. Ensure that employees are properly trained; training must be documented (date, names of people trained, outline of training program). Training topics should include;
1. Background information on State and University radiation safety rules and regulations.
  2. Location and conditions for storage of radioactive materials.
  3. Health effects caused by overexposure to radioactive materials.
  4. A review of laboratory safety procedures.
  5. Waste handling and disposal.
  6. The obligation to report unsafe conditions to the Authorized Individual or the RSO.
  7. How and when to use a radiation survey meter.

8. How to respond to spills and emergencies.
  9. Where to find copies of the Radiation Safety Program, the Radiation License and ODEQ radiation regulations.
- G. Carry out surveys using "official" calibrated University radiation monitoring equipment.
1. Maintain and ensure calibration of "official" University radiation monitoring equipment.
  2. Perform routine laboratory inspections and radiation surveys.
  3. Perform leak tests on sealed sources as required.
  4. Perform special surveys, including wipe tests of sources when received.
  5. Supervise radiation emergency responses and decontamination procedures.
  6. Maintain documentation of test and survey results.
- H. Maintain the radiation storage area.
1. Implement a radioactive waste collection and disposal program.
  2. Maintain disposal records.
  3. Maintain inventory records.
- I. Control radioactive material entry and exit from the University.
1. Process radioactive materials purchase requisitions.
  2. Receive and store radioactive materials until transferred to purchaser's laboratory.
  3. Maintain records regarding purchase, transfer and disposal of all materials.
- J. Appoint a competent individual to serve as RSO when absent from the University.

**2. AUTHORIZED USERS (AU)**

- A. Authorized Individuals must provide for the safe handling of radioactive materials or radiation emitting equipment in their laboratories.
- B. Provide adequate facilities, radiation detecting equipment, shielding materials, personal protective apparel and handling devices.
- C. Establish laboratory radiation safety procedures, including;
1. Limiting access to restricted areas.
  2. Compliance with sign requirements.
  3. Proper use and handling methods including personal protective equipment, shielding and interlocks as appropriate.
  4. Proper labeling, storage and security of radioactive materials.
  5. Approval of experiments run after normal work-hours.
  6. Proper security of radioactive sources.
  7. Proper use and calibration of radiation survey meters.

- D. Provide written standard operating procedures for operations that present a risk of over exposure to radiation.
- E. Provide locked and shielded radiation source storage facilities as required by license conditions and state regulations.
- F. Provide necessary information to the RSO.
  - 1. Inform RSO of any anticipated changes that must be reflected on the radiation license; changes include using new sources, different laboratories, different storage facilities, etc.:
  - 2. Complete and promptly return Radiation Safety Program forms as requested; forms include monthly disposal information and quarterly inventories.
  - 3. Maintain complete and up-to-date laboratory records which includes a list of your sources, the dates of experiments, how much was used in a given experiment, nature and disposal of the material used.
  - 4. Inform RSO if any persons handling radioactive materials in your laboratory are under 18 years of age or are pregnant as special conditions may apply to these people.

**3. OTHERS THAT USE RADIOACTIVE MATERIALS OR RADIATION EMITTING DEVICES**

- A. Responsible for complying with the Radiation Safety Program, any particular laboratory requirements, ODEQ Code regulations and the University license conditions.
- B. Must report spills, contamination (known or suspected) and other unsafe conditions to their employer.
- C. After handling radioactive materials must (using properly cleaning techniques) clean (and if necessary decontaminate) their work area and ensure that their clothing and body are free of measurable contamination.

**V. RADIATION EXPOSURE REGULATIONS**

- To ensure that routine over exposure to radiation does not occur, there are regulations that limit personal exposure to certain acceptable levels; these levels are called "maximal permissible radiation doses". Other regulations limit water and air concentrations; these standards are called "maximal permissible radiation concentrations". All users must be familiar with these regulations.
- Maximal permissible radiation doses have been established for internal and external radiation; for controlled and non-controlled areas; for contamination of surfaces (such as lab benches or floors); for waste emissions in water and air; and for transportation purposes. All users must be familiar with these regulations.

## **VI. BASIC CONDITIONS OF THE RADIATION SAFETY PROGRAM**

### **1. Control of radiation exposure and contamination**

- A. Keep exposure to ionizing radiation as low as is reasonably achievable (ALARA).
- B. Radiation exposure must not exceed an absorbed dose greater than the permissible exposure levels provided in the Code.
- C. Limit the amount of radioactive materials used in academic courses to quantities less than exempt quantities in the Code.

