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#### 3.1 INTRODUCTION

The specific procedures required for the proper control of radioactive materials and radiation sources at the University of New Orleans (UNO) are described in this section. Questions concerning these procedures should be directed to the Radiation Safety Office.

#### 3.2 GRANT AND CONTRACT PROPOSALS

All proposals involving the use of radioactive materials or radiation sources must be routed through the Radiation Safety Committee, by checking the appropriate box on the UNO routing form. The project number must be provided in the comments box of the routing form if the work is included under an existing approved Radiation Users Project. If the work is not covered by an existing project, the P.I. should initiate a user application as soon as feasible. No purchase or use of radioactive material or radiation producing equipment is permitted until project approval is obtained. Procedures for the user application process and approval are detailed in Section 3.3.

Upon receipt of the routing form, The Office of Research and Sponsored Programs will inform the Radiation Safety Officer and the members of the Radiation Safety Committee of the proposed work. The P.I. will be instructed by the ORSP to contact the Radiation Safety Committee for a review of the proposed work. Approval will be communicated to the ORSP by the Chair of the Radiation Safety Committee.

#### 3.3 USER APPLICATIONS

Individuals who wish to use radiation sources or radioactive materials in research, development, teaching, or demonstration projects must obtain prior approval from the Radiation Safety Committee. Request shall be by completion and submission of a User Application to the Radiation Safety Committee. Users shall be notified of project approval, in writing, from either the Radiation Safety Officer or the Chairperson of the Radiation Safety Committee. Approval will be granted for a three-year period supposing no change has been made from the original application, after which a renewal approval becomes necessary.

The Application Form requires the date submitted, descriptive title, user's name, department, college, user's employee's identification number, e-mail address, and a general description of the procedures involving the use of sources of radiation. **NOTE:** This description should be general enough to cover most anticipated uses. The applicant must also supply information about his/her training and work experience in handling radiation sources and radioactive materials. The applicant's qualifications must be commensurate with the planned use of sources of radiation.

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User approvals are only issued to principal investigators (faculty, or persons deemed qualified by the Radiation Safety Office). It is the principal investigator's responsibility to provide proof to the Radiation Safety Officer of radiation safety training for all persons involved in radiation related activities under his/her control (see Section 3.4: Training).

Radionuclides or radiation sources and their proposed uses required for the project must be sufficiently described to permit an adequate radiological safety assessment. The use of radiation producing equipment requires separate registration by the Louisiana Department of Environmental Quality. List the total activity of each radionuclide that the user anticipates ordering at any one time and the total activity of each radionuclide that the user expects to possess on hand at any one time on the User Application Form.

Each location where radioactive materials or radiation sources are to be employed and/or stored during the course of the project must be specified. This information is required in order that the Radiation Safety Officer can ensure that the sites conform to the University's radioactive materials license. The Campus Radiation Safety Officer is also required to inspect the specified locations to ascertain that the proposed use of sources of radiation is consistent with all applicable license specifications, state and federal regulations, and University rules and policies.

Indicate the proposed start and end dates for the project in the space provided. All approvals shall expire three years from the approval date, unless the user has indicated an earlier closing date for the project.

Attach a project outline with the User Application Form detailing operational parameters of importance to radiological safety assessment. Standard laboratory practice for handling radioactive materials can be assumed, but deviations from standard practice must be described. Waste handling plans must also be described in detail.

Once the application package is completed, it is to be transmitted to the Radiation Safety Committee for review. This review may include discussions with the applicant and site visits, with specific suggestions for revision of the application. It is the Radiation Safety Committee's responsibility to ensure that the application meets all regulatory standards. Review of User Applications by the Campus Radiation Safety Committee is limited only to matters of radiological safety.

### 3.4 TRAINING

The Campus Radiation Safety Officer shall maintain a list of all persons who have been certified and trained in radiation safety commensurate with their radiation exposure potential. Certification of training shall be one of the following:

- a. Faculty by credentials submitted with the User Application;

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- b. Certification submitted, in writing, from the principal investigator that the person is trained in radiation safety and that he/she has read and understand his/her responsibilities as defined in the Campus Radiation Safety Manual; or
- c. By completing the course offered by the LSU Radiation Safety Office, LSU Medical Center, New Orleans, and passing a subsequent examination.

The Radiation Safety Officer may require the person involved in radiation activities to take the online course offered by the LSU Radiation Safety Office as it is deemed necessary.

In addition to the standard radiation safety training each approved user is required to provide annual in-laboratory training to all persons assigned to or who frequent their laboratories. The following topics shall be covered, but not limited to.

- No eating and drinking (section 5.2)
- Security of radioactive materials (section 3.11 and 3.12)
- Proper waste disposal (section 3.9)
- Laboratory emergencies involving radioactive materials (section 6)

Such training shall be documented in a timely manner and filed in the laboratory for future inspections.

### 3.5 RADIONUCLIDE ORDERS

Only principal investigators may authorize to order radionuclides. Radioactive materials are ordered just as any other materials or supplies with the proviso that the shipment is to be made to the physical address of the Radiation Safety Office. When radioactive materials are ordered, the individual ordering should notify the Radiation Safety Office as to what, how much is being ordered along with the name of the vendor and the anticipated delivery date. The purpose of this notification is to ensure that the shipments are properly processed and available to the user in a timely fashion. When ordering radioactive materials the following information shall be provided to the vendor:

Ship to: Radiation Safety Office  
Room 106A  
Department of Biological Sciences  
University of New Orleans  
2000 Lakeshore Drive  
New Orleans LA 70148

Billing address and name of the principal investigator ordering must appear on the mailing/package slip.

