Radiation Safety Manual

Reviewed August 2025

University of Idaho
Environmental Health and Safety

Part 100: Introduction

100.10 Introduction - The University of Idaho recognizes the importance of radioactive materials and radiation-producing equipment in the teaching and research activities conducted at the university. The purpose of this Radiation Safety Manual is to promote these beneficial activities while providing procedures which will ensure that all activities comply with the university's radioactive materials license, and registration of radiation-producing equipment.

100.20 Applicability - All personnel who use University of Idaho facilities, or who participate in University of Idaho sponsored activities which involve the use of radioactive materials or radiation-producing equipment, are expected to comply with the provisions of this manual. This applies to all personnel whether they are employees or students at the university.

100.30 Reference to Federal Regulations - The provisions of this manual are designed to ensure compliance with Nuclear Regulatory Commission regulations. The Code of Federal Regulations, Title 10, is considered an integral part of this Radiation Safety Manual and should be consulted whenever additional information is needed. These regulations are available at the Environmental Health and Safety Office.

100.40 Reference to State Regulations - The provisions of this manual are designed to ensure compliance with Idaho Radiation Control regulations concerning radiation-producing equipment. These regulations are considered an integral part of this Radiation Safety Manual and should be consulted whenever additional information is needed. These regulations are available at the Environmental Health and Safety Office.

100.50 Radiation Safety Committee - Under the university's radioactive materials license and registration of radiation-producing equipment, the authority for administration of a comprehensive radiation safety program is delegated to the Radiation Safety Committee.

100.60 Revocation of Approval - Failure of an individual to comply with the provisions and procedures in this manual or any other special provisions and procedures specified by the Radiation Safety Committee can result in the committee revoking the individual's approval of working with radioactive materials and/or radiation-producing equipment. In addition, any radioactive materials or radiation-producing equipment possessed by this individual may be confiscated or their use prevented.

100.70 Threat to Health, Property, or the Environment - The radiation safety officer or designee is authorized to restrict access to a laboratory or an area or to immediately terminate a project, process or any other procedure that poses an imminent danger to health, property or the environment.

Part 150: Organizational Structure

150.10 Introduction - The authority and inherent responsibilities of a comprehensive radiation safety program are delegated to the Radiation Safety Committee. The authority and responsibilities of the Radiation Safety Committee are listed below. A certain portion of the committee's authority and responsibility is assigned to the radiation safety officer or designee. The individual user is accountable for the safe operation of his/her activities involving the use of radioactive materials or radiation-producing equipment according to procedures specified in this manual and by the Radiation Safety Committee.

150.20 The Radiation Safety Committee:

A. The Radiation Safety Committee is responsible for all matters pertaining to the formulation, administration, and operation of a comprehensive radiation safety program at the University of Idaho. This committee shall also provide consultation to the individual researcher concerning safety procedures when using radioactive materials or radiation-producing equipment.

B. The committee has the authority to approve or disapprove of any proposed use of radioactive material or radiation-producing equipment; to stop and prevent any existing use of radioactive material or radiation-producing equipment, and; to approve or disapprove of, or prevent, an individual to possess, store or use radioactive materials.

C. The committee shall be composed of the radiation safety committee chairperson, radiation safety officer, budget director, safety officer, an academic dean or department chair, and up to eight technical members with broad representation from various departments using sources of radiation. A technical member must meet the requirements of an authorized user, and either be an active user of radioactive materials or radiation-producing equipment or have previously been an active user of radioactive materials or radiation-producing equipment. The radiation safety officer, budget officer, and safety officer shall be permanent voting members.

D. To provide the necessary expertise and continuity of operation, the radiation safety committee chairperson and technical members may serve consecutive terms. Two members, who have served the normal three-year term, will be allowed to continue to serve on the committee.

E. A quorum shall consist of the radiation safety committee chairperson, radiation safety officer, budget officer, and a minimum of four technical members.

F. The Radiation Safety Committee shall meet as required to discharge its obligations, but at least quarterly.

G. The Radiation Safety Committee shall conduct an annual review of the radiation safety program. This review shall include, but not be limited to, the following:

1. An examination of personnel dosimetry results.
2. An evaluation of Nuclear Regulatory Commission, state, and radiation safety officer inspections.
3. An evaluation of compliance by users with radiation safety requirements.

4. A performance evaluation of the radiation safety officer.
5. An assessment of the radiation safety manual requirements.
6. An evaluation of any reported accidents or incidents.
7. An assessment of the review process used to evaluate applications to use radioactive materials and radiation-producing equipment, and the limits authorized thereby.
8. An audit of the university's ALARA (As Low As Reasonably Achievable) policy and program, to ensure exposures and effluent releases are maintained at a minimum.