### **2. Compliance with regulations**

- A. The use, storage, transportation, and disposal of radioactive material must conform to the Code, University Radiation Safety Program and License conditions.
- B. Individual laboratories must establish **specific written procedures** for using equipment and radiation sources; using proper shielding materials; using interlocks when appropriate; disposing of materials correctly; etc. Specific laboratory rules and procedures are incorporated in the Radiation Safety Program, and thus must be followed by laboratory employees, students and guests using laboratory facilities.

### **3. Authorization**

- A. The Radiation Safety Officer (RSO) authorizes the use of all radioactive material and radiation emitting devices. Prior to purchase of new materials or devices, the use of the new items must be authorized by the RSO.
- B. Laboratories in which radioactive materials may be handled or stored must be authorized by the RSO.
- C. Individuals who supervise the use of radiation sources in their laboratory must be authorized by the RSO.
- D. Employees and students who wish to handle radioactive materials or radiation emitting equipment may do so only under the direct supervision of the individual authorized to use the material or equipment.

### **4. Medical examinations**

- A. The RSO may require persons who handle radiation sources, to have a medical examination if exposure or use pattern raises concern.
- B. The RSO may require persons who may have been over exposed to ionizing radiation to have a medical examination.

## **VII. PURCHASE, TRANSFER, TRANSPORTATION AND RECEIPT OF RADIOACTIVE MATERIALS**

### **1. Purchase of radioactive materials**

- A. To maintain an accurate inventory of radioactive sources the RSO must process all purchases of radioactive material.
- B. To initiate an order, send a completed purchase requisition to the RSO.

- C. The RSO will retain purchase requisition information to reference when opening and storing radioactive shipments.

**2. Receipt of radioactive materials**

- A. When packages bearing radiation labels arrive in the Receiving Department they are to be inspected for visible damage, moisture and stains; if there is evidence of damage, receiving will request the deliverer to remain on campus until the RSO or his designate has inspected and monitored the package.
- B. The RSO is to be notified by Receiving when the University receives radioactive materials; the wrappings and container are monitored for radiation and the package will be transported by the RSO or his designate to the purchaser.
- C. Material will be released to the authorized user when it has been determined that the packaging is intact and that appropriate shielding, safety equipment and procedures are available in their laboratory.

**3. Transfer of radioactive materials to and from other institutions**

- A. To maintain an accurate inventory of sources the RSO must handle all transfer and disposal of radioactive materials and will prepare license amendments when transfers and disposal are desired.
- B. Transfer of radioactive materials between institutions must be preceded by exchange of license information and amendments of both institutions licenses.
- C. Incoming and outgoing shipments will be handled by the RSO. Notify the RSO when such transfer of materials is anticipated.
- D. The RSO will package and ship or receive the materials. Transportation outside the University must meet DOT and Code regulations which include specific rules on packaging, labeling and physical transport.

**4. Transportation of radioactive material within University property lines.**

- A. Transfer of material between researchers in University laboratories is encouraged when it is mutually beneficial; the RSO must be informed about the transfer in advance so the inventory can be updated. The Transfer of Radioactive Materials Form must be filled out and sent to the RSO prior to transfer.
- B. Material must be in a shatter-proof properly labeled container that has been wipe tested and shown not to be contaminated.
- C. Emitted radiation cannot exceed 200 mrem/hour on the surface and 10 mrem/hour one meter from the surface of the package.
- D. Source must be responsibly transported by an authorized person who has planned the route to avoid pedestrian traffic. Transportation by private vehicle must be approved by the RSO.

### **III. PROCEDURES THAT APPLY TO LABORATORIES IN WHICH RADIOACTIVE MATERIALS ARE HANDLED**

#### **1. Storage of radioactive material**

- A. Do not leave radioisotopes unattended. Keep sources locked up when not in use.
- B. Store radioactive material so that it is protected against fire, explosion, and flooding; from breakage of primary storage-containers, and from unauthorized removal.
- C. After experiments using an open source, package and label waste materials appropriately for decay or disposal. Contact the RSO for packaging instructions. Items can be stored in the radiation storage facility if desired.