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**3.6 DELIVERY OF RADIOACTIVE MATERIALS**

All radioactive materials destined UNO shall be delivered directly to the Radiation Safety Office. There are only four allowed exceptions to this requirement:

- a. By prior approval of the Campus Radiation Safety Officer, a user may be permitted to retrieve a very-short-lived (less than 24-hour half-life) radionuclide shipment directly from the carrier;
- b. By prior approval of the Campus Radiation Safety Officer, large pieces of equipment containing radioactive materials may be delivered directly to the building where they are to be installed;
- c. By prior approval of the Campus Radiation Safety Officer, no more than 10  $\mu\text{Ci}$  of  $^3\text{H}$ ,  $^{125}\text{I}$ , or  $^{131}\text{I}$  in RIA kits may be delivered directly to the user. A log of receipt and use of kits shall be maintained and submitted to the Radiation Safety Office periodically; and
- d. Liquid scintillation standard of  $^3\text{H}$  or  $^{14}\text{C}$  and sealed check source whose activity is less than 10  $\mu\text{Ci}$ .

With the exception of RIA kits, the Radiation Safety Office must be notified promptly upon arrival of the radioactive materials so that proper inventory and receiving procedures can be completed.

All other radioactive materials are delivered to the Radiation Safety Office to ensure adequate inventory control through the completion of the Disbursement and Inventory Log Form (see Exhibit 3-2) and to ensure proper initial radiation monitoring of packages. State regulations require that the University be able to verify at any time the total quantities of radioactive materials on hand and to show an inspector the physical location of each shipment or prove that it has been properly removed or shipped for disposal. Monitoring packages before distributing them to individual users is required to prevent release of material from broken or otherwise contaminated containers and to permit notifying end-user of excessive radiation levels in order to ensure extra care when the packages are handled.

After the inventory form and package monitoring have been completed, the principal investigator who ordered the radioactive materials will be notified by telephone that the material is available for disbursement.

The inventory form to be issued by the Radiation Safety Office consists of a cover sheet given to the user at the time of disbursement and a duplicate inventory card for internal records that is maintained by the Radiation Safety Office. The duplicate inventory card, which provides space for detailed inventory information is filed according to a serially assigned number when the shipment is received. This serial number identifies the radioactive material during its usage and storage on the campus.

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**3.7 RECEIVING AND MONITORING OF SHIPMENTS**

For the purpose of receiving and monitoring isotope shipments, a "qualified" staff member shall be any person who is authorized by the Campus Radiation Safety Officer to inspect and log-in radioactive packages.

A qualified staff member shall wear latex or vinyl gloves, laboratory coat, and safety glasses at all times during the inspection and opening of any package known or suspected to contain radioactive materials.

All radioactive isotope packages are required to be received and inspected at the Radiation Safety Office, by a qualified staff member, before release to the approved users. Exceptions to this procedure require prior approval by the Campus Radiation Safety Officer. All shipments received by the Radiation Safety Office will be inspected for leakage, breakage, or defective packaging within three hours of receipt.

If the package is affixed with a WHITE I, YELLOW II, OR YELLOW III label, the staff member inspecting the package will measure the external dosage rate at the surface of the package before opening the packaging using a meter suitable for quantitative measurement of beta and gamma radiation levels. If the penetrating exposure rate is greater than 10 mR/hr at the surface of the package it will be opened and inspected only in an approved fume hood and/or area with appropriate shielding intervening between the source and personnel. The outside of **All** packages affixed with a WHITE I, YELLOW II, OR YELLOW III label will be tested for external contamination by means of a smear test. The smear will be measured with the appropriate instrument in order to determine surface contamination levels. The package will not be released from the Radiation Safety

Office if contamination levels greater than 2,200 dpm of beta and gamma total or 220 dpm of alpha per 100 cm<sup>2</sup> are detected. In addition, if these limits are found to have been exceeded, the Radiation Safety Office must notify the final delivery carrier and the Louisiana Department of Environmental Quality by telephone or facsimile.

If the radioactive material is in a special form (sealed source), a contamination smear will be taken from the outer surface of the encapsulation and measured with an appropriate instrument in order to determine surface contamination levels. The package will not be released from the Radiation Safety Office if contamination levels are greater than 185 Bq (0.005 µCi) of removable contamination. If this limit is found to have been exceeded, the Radiation Safety Office must notify the final delivery carrier and the Louisiana Department of Environmental Quality by telephone or facsimile.

Once it is determined that an isotope package is suitable for release, it will be logged in. The log-in procedure checks whether or not the user is approved for the specific isotope and activity as well as assigns a unique serial number to the isotope shipment for tracking purposes. If the potential end user is not approved for a particular shipment for any reason, the shipment will be held at the Radiation Safety Office until proper approval is obtained from the Campus Radiation Safety Officer. If the isotope

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shipment meets all of the requirements for release discussed in this section, the assigned serial number will be inscribed with indelible ink on the innermost container, which actually contains the radioactive material. In the case of a sealed source, a preprinted tag bearing the assigned serial number will be attached to the outer casing or housing of the sealed source. The shipment will be recorded on the master log and the approved user will be notified that it is ready for pickup.

Additional information kept on record concerning each isotope includes the purchase order number, date of receipt, reference date, physical and chemical form of the isotope, activity, volume or weight, specific concentration, manufacturer, and the name of the person who inspected the package.

**3.8 RADIONUCLIDE DISBURSEMENT**

Upon being notified of the arrival of radioactive material, the user who originated the order may pick it up from the Radiation Safety Office or may send a trained member of his/her staff. At the time of transfer, the individual who receives the radionuclide must sign for receipt of the material. **NOTE:** Radioactive materials which must be transported on a public thoroughfare must comply with Department of Transportation regulations. This is accomplished by completing a shipping form.

When the radioactive material is transferred to the user, the cover sheet of the inventory form shall accompany the material. The user is required to maintain on this sheet a cumulative up-to-date record of withdrawals from and ultimate disposition of the material. When the material has been completely used and disposed of, the disposition of the source shall be noted and the completed cover sheet shall be returned to the Radiation Safety Office. Only the principal investigator shall sign "Disposition Certified by" as in Exhibit 3-5.