The Radiation Safety Committee will take action to correct any observed deficiencies or inadequacies in the university's radiation safety program.

150.30 The Radiation Safety Committee Chairperson:

A. The primary duties of the chairperson shall be to schedule and chair all meetings of the Radiation Safety Committee and to ensure that license applications are promptly processed.

B. The chairperson will be selected each spring by the current members of this committee to serve for the next school year (starting August 1). In addition, the Nuclear Regulatory Commission must also approve the selection of the chairperson.

C. The chairperson will provide an annual evaluation of the radiation safety officer's performance to the director of human resources and risk management.

D. The term of office is for one year. The chairperson may serve two consecutive terms.

150.40 The Radiation Safety Officer:

A. The radiation safety officer is the secretary of the Radiation Safety Committee, and as such maintains records of the committee's proceedings and decisions.

B. He/she is responsible for implementing the policies of the committee.

C. Requests for approval of new uses of radioactive materials or radiation-producing equipment or requests to modify existing programs shall be submitted to the Radiation Safety Committee through the radiation safety officer.

D. Specific duties of the radiation safety officer include the following:

1. Provide consultation services related to the radiation safety program to all personnel.
2. Provide training courses or other instruction in radiation safety for students and employees.
3. Investigate incidents involving radioactive materials, radiation-producing equipment, or exposure to radiation, and assist with decontamination procedures when necessary.
4. Reports accidents, exposures, and/or incidents as required by Nuclear Regulatory Commission regulations.
5. Coordinate personal dosimetry services for individuals as needed.
6. Receive radioactive materials sent to the university and deliver to the appropriate user.
7. Maintain an inventory of all radioactive materials and radiation-producing equipment at the university.

8. Conduct leak tests of sealed sources as required.
9. Conduct inspections and surveys of laboratories and facilities where radiation hazards may exist to ensure compliance.
10. Arrange for calibration of instruments used by radiation safety personnel.
11. Maintain all records pertinent to the radiation safety program.
12. Provide for storage of all radioactive materials and radiation-producing equipment not currently in use.
13. Coordinate the packaging and shipping of all radioactive materials and radiation-producing equipment leaving the university.
14. Provide for proper disposal of radioactive materials.
15. Update the committee and authorized users of regulatory changes as appropriate.
16. Serve as liaison to the regulatory agencies.

E. The radiation safety officer or designee shall have the right to enter any laboratory or area using radioactive materials or radiation-producing equipment for the purpose of fulfilling the duties of this position.

F. The radiation safety officer may delegate some of his/her responsibilities and duties to other Environmental Health and Safety personnel provided these employees have been properly trained and have been approved by the radiation safety officer.

G. Line of supervision is to the safety officer, then the director of human resources and risk management, and then the financial vice-president.

Part 200: ALARA

200.10 Introduction - The unique property of radioactive materials and radiation-producing equipment to emit energy in the form of particle or electromagnetic radiation, which can cause biological damage, is the primary concern of any radiation safety program. The federal government has established limits on the amount of radiation personnel may receive. However, it is the intent of a radiation safety program, and a regulatory requirement, to maintain as low as possible the amount of radiation received by an individual. This concept is called **A**s **L**ow **A**s **R**easonably **A**chievable - ALARA. It is the responsibility of the university and those individuals using radioactive materials and radiation-producing equipment to always practice ALARA.

200.20 Complying with ALARA - This radiation safety manual has been provided to assist the user in complying with the concept of ALARA. By following the provisions of this manual, the user will be able to minimize or eliminate any unnecessary exposure to radiation while using radioactive materials or radiation-producing equipment.

Part 300: Obtaining Authorization to Use Radioactive Materials

300.10 Introduction - Any person who wishes to use radioactive materials shall first obtain authorization from the Radiation Safety Committee. A written request following the format in Part 300.20 shall be submitted to the Radiation Safety Committee via the radiation safety officer. The request will be reviewed by the radiation safety officer prior to any action taken by the Radiation Safety Committee.

300.20 Format for Application to Use Radioactive Materials:

A. Section 1 - User Information - Provide the information listed below.

1. Name
2. Department
3. Office
4. Phone Number

B. Section 2 - Type and Maximum Quantity of Radioactive Material(s) Requested - List each radioisotope and the possession limit required. Please be reasonable in requesting possession limits but also allow enough to cover the storage of waste and for acquisition of new material.

C. Section 3 - Description of Intended Use of Radioactive Materials