#### **2. Caution signs**

- A. The RSO will provide appropriate caution signs for doors and walls of rooms in which radioactive materials are stored or used. Signs can be removed only by the RSO. Contact the RSO if caution signs need to be replaced or removed.
- B. Some caution signs have a section which must be filled out by the "Authorized Individual". This information must be kept up-to-date. Contact the RSO if new signs are needed for updating purposes.

#### **3. Labeling of containers and glassware**

- A. Containers used to store radioactive materials must be labeled. Mixtures of isotopes must be labeled.
- B. Labels should be durable, clearly visible, bear the radiation symbol and contain the words "CAUTION RADIOACTIVE MATERIAL".
- C. Labels should also contain the chemical identity of the material (or mixture); the quantity of radioactive material in  $\mu\text{Ci}$  or  $\mu\text{Ci/ml}$ ; the date; the name of the generator; and the generation date.
- D. Labeling is not required for transient use of containers; transient use means that the user is continuously present in the lab during the containers use and decontaminates the container after its use.

#### **4. Labeling equipment**

- A. Post a "Caution Radioactive Materials" sign at sinks and hoods approved for radionuclide discharge.
- B. Post a "Caution Radioactive Materials" sign on refrigerators, freezers and cabinets where radioactive materials are stored.

### **IX. PERSONAL PROTECTION**

- Deviations from specific requirements and precautions may be approved by the RSC; submit requests to the RSO.
- Do not smoke, eat, drink, prepare or store food or personal affects, or apply cosmetics where unsealed radioactive materials are being used, handled, transferred or stored.

- Whenever practical, perform at least one trial run (without radioactive materials) of experiments to assess the adequacy of procedures and safety equipment.
- Dispose of radioactive waste as described in this manual. If questions about proper disposal arise, call the RSO for assistance.
- For each experiment in which radioactive material is used, enter into the laboratory log book the amount of material used (in  $\mu\text{Ci}$ ) and how the waste was disposed (for example: as trash after decay, down the sink or given to the RSO.)
- Wear protective gloves and a lab coat when handling of radioactive materials. Remove these items before leaving the laboratory. Take care to not touch pens, notebooks, doorknobs and other items with gloved that may be contaminated.
- Do not mouth pipette radioactive solutions. Keep pipetting devices used with radioactive materials away from those used with non-radioactive materials.
- Tongs or other remote handling device must be used with sources or containers emitting  $> 1$  roentgen/hr at point of contact.
- Operations which may generate particles (e.g. dust, mist, fume), vapor or gas for example evaporation, sanding, grinding, powder transfer or handling volatile or gaseous material, must be performed in a chemical fume hood which has been approved by the RSO for use with radioactive materials.
- When possible, capture radioactive aerosols by filtering the exhaust or passing exhaust through a bubbler containing an absorbent liquid.
- Each time an experiment using open radioactive material sources is carried out, use a survey meter and/or wipe tests to check for skin, hair and contamination. Notify the RSO immediately if normal decontamination steps fail to remove activity.
- Survey bench and equipment for contamination at the end of the experiment, before equipment is removed from the laboratory. Decontaminate as needed; if a surface remains contaminated notify the RSO.
- Wash hands before leaving the laboratory if radioactive materials have been used.
- Transport radioactive material in shielded containers.
- If radioactive material is accidentally discharged in a laboratory sink, record the approximate amount lost (in  $\mu\text{Ci}$ ), in the laboratory use log, and report the amount to the RSO. Do not deliberately discharge contaminated solutions into drains if the activity may be more than concentrations listed in Table 2, Column 2 of the Ionizing Radiation Appendices.

- If a film badge, pocket dosimeter, or badge ring has been issued to you, wear it whenever you handle radioactive materials and when you are in an area where such materials are being handled or stored.
  - a. Store dosimeters in a designated low background area in or near the laboratory.
  - b. Do not leave dosimeters on or in your lab coat or share them with others. If a personal film badge is inadvertently exposed to high activity, the data are ascribed to the wearer. This can result in limiting access to radioactive materials for protracted periods of time. In addition, these data become part of a permanent record of exposure that is transferred from institution to institution. High unexplained data are viewed as real exposure.