**3.9 WASTE HANDLING PROCEDURES**

State regulations as well as the University's radioactive materials license impose severe restrictions on waste disposal methods. **NOTE:** Waste that is classified as biohazardous must be certified bionutralized before packaging as radioactive waste.

For this reason, waste disposal is centralized through the Radiation Safety Office. Exceptions to this policy are specifically and individually considered.

**3.9.1 Classification of Waste Materials**

Waste materials can be generally classified as:

- a. Miscellaneous solid waste (glassware, paper towels, dissecting instruments, gloves, etc.);

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- b. Major aqueous waste solutions (reaction solutions, primary dilutions of stock solutions, residual stock solutions, etc.);
- c. Minor aqueous waste solutions (third rinses from glassware, radioactively decayed solutions containing less than microcurie amounts of activity, etc.);
- d. Major organic waste solutions (see b. above);
- e. Minor organic waste solutions (see c. above and liquid scintillation counting solutions);
- f. Animal carcasses;
- g. Animal excreta, botanical wastes, bedding;
- h. Permanently contaminated equipment.

**3.9.2 Disposal of Potentially Contaminated Items**

It is incumbent on the person working with radioactive materials to assure that all waste is discarded properly. This means that unless it is known otherwise, all items in a radiation laboratory are to be considered contaminated. Such items shall be surveyed prior to disposal as uncontrolled released.

**3.9.3 Storage and Labeling**

Wastes in radiation laboratories shall be stored only in approved and appropriately labeled containers. **NOTE:** Any container which could be mistaken for a container for ordinary trash will not be approved. Waste shall be segregated by solid, aqueous liquid, organic liquid, and animal carcasses, excreta and bedding. Radioisotopes with half-lives greater than 100 days may be combined provided no chemical hazard is created. Radioisotopes with shorter half-lives shall be stored separately. Radioisotope waste with half-lives of no more than 36 days may be held in the laboratory for decay. Each container of waste shall have a label to indicate the isotope(s), total quantity in millicuries, and the date the material was placed in the container.

**3.9.4 Waste Packaging**

To ensure that radioactive waste can be handled in a safe and efficient manner the following is required of the generator:

- a. Do not mix solid and liquid waste. If it is determined that waste has been mixed it will be returned to the generator for separation.
- b. Remove all radioactive labels from short half-life waste that is to be held for decay.

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- c. Store bulk liquid waste in containers provided by or approved by the Radiation Safety Office. Waste in unapproved containers will not be picked up. **NEVER USE BREAKABLE GLASS CONTAINERS.** The generator will be required to transfer the waste to an approved container.
- d. Affix a completed radioactive waste tag to each box, bag, or container of the radioactive waste (see Exhibits 3-3 and 3-4).
- e. For certification of final disposition complete the lower portion of the Disbursement and Inventory Log Form (Exhibit 3-5) and return the form to the Radiation Safety Office. This form must be signed by the principal investigator.

#### 3.9.5 Waste Pick-Up

The Radiation Safety Office will schedule radioactive waste pickups from the generating laboratories on a routine basis. By prior arrangement, waste may be brought to the Radiation Safety Office.

#### 3.9.6 Disposal

Waste will be disposed of in one of the following manners:

- a. **INCINERATED:** Disposal by incineration is the preferred method of disposal when incinerator facilities are available. **NOTE:** Sealed sources and large pieces of glass and metal shall be segregated from other dry waste.
- b. **SHIPPED TO A RADIOACTIVE WASTE DISPOSAL SITE:** Solid and organic liquid radioactive wastes with half-lives greater than 100 days will be disposed of in this manner. Cost of disposal will be borne by the generator.
- c. **HELD FOR DECAY:** Radioactive wastes (solid and organic liquid) and radioactive animal carcasses with half-lives of less than 100 days will generally be disposed in this manner. After being held for 10 half-lives, the material may be disposed of as ordinary waste. **NOTE:** Prior to disposal as ordinary waste all containers shall be surveyed to confirm that the radioactive material has decayed. **EXCEPTION:** Animal carcasses and tissues must be disposed of in accordance with any additional regulations pertaining to such materials. **NOTE:** Radiation labels shall be removed before placing this type of waste into a radioactive waste container. **NOTE:** One of the conditions of the broad-scope license is that radioactive waste with a half-life of greater than 36 days must be held for decay exclusively by the Radiation Safety Office.
- d. **DUMPED TO THE SANITARY SEWER:** Water soluble radioactive waste which does not contain hazardous chemicals and metals, i.e., aqueous liquids can be disposed of in the sanitary sewer. The concentration of the radioactive waste and total millicurie quantity



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disposed per year is governed by state regulations. **NOTE:** Prior to disposing of radioactive waste in this manner the generator shall inform the Radiation Safety Office to assure that the concentration and annual quantity released to sanitary sewer are not being exceeded.

- e. DESIGNATED AS HAZARDOUS NON-RADIOACTIVE WASTE: Organic scintillation medium or animal tissue containing 0.05  $\mu\text{Ci}$  of  $^3\text{H}$ ,  $^{14}\text{C}$ , or  $^{125}\text{I}$  or less per mL or gram of material may be disposed of as hazardous waste provided the applicable regulations for the chemicals are followed.

Disposal of radioisotopes by any of these methods requires that permanent auditable records of the amount of disposed material be kept in the generator's office or laboratory. It is the user's responsibility to keep a record of the source serial number from which the waste was generated and the amount generated.

### 3.9.7 Disposal Fees

All costs of the disposal of radioactive waste shall be the responsibility of the generator (approved user).

## 3.10 TRANSFER AND SHIPMENT OF RADIOACTIVE MATERIALS

Federal and state regulations restrict the transfer of radioactive materials to persons and institutions holding valid radioactive materials licenses. A copy of the receiver's radioactive materials license must be provided to the Campus Radiation Safety Officer before the shipment or transfer can be authorized.

The Radiation Safety Office will assist in the transfer, including providing specific information on packaging and labeling packages for shipment and giving advice on acceptable shipment methods, applicable regulations, and restrictions. The department from which the shipment originates shall incur the cost of the transfer. Permanent records of transfers are maintained in the Radiation Safety Office. When particularly hazardous shipments are received or sent, records of personnel exposures, shipping-cask smears, and other pertinent information are maintained in the Radiation Safety Office.

## 3.11 STORAGE OF RADIOACTIVE MATERIALS

Individual users are expected to keep on hand in their laboratories only those radioactive materials that are actively in use or those that they feel must remain in their possession or are being held for decay. The intent of this policy is to reduce as far as possible the number of places on campus where the security of radiological materials might be jeopardized in emergencies such as fires or explosions.

All storage locations must be posted with approved radiation warning signs, which are available from the Radiation Safety Office. Quantities of radioactive material above those limits listed in Table 1 shall be

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secured to prevent removal or unauthorized use. Security may be accomplished in the following manners:

- a person assigned to the laboratory being physically present in the laboratory
- the laboratory locked
- all radioactive materials locked in a cabinet, refrigerator, or freezer
- all radioactive material locked in a properly labeled box of minimum dimensions of 4×6×6 inches
- any radiation producing equipment with an on/off key shall have the key removed and be properly safe-guarded
- sealed sources in portable instruments such as moisture gauges shall be secured by locking or surveillance
- sealed sources in instruments such as  $^{63}\text{Ni}$  electron capture detectors will be considered secure as long as the instrument is not portable

Other methods of security may be approved by the Campus Radiation Safety Committee on request from an authorized user.

TABLE 1  
TOTAL LABORATORY QUANTITIES REQUIRING SECURITY

ISOTOPE*	MICROCURIES
$^3\text{H}$	1000
$^{14}\text{C}$	100
$^{32}\text{P}$	10
$^{35}\text{S}$	100
$^{45}\text{Ca}$	10
$^{51}\text{Cr}$	1000
$^{125}\text{I}$	1

(\*) for isotopes other than those listed above, contact the Radiation Safety Office.

Storage or the consumption of food, beverages, tobacco products, or storage of eating utensils in areas approved for the use or storage of radioactive materials is prohibited. On request by an approved user to the Campus Radiation Safety Officer, exceptions may be made in situations where radiation safety is not compromised. In these cases the area shall be posted as a non-radiation area. Routine house-hold items used in the research laboratory (e.g. casserole dishes, can openers, spatulas spoons) must be labeled not for human consumption of food. Normal food stuffs (e.g. sugar, cornmeal, molasses, powdered milk, etc) used for laboratory rearing of laboratory animals (e.g. fruit flies, etc) must be marked "Not for human consumption."

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#### 3.12 RADIOACTIVE MATERIALS ACCOUNTABILITY

The University is required by the terms of its radioactive materials license and by state regulations to be able to account for all radioactive materials under its control. Records of receipt, disbursement, transfer, and ultimate disposal of radioactive materials are maintained in the Radiation Safety Office, as described in preceding sections of this manual. Records in the Radiation Safety Office must reflect known locations and known users.

Individual users must keep current up-to-date internal records of the radioactive materials they received from the Radiation Safety Office, how the radioactive materials are used, what the current activity of each individual bottle or vial is, and what material has been returned to the Radiation Safety Office. These records need not be highly formal nor extremely detailed, but they must provide the necessary up-to-date information when requested by the Radiation Safety Office. Periodically, the Radiation Safety Office will ask each user to conduct physical inventories of their radioactive materials and to certify that the records are in agreement with those of the Radiation Safety Office.

Transfer of radioactive material between approved users requires prior approval of the Radiation Safety Office. Radioactive material may be used and stored only in rooms previously approved by the Radiation Safety Office. Certain specified radioactive materials on loan from the federal government require additional accountability procedures, which are the responsibility of the Radiation Safety Office.

#### 3.13 REGISTRATION OF MACHINES PRODUCING IONIZING RADIATION

Regulations of the Louisiana Department of Environmental Quality require that all equipment that produces ionizing radiation (unless specifically exempted by the regulations) must be registered with that department, which then issues a certificate of registration to the owner of the equipment. The certificate must be posted on or near the machine. The Radiation Safety Office has the responsibility for submitting registration applications.

Machine sources included under the registration requirement include diagnostic x-ray machines of all classes (e.g. field-portable, fluoroscopic, special-procedures, panoramic-dental, craniological, etc.), therapeutic x-ray machines of all classes (e.g. deep-therapy, superficial-therapy, supervoltage, etc.), industrial x-ray units, analytical instruments (e.g. diffraction, fluorescence, etc.), and accelerators (e.g. synchrotron, cyclotron, electron-therapy systems, etc.).

Although the Radiation Safety Office has the responsibility of completing registration forms, it is incumbent upon individuals initiating purchase of radiation producing equipment to notify the Radiation Safety Office of the arrival of such equipment. Such purchases must have been approved previously by

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the Campus Radiation Safety Officer or the Campus Radiation Safety Committee via a User Application. When a radiation producing machine is moved to a new location or is transferred from the campus, the Radiation Safety Office must be notified to assure that records are current. Physical inventories of radiation-producing equipment will be made on an annual basis. Movement of a radiation-producing machine from one location to another requires prior authorization from the Radiation Safety

Officer that will be granted only after preliminary safety and shielding analyses have been completed.

#### 3.14 NEW FACILITIES APPROVAL

New buildings or renovation of areas in old buildings in which radioactive materials or radiation sources are to be used must be approved by the Radiation Safety Officer and/or the Radiation Safety Committee.

Radiation safety personnel should be involved as early as possible in the planning of new facilities. Proper design considerations can result in significant savings to the University by reducing initial costs and avoiding expensive corrective alterations later.