## X. DISPOSAL OF RADIOACTIVE MATERIALS

1. Disposal of radioactive waste is expensive and is becoming increasingly difficult to accomplish because of the scarcity of disposal sites. Therefore, it is important to minimize waste.
2. **Waste minimization can be accomplished by:**
  - A. Ordering and using minimum volumes and activity.
  - B. Hold short-lived radioactive waste for decay.
  - C. Release certain low activity materials into the sanitary sewer.
  - D. Evaporate to a small volume aqueous waste that can't go to the sanitary sewer.
  - E. Never mix long half-life non-dischargeable waste with either dischargeable or short half-life waste.
  - F. Use only scintillation cocktail which can be discharged into laboratory drains.
3. **Disposal of liquid waste into sewage system.**
  - A. To comply with the ODEQ Code the University must control the amount of radioactivity discharged into the sewage system and released to the atmosphere, so that the university does not exceed the limits based on:
    1. Concentration; and
    2. Total activity (per day and per year).
  - B. Radioactive wastes may be discharged into a sink provided that:
    1. The sink has been approved by the RSO and labeled for this purpose.
    2. The radioactive material is readily soluble or dispersed in water.
    3. The total quantity released in any day does not exceed a specified amount.
  - C. Laboratory use and disposal records must be maintained and updated each time disposal occurs. Record must include the date, radionuclide and the estimated activity released (in  $\mu\text{Ci}$  or  $\text{mCi}$ ) and where the material was disposed.
4. **Disposal of non-dischargeable liquid and all solid radioactive waste materials**
  - A. Short half-lived materials can be held for decay.

1. Package materials and record chemical identity, packing date and the date at which 10 half-lives will have elapsed.
  2. Prior to disposal, measure activity to ensure that it is background.
  3. Remove radiation labels before disposal. Ensure that disposal data are recorded in laboratory radioactive materials log book.
- B. In general:
1. Don't mix liquid and solid, or long and short half-life waste materials.
  2. Radiation level at the surface and one foot from the surface of the container shall not exceed 200 mrad/hr and 5 mrad/hr respectively.
  3. Chemically reactive radioactive materials (e.g. pyrophoric, explosive, water or air reactive) should be pre-reacted before disposal if at all possible. Radioactive chemical waste haulers will not handle chemically reactive materials.
  4. Label waste containers with chemical identity, form, and activity.
  5. A separate record of what (and how much) material is in each container must be available to the RSO when the container is collected.
  6. Make arrangements for disposal of radioactive biohazards such as bacteria and viruses before these materials have been generated.
- C. Disposal of solids: except for material suitable for decay, solids must be disposed of by transferring to an approved burial site.
1. Seal powdered material in metal or plastic container for disposal.
  2. Pack objects weighing more than five pounds separately.
  3. Pack sharp objects inside shatterproof protective containers.
  4. Label containers with identity of contents and cumulative activity.
  5. Contact the RSO for container pickup when the container weighs 25 pounds, or is full or when it nears the radiation criteria given above.
- D. Disposal of liquids that can't go to the sewer.
1. Adjust solutions to pH 4-10 prior to disposal.
  2. Use separate containers for organic and aqueous waste solutions.
  3. Allow aqueous waste to evaporate to a solid in a disposable container.
  4. Accumulate and label organic radioactive waste per c. 4 and 5 above.
  5. Use of non-aqueous scintillation cocktail (which can't go down the sewer) is discouraged. If this type of material must be used seek approval to do so from the RSO. Inform the RSO why organic cocktail is needed and how it will be disposed of and who will pay for disposal.
5. **Release of Radioactive Material into Ventilation Exhaust Systems**
- A. Unless otherwise authorized by the Radiation Safety Officer, laboratory hood exhaust concentrations averaged over 24-hours must not exceed specific amounts.
  - B. Immediately contact the RSO if there is an environmental release of airborne radioactive material in concentrations (averaged over 24 hours), in excess of amounts given in the Code.

- C. Determine average concentration at the point where the material leaves the exhaust duct. Consult with Radiation Safety Officer to determine if a longer averaging period can be used.
- 6. Notify RSO prior to starting work that will generate radioactive waste material not covered in the above discussion.**
- 7. Disposal of short half-life, open source materials**
- A. When short half-life, open source radioactive materials such as P-32 and S-35 decay to certain low levels, liquids can be disposed of in the sanitary sewer system and solids as regular trash.
  - B. To discard this material, using usual radiation precautions, wash the original container with 5 volumes of water (in moderate flow of running water) and allow water to continue to run for five minutes to dilute material in the building drain system. Deface or remove the radioactive label from the washed container and put it into the trash. Remember to document disposal in your laboratory radiation log book.
  - C. Solid materials (such as towels, wipes and bench covers) used with that particular container of radioactive material can be thrown in the regular trash after all "radioactive material" labels have been removed or defaced.