#### 3.15 PERSONNEL MONITORING

All employees of UNO and its consultants handling radioactive materials or using radiation sources of types and quantity such that it is possible to receive an exposure equal to or greater than ten percent of the applicable radiation dose limit specified by the State of Louisiana and persons operating potentially open beam analytical x-ray equipment shall be included in the radiation monitoring program. Long-term visiting researchers, post-doctoral fellows, and other such persons working with radiation as described above shall also be covered by the program. Other persons may be assigned to the personnel monitoring program at the discretion of the principal investigator and/or the Radiation Safety Officer. Records for persons who are monitored but who do not meet regulatory monitoring requirements will not necessarily be kept.

Students who are enrolled in courses involving the handling of radioactive material or use of radiation sources may be assigned to the radiation monitoring program. The decision to assign or not to assign will be a joint decision between the instructor and the Radiation Safety Officer. If they cannot reach a decision, the Radiation Safety Committee will make the determination. When persons are assigned to the monitoring program they will be asked if they know or have been told whether they have ever received an overexposure of radiation. If the answer is affirmative, the person will not be allowed to work with radiation until the past radiation exposure records have been obtained and evaluated. For other persons, prior exposure histories will not be obtained unless they receive an exposure at UNO of greater than twenty-five percent of the applicable radiation dose limit.

Personnel dosimeters will be exchanged on a frequency from monthly to annually depending on the exposure potential and type radiation being monitored.

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Good practice dictates, and state laws require, that the University provides individual radiation exposure information on an annual basis upon request to the Radiation Safety Office. Further, individuals must be notified if their radiation doses exceed radiation protection guidelines.

The monitoring program includes, where applicable, personnel body dosimeters, personnel extremity dosimeters, rate sensitive area monitors, portable survey instruments, portable and fixed air sampling instruments, surface smears, and bioassay procedures. Personnel dosimetry devices are available for detection of beta, x- and gamma-ray, and neutron radiations. Supporting techniques allow assessment of alpha inhalation hazards. At the time of project approval, the Campus Radiation Safety Officer will determine the type of monitoring techniques required for that project.

Exposure in excess of administrative limits detected on a personal dosimeter requires immediate notification of the wearer, initiation of any appropriate medical assistance, and investigation as to the cause of the exposure. When necessary, the Louisiana Department of Environmental Quality shall be notified of the incident. Anyone who suspects an overexposure should report this immediately to the Radiation Safety Officer.

Records of individual radiation dose histories are maintained in the Radiation Safety Office. Individuals may check their individual records. The Radiation Safety Office will respond to requests for radiation exposure histories from employers after an individual leaves the campus.

**3.16 PROCEDURE FOR BADGING AND FOR INVESTIGATING ELEVATED RESULTS**

Anyone requiring a radiation dosimeter must complete and sign a radiation worker application (see Exhibit 3-6) in order to be enrolled in the radiation monitoring program. If a person has been exposed to radiation over the regulatory allowable limit prior to coming UNO, then contact will be made with the previous employer to obtain a copy of that person's cumulative exposure history. This will be used to closely monitor that person's cumulative exposure while working at UNO.

Dosimeters are issued either on a temporary basis (good for one calendar quarter only) or on a permanent basis. Most new participants are issued a dosimeter for the first quarter of their enrollment in the program within five working days of receipt of the completed dosimeter application. Any participant continuing to work with radioactive materials for longer than one quarter will be placed on the permanent program to receive dosimeter(s) routinely on a quarterly or monthly basis, depending on the exposure potential and type of radiation being monitored.

Prior to the beginning of each wear period, the dosimeters will be replaced by the Radiation Safety Officer.

**Note:** Students working on semester class projects, with permission, are allowed to retain their dosimeters until the end of their class semester.

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After the wear period, dosimeters are packaged and sent to an NVLAP-approved processor for reading. The Radiation Safety Office examines the recorded results upon receipt in order to determine whether or not administrative limits have been exceeded. If a whole body dose equivalent is found to be greater than or equal to 100 mrem, or if a ring dosimeter dose equivalent level is found to be greater than or equal to 1,000 mrem within the time of one wear period depending on the monitoring sites, then the matter will be investigated. The results of the investigation along with any corrective actions will be documented. Individuals will be notified if their radiation doses exceed radiation protection guidelines.

Any participant seeking to be dropped from the dosimeter program must notify the Radiation Safety Office in writing. All letters requesting removal from the dosimeter program are maintained in the Radiation Safety Office.

#### 3.17 SITE MONITORING

The Radiation Safety Office has the responsibility for monitoring all locations where radioactive materials and radiation sources are used or stored. Site monitoring checks are normally made at approximately three-month intervals; no prior notification for such a check is given. More frequent site-monitoring checks will be made if unusual hazards exist or if a significant change from previous monitoring is detected. Users may request special monitoring on a one-time basis or may request more frequent routine monitoring.

Site-monitoring checks includes smears to establish removable contamination levels and, where applicable, portable-survey-meter measurements of radiation levels and surface contamination levels. Monitoring also includes visual inspection of working conditions, observations of operating techniques, storage of waste, labeling of waste containers, posting of warning signs, radioisotope disbursement records, instrument calibration (calibrated annually), records of in-laboratory training, and discussions with site personnel to suggest improvements in radiation safety practices.

Because Radiation Safety Office personnel cannot be present for frequent monitoring in every laboratory, users are encouraged to monitor their own facilities on schedules tailored to their specific needs. **NOTE:** The principal investigator must conduct or ensure that contamination surveys are conducted by his/her staff at the end of each day when "handling" of more than 0.5 mCi of a radionuclide has occurred (see section 3.18.6). The term "handling" entails any activity involving the use of radioactive material. In other words, if a person picks up a vial containing more than 0.5 mCi of radioactive material, then a laboratory survey is required. Records of laboratory monitoring by users shall be maintained in written form within each laboratory for two years (see 3.18.6). These records will be reviewed periodically by the Radiation Safety Office.

Corrective recommendations in writing will be sent to the principal investigator. However, memoranda to the Campus Radiation Safety Committee may become necessary in the event of persistent problems.

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**3.18 PROCEDURE FOR LABORATORY SURVEY INCLUDING ANALYSIS BY RADIATION SAFETY OFFICE****3.18.1 Laboratory Surveys**

The goal of the laboratory survey program is to maximize the ability to detect contamination, excessive exposure levels, and/or procedural problems in all laboratories handling radioactive materials on campus. The survey program is designed to make the most effective possible use of personnel and Radiation Safety Office resources for timely detection and remediation of potential problems in laboratories using radioactive materials.

Each laboratory that handles or stores unencapsulated radioactive materials regardless of isotope or activity shall be surveyed at approximately three-month intervals based on the calendar quarter beginning in the month of January each year.

. Personnel conducting surveys will be those recognized by the Campus Radiation Safety Officer as competent to safely and effectively carry out laboratory contamination surveys.

The person(s) conducting a survey shall wear a laboratory coat and vinyl or latex gloves at all times during a contamination survey. Gloves will be properly disposed of as radioactive waste after surveys for a given work period are completed.

**3.18.2 Opening Laboratory Surveys**

If a laboratory has never been surveyed before or is an inactive laboratory where isotopes were used at some point in the past, an opening survey will be performed before isotopes are used or stored in the laboratory. The principal investigator shall provide a diagram of the basic layout of the laboratory including exits and entrances, benches, desks, sinks, refrigerators, fume hoods, incubators, centrifuges, and waste container(s) as well as indicate on the diagram where the majority of isotope work will be performed (usually on a laboratory bench) as a "work area". This diagram will be used to make up the computer-generated, permanent laboratory diagram to be kept on file at the Radiation Safety Office and submitted with each contamination survey report.

The person conducting the survey will ascertain where the work areas will be. Areas in the laboratory which will actually be tested for surface contamination will be chosen, with top priority given to those areas where the isotope(s) will be handled most frequently (work area) and where the probability of detection of contamination is greatest (floor at exits and entrances, door handles, sinks, fume hoods, refrigerators). Any given laboratory shall have no fewer than six sample areas with samples at exit(s) and entrance(s), floor in front of work area(s), and work area surface(s) always included. These sample areas shall be listed and correspondingly numbered on the laboratory diagram. All appropriate emergency notification, caution, and "Notice To

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Employees" signs will be posted during the opening survey by the person conducting it. The person conducting the survey will then proceed with the Laboratory Survey Procedure as specified in the next section.

### 3.18.3 Laboratory Survey Procedure

Once the sample areas have been established, the person conducting the survey will measure background levels of ionizing radiation in the laboratory using a currently calibrated survey meter connected to a pancake probe (Ludlum Model 44-9 probe or equivalent) where applicable. The surveys will be concentrated in the numbered sample areas. If any given sample location reads greater than or equal to 0.1 mR/hr in the case of gamma or greater than twice background cpm in the case of alpha or beta emitting sources, the measurement will be recorded on the laboratory diagram at the point corresponding to the location in the laboratory where the measurement was taken. **Any reading exceeding these limits will be verbally reported to the Campus Radiation Safety Officer immediately after the survey is completed.** The Radiation Safety Officer will take whatever action deemed appropriate and commensurate with the potential seriousness of the situation.

Samples for removable contamination will be taken with dry polyfoam smears at each of the sample locations. Each smear will be taken so as to cover an area of approximately 100 cm<sup>2</sup> of the numbered sample location. Once taken, the smear will be placed in a correspondingly numbered coin envelope and retained for appropriate analysis.

The person conducting the survey will also check for violations of proper laboratory procedures such as evidence of eating, drinking, or smoking in the laboratory. Any violations noted will be recorded on the laboratory diagram under the section "Comments". The person conducting the survey will verbally report any observed violations to the Campus Radiation Safety Officer or the Assistant Radiation Safety Officer immediately. The Campus Radiation Safety Officer or the Assistant Radiation Safety Officer will confirm the violation and make recommendations to the Campus Radiation Safety Committee as appropriate. Additionally, the isotopes listed on the Radiation Notification Sign will be checked against those listed on the laboratory diagram. If there is a discrepancy, this will also be noted on the laboratory diagram under "Comments".

### 3.18.4 Close-Out Surveys

In order for a close-out survey to be conducted, the principal investigator must notify the Radiation Safety Office at least two weeks in advance that he or she intends to close the laboratory and remove all radioactive materials. Before the close-out survey can be conducted, the principal investigator must demonstrate to the Radiation Safety Office that all isotope sources have been accounted for and that all laboratory equipment and supplies used in connection with radioactive materials have either been properly decontaminated or properly disposed of. Additionally, all radioactive wastes must be accounted for and properly disposed of. Failure to comply could result in civil or criminal penalties against the responsible individual and/or the University. If a principal investigator has left the University without prior notification to the



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Radiation Safety Office, the requirements listed in this section become the responsibility of the head of the department where the principal investigator carried out his or her research activities.

When the requirements set out in this section have been satisfied, the Radiation Safety Officer will conduct a routine laboratory survey including contamination smears and survey meter measurements where applicable. If all samples and measurements are below the action limits, the Radiation Safety Officer will enter the laboratory and conduct a visual inspection for any remaining radioactive materials or equipment. If the laboratory appears to be in good order and there is no evidence of remaining radioactive materials or equipment, all signs and notifications related to radioactive materials usage will be removed from the laboratory. The laboratory will then be removed from the survey list and placed in the inactive laboratories file.

**3.18.5 Laboratory Contamination Smears Analysis**

After laboratory contamination smears have been taken from a laboratory, the samples will be analyzed for radioactive contamination in a liquid scintillation counter.