## **XI. EMERGENCY PROCEDURES**

- Notify the RSO if you know or suspect that external exposure exceeds the permissible exposure limit; that exposure by inhalation, ingestion, or injection has occurred; or that radioactive material has accidentally been released to the laboratory atmosphere, surfaces, drains, or ventilation system.
- See next three pages for emergency procedures for the following situations:
  - a. Serious injury with contamination**
  - b. Minor injury with contamination**
  - c. Contamination incident without injury**
- Post emergency response signs in all laboratories in which radioactive materials are used (call RSO if a sign is needed).

### **1. SERIOUS INJURY WITH PERSONAL CONTAMINATION**

- A. REPORT:
  - 1. Tell others in the area a spill has occurred and secure area. Keep onlookers out of area.
  - 2. Call Campus Security and give the following information:
    - a. Somebody has been seriously injured in building/room\_\_\_\_\_.
    - b. Radioactivity is involved.
    - c. Your name and the telephone extension you are on.
  - 3. Campus Security will contact the RSO (or designate) and call for medical assistance.

**B. TAKE CARE OF THE INJURED PERSON**

1. CARE TAKES PRECEDENCE OVER CLEAN-UP; HOWEVER, DO ATTEMPT TO LIMIT SPREAD OF CONTAMINATION
2. Evacuate area if powdered, volatile or gaseous activity is released.
3. Apply first aid as necessary.
4. Stay with patient until assistance arrives so you can explain what happened and the apparent extent of contamination.

**C. CONTAMINATION CONTROL:**

1. For a release of powdered, volatile, or gaseous activity, turn off hoods and any critical equipment and evacuate the area. If deemed necessary, seal the doors.
2. For a localized non-volatile liquid spill:
  - a. Prevent spread of material by covering it with absorbent material.
  - b. Wear gloves. Carefully wipe liquid up placing wipes in a plastic bag. Rinse area with water and place wet wipes in bag. Do not dispose of rinse water in sink.
  - c. Survey with thin window GM survey meter to determine if decontamination is complete.
  - d. Laboratory personnel should wait in a non-contaminated area until the RSO arrives. Everyone will be checked for contamination with radiation survey meter.
3. RSO will survey area to determine extent of contamination.

**D. DECONTAMINATION OF VICTIM**

1. Survey clothing; if contaminated, remove, package and label.
2. Decontaminate skin.

**2. MINOR INJURY WITH CONTAMINATION**

**A. REPORT:**

1. Tell others in the area that a spill has occurred. Secure area.
2. Call Campus Security and give the following information:
  - a. Somebody has sustained minor injury in building/room\_\_\_\_\_.
  - b. Radioactivity is involved.
  - c. Your name and the telephone extension you are on.
3. Campus Security will contact the RSO (or designate) come to the laboratory; they will determine if medical treatment is needed.

**B. FIRST AID**

1. Provide first aid as needed.

**C. CONTAMINATION CONTROL:**

1. For a release of powdered, volatile, or gaseous activity, turn off hoods and any critical equipment and evacuate the area. If deemed necessary, seal the doors to the area.

2. For a localized non-volatile liquid spill:
  - a. Prevent spread of material by covering it with absorbent material. Wear gloves.
  - b. Carefully wipe liquid up placing wipes in a plastic bag. Rinse area with water and place wet wipes in bag. Do not dispose of rinse water in sink. Survey with thin window GM survey meter to determine if decontamination is complete.
  - c. Laboratory personnel wait in non-contaminated area until the RSO arrives. Everyone will be checked for contamination with the radiation survey meter.
3. RSO will survey area to determine extent of contamination.

**D. DECONTAMINATION OF VICTIM**

1. Survey victims clothing; if contaminated, remove, package and label.
2. Decontaminate skin.

**3. CONTAMINATION INCIDENT WITHOUT INJURY**

**A. REPORT:**

1. Tell others in the area that a spill has occurred. Secure area.
2. Call Campus Security and give the following information:
  - a. An incident involving radioactivity occurred in: building/room.
  - b. Your name and the telephone extension you are using.
3. Campus safety will contact the RSO (or designate) to come to the laboratory.