All smears will be subsequently counted in a liquid scintillation counter calibrated for the detection of beta emitting isotopes.  $^{14}\text{C}$  and  $^3\text{H}$  standard vials and blank control will be run along with each group of samples counted with the liquid scintillation detector.

**3.18.6 Laboratory Surveys by Approved Users**

A laboratory survey shall be conducted by the approved user on any day that more than 0.5 millicuries of radioactive material has been used or handled. **NOTE:** Handling is defined as the touching or picking up a vial or container containing radioactive material. Laboratory surveys may be conducted by swiping surfaces with styrofoam tabs and subsequent counting in the appropriate counting equipment, or in the case of energetic beta emitters and gamma emitters, by survey with the appropriate radiation survey instrument. Typical survey instruments will not detect the presence of  $^3\text{H}$ ,  $^{35}\text{S}$  or  $^{14}\text{C}$ . All survey results shall be documented in writing and retained in the laboratory for a period of two years.

**3.19 LEAK TESTING OF SEALED SOURCES**

Procedures for leak testing of sealed sources are as follows:

- a. All sealed sources greater than 100  $\mu\text{Ci}$  and all sealed alpha sources greater than 10  $\mu\text{Ci}$  shall be leak tested upon arrival at the Radiation Safety Office.

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- b. Sealed sources that are greater than 100  $\mu\text{Ci}$ , designed not to emit alpha particles, and not stored under the direct control of the Campus Radiation Safety Officer, shall be leak tested at six-month intervals.
- c. Sealed sources that greater than 10  $\mu\text{Ci}$ , designed to emit alpha particles, and not stored under the direct control of the Campus Radiation Safety Officer, shall be leak tested at three-month intervals.
- d. At the time any sealed source is removed from storage, leak testing shall be conducted before it is released or transferred for use.
- e. Occasionally, certain sources shall be leak tested either more or less frequently at the stipulation of the Louisiana Department of Environmental Quality.
- f. Leak tests are generally obtained by using a dry cotton swab (Q-Tip) to wipe the outside surface of the container.
- g. Records of sealed-source leak tests shall be maintained by the Radiation Safety Office.

#### 3.20 FEES

Users are responsible for all costs associated with the use of radioactive materials and equipment.

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#### 3.21 DECLARED PREGNANT WOMEN

Once a woman has declared, in writing, that she is pregnant, the allowable dose equivalent to the embryo/fetus during the entire pregnancy, due to occupational exposure, is not to exceed 0.5 rem. The regulatory definition of a declared pregnant woman is:

"A woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception."

### **3.22 SPECIAL SERVICES**

Personnel on the Radiation Safety Committee are available for confidential consultation on all problems related to radiation hazards and their control.

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## EXHIBIT 3-1

## RADIATION SAFETY OFFICE

Telephone 280-1364 ♦ Fax: **APPLICATION TO USE RADIATION SOURCES AND/OR RADIOACTIVE MATERIALS**

Applicant \_\_\_\_\_ Employee # \_\_\_\_\_  
College \_\_\_\_\_ Department \_\_\_\_\_ Office \_\_\_\_\_  
Phone (office) \_\_\_\_\_ Phone (home) \_\_\_\_\_ E-mail \_\_\_\_\_  
Assistant \_\_\_\_\_ Laboratory Phone \_\_\_\_\_  
Phone (office) \_\_\_\_\_ Phone (home) \_\_\_\_\_ E-mail \_\_\_\_\_

**Attach** an outline of the proposed use of radiation sources and/or radioactive material to be considered for approval. Provide sufficient detail to permit evaluation of potential radiation hazards, including procedures assuring radiation control, waste handling, etc.

**List** your training and experience in the handling of radioactive material and radiation sources

**List** radionuclides to be used and possessed

Radionuclide \_\_\_\_\_ : Possession Limit \_\_\_\_\_ mCi; Shipment Limit \_\_\_\_\_ mCi  
Radionuclide \_\_\_\_\_ : Possession Limit \_\_\_\_\_ mCi; Shipment Limit \_\_\_\_\_ mCi  
Radionuclide \_\_\_\_\_ : Possession Limit \_\_\_\_\_ mCi; Shipment Limit \_\_\_\_\_ mCi  
Radionuclide \_\_\_\_\_ : Possession Limit \_\_\_\_\_ mCi; Shipment Limit \_\_\_\_\_ mCi

**List** location(s) where radiation sources and/or radioactive materials will be used or stored. Please provide a diagram of the basic layout of the laboratory including exits and entrances, benches, desks, sinks, refrigerators, fume hoods, incubators, centrifuges, and waste container(s) as well as indicate on the diagram where the majority of isotope work will be performed as a "work area".

Building \_\_\_\_\_ Room(s) \_\_\_\_\_

**Survey Meter** Manufacturer \_\_\_\_\_ Model \_\_\_\_\_ Serial # \_\_\_\_\_ Calibration Date \_\_\_\_\_

Applicant Signature \_\_\_\_\_ Date \_\_\_\_\_

☐ I acknowledge that the department is responsible to see that the above named person closes out all issues related to radioactive material prior to that person leaving the University. The department will bear the cost of resolving all unresolved issues.

Department Chair \_\_\_\_\_ Date \_\_\_\_\_

### SECTION 3

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## EXHIBIT 3-2

RADIATION SAFETY OFFICE

Telephone: 280-1364

## DISBURSEMENT AND INVENTORY LOG

Radionuclide\_\_\_\_\_ Total Activity<sup>(\*)</sup>\_\_\_\_\_ Serial # \_\_\_\_\_

Dept. Ordering\_\_\_\_\_ Individual\_\_\_\_\_ Purchase Order\_\_\_\_\_

Supplier \_\_\_\_\_ Catalog # \_\_\_\_\_ Date Received \_\_\_\_\_

Specific Activity\_\_\_\_\_ Date Assayed\_\_\_\_\_ Total Vol.(wt) \_\_\_\_\_

Form

Inspected \_\_\_\_\_ Radiation Level \_\_\_\_\_ Smear Test \_\_\_\_\_

(\*) Total below must equal "Total Activity" above when the final disposition of the source is tallied

[illegible]

NOTICE TO USER: Use this form to maintain inventory and to record final disposition of this source

DISPOSITION:           Decayed                                 \_\_\_\_\_ mCi

Dry Radioactive Waste	
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Sanitary Sewer

Scintillation Fluid as Waste

Other as \_\_\_\_\_

\_\_\_\_\_

DISPOSITION

CERTIFIED BY: \_\_\_\_\_ Total<sup>(\*)</sup>

## SECTION 3

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## EXHIBIT 3-3

RADIATION SAFETY OFFICE

Telephone: 280-1364

## RADIOACTIVE WASTE TAG

Principal Investigator: \_\_\_\_\_

Location: \_\_\_\_\_

Date Radwaste Received: \_\_\_\_/\_\_\_\_/\_\_\_\_

Check category of package and describe below	H-3 and/or C-14	Half-life less than 100 days	Heavy elements mass>209	Any other nuclides
1. Dry solid				
2. Aqueous waste				
3. Organic waste			XXX NOT ALLOWED XXX	
4. Vials				
5. Other liquids				
6. Other materials				
7. Animal or other biological				

## Description of Material

Description of Material	Isotope	Amount
_____	_____	mCi
_____	_____	mCi
_____	_____	mCi

Solid Containers: \_\_\_\_\_ ft<sup>3</sup>

Liquid Containers: \_\_\_\_\_ gal.

Vials (total): \_\_\_\_\_ vials

For Radiation Safety Office Use Only:

Total Volume: \_\_\_\_\_ % of barrel

## SECTION 3

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## EXHIBIT 3-4

RADIATION SAFETY OFFICE

Telephone: 280-1364

## SAMPLE OF COMPLETED RADIOACTIVE WASTE TAG

Principal Investigator: H.J. MullerLocation: Life Sciences 1234Date Radwaste Received: 01/02/2003

Check category of package and describe below	H-3 and/or C-14	Half-life less than 100 days	Heavy elements mass>209	Any other nuclides
1. Dry solid	√			Sr-90
2. Aqueous waste				
3. Organic waste			XXX NOT ALLOWED XXX	
4. Vials				
5. Other liquids				
6. Other materials				
7. Animal or other biological				

## Description of Material

Isotope	Amount
H-3 _____	2.5 _____ mCi
C-14 _____	1.2 _____ mCi
Sr-90 _____	0.6 _____ mCi

Solid Containers: _____	10 _____	ft <sup>3</sup>
Liquid Containers: _____		gal.
Vials (total): _____		vials

For Radiation Safety Office Use Only:

Total Volume: \_\_\_\_\_ % of barrel

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**EXHIBIT 3-5**

RADIATION SAFETY OFFICE

Telephone: 280-1364

### SAMPLE OF COMPLETED DISBURSEMENT AND INVENTORY LOG

Radionuclide <u>H-3</u>	Total Activity <sup>(*)</sup> <u>3.0 mCi</u>	Serial # <u>12345</u>
Dept. Ordering <u>Chemistry</u>	Individual <u>Marie Curie</u>	Purchase Order <u>12345678</u>
Supplier <u>ICN</u>	Catalog # <u>23456</u>	Date Received <u>01/02/2003</u>
Specific Activity <u>10 Ci/mmole</u>	Date Assayed <u>12/30/2002</u>	Total Vol.(wt) <u>0.01 mL</u>

Form

water

Inspected <u>A. Einstein</u>	Radiation Level <u>N/A</u>	Smear Test <u>N/A</u>
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(\*) Total below must equal "Total Activity" above when the final disposition of the source is tallied

[illegible]

NOTICE TO USER: Use this form to maintain inventory and to record final disposition of this source

DISPOSITION:	Decayed	0.00	mCi
	Dry Radioactive Waste	1.25	
	Sanitary Sewer	0.50	
	Scintillation Fluid as Waste	1.25	
	Other as		

DISPOSITION

CERTIFIED BY: \_\_\_\_\_ 3.00 Total (\*)



## RADIATION SAFETY OFFICE

UNIVERSITY OF NEW ORLEANS

## Campus Radiation Safety Manual

Previous Revision: May 1999

Current Revision: July 2012

## SECTION 3

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## EXHIBIT 3-6

RADIATION SAFETY OFFICE

Telephone: 280-1364

## SAMPLE OF RADIATION WORKER APPLICATION

UNO RADIATION SAFETY OFFICE

Radiation Worker Application

FIRST NAME: \_\_\_\_\_ LAST NAME: \_\_\_\_\_  
DEPARTMENT: \_\_\_\_\_ DEGREE: \_\_\_\_\_  
ADDRESS: \_\_\_\_\_ E-MAIL: \_\_\_\_\_  
OFFICE PHONE: \_\_\_\_\_ LABORATORY PHONE: \_\_\_\_\_  
BIRTH DATE: \_\_\_\_\_ SOCIAL SECURITY #: \_\_\_\_\_  
SEX: \_\_\_\_\_ EMPLOYMENT TYPE: \_\_\_\_\_  
P.I.: \_\_\_\_\_ STARTING DATE: \_\_\_\_\_

TRAINING DATE INFORMATION

\_\_\_\_ / \_\_\_\_ / \_\_\_\_ certified by P.I.

\_\_\_\_ / \_\_\_\_ / \_\_\_\_ online course offered by the Radiation Safety Office

DOSIMETRY INFORMATIONRING BADGEWHOLE BODYPARTICIPANT# \_\_\_\_\_ ISSUED: ☐ ☐

TEMPORARY BADGE# \_\_\_\_\_

Have you ever been told that you have been exposed to radiation over the allowable limit?

Yes \_\_\_\_\_ No \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

ADDITIONAL NOTES:

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