**B. CONTAMINATION CONTROL:**

1. For a release of powdered, volatile, or gaseous activity, turn off hoods and any critical equipment and evacuate the area. You may wish to seal the door.
2. For a localized non-volatile liquid spill: (a) prevent spread of spill by covering it with absorbent material and wear gloves, (b) carefully wipe liquid up placing wipes in a plastic bag (c) rinse area with water and place wet wipes in bag (d) do not dispose of rinse water in sink (e) survey with thin-window GM survey meter to determine if decontamination is complete.
3. Laboratory personnel wait in one area until the RSO arrives. Everyone in the area will be checked for contamination with the GC survey meter.
4. RSO will survey area to determine extent of contamination.

**C. DECONTAMINATION OF PEOPLE**

1. Survey clothing; if contaminated, remove, package and label.
2. Decontaminate skin.

## **XII. PERSONNEL AND LABORATORY MONITORING**

### **1. Personal dosimetry**

- A. Film badges must be used in areas which require a "Radiation Area" sign unless this requirement is waived by the RSC.
- B. Film badges and/or bioassay services may be required if employees are potentially exposed to 50% (25% for people under 18 and pregnant women) of the permissible dose. Wear film badges as specified by the RSO whenever exposure to radiation may occur.
- C. When film badges are not in use, store them in the laboratory such that they receive minimal radiation exposure. Don't store them in or on laboratory coat.

### **2. Laboratory surveys carried out by laboratory personnel**

- A. Laboratories in which open radioactive sources are used must have an appropriately calibrated radiation survey meter unless the RSC waives this requirement. The survey meter must be sensitive enough to detect 0.1 mR/hr.
- B. It is the Authorized Individuals responsibility to ensure that these instruments are calibrated annually. The RSO will advise the laboratory when it is time to send the meter in for calibration, and suggest where it can be sent.
- C. During and after the use of radioactive materials, surveys must be performed to show that exposure is ALARA and the spread of contamination has been controlled. Survey work area, storage sites and disposal sinks.
- D. Wipe tests (counted the same way as the experimental samples or brought to the radiation safety office for counting) will also be performed. (Wipe samples in scintillation vials can be brought to the RSO for analysis if desired.) Wipe tests must be sensitive enough to detect 1000 dpm/100 cm<sup>2</sup>.
- E. Survey data must be recorded and maintained in the laboratory. (The RSO will inspect records annually.)
- F. Decontaminate areas found to have high counts. Report non-removable contamination to the RSO.

### **3. Official Laboratory Surveys**

- A. The RSO or his designate will conduct quarterly surveys of laboratories in which radiation sources are handled or stored.
- B. Both a survey meter and wipe tests will be used.
- C. Records of these surveys will include:
  - 1. Identification of equipment used, calibration date, serial number and counting efficiency.
  - 2. Name of person conducting survey.
  - 3. Drawing of area surveyed identifying where samples were located.
  - 4. Data, keyed to drawing.

### **4. Removal of laboratories from the Radiation License**

- A. When radioactive materials will no longer (in the foreseeable future) be handled in the laboratory, it should be removed from the Radiation License.
- B. Likewise, when an Authorized Individual changes labs or leaves the University, his or her laboratories are removed from the Radiation License.

- C. To be removed from the license the laboratory must be carefully surveyed and declared non-contaminated. Then a license amendment is submitted. Signs cannot be removed from laboratories by anyone but the RSO or RSO designate.

**5. Leak Tests**

- A. Sealed beta and/or gamma sources (except for gases) containing material other than tritium, with half-life greater than 30 days, will be tested for leakage prior to initial use and every six months thereafter. These sources need not be leak tested if they are in storage, but must be tested when removed from storage before use or transfer.
- B. Sealed sources containing  $\leq 100 \mu\text{Ci}$  beta and/or gamma emitting material, or  $\leq 10 \mu\text{Ci}$  of alpha emitting material need not be wipe tested.
- C. Sealed alpha sources (except for gaseous form) greater than  $10 \mu\text{Ci}$  will be tested for leakage at least quarterly whether they are in use or not.
- D. Leak tests will be performed by the RSO. Leaking sealed sources cannot be used; they will be taken out of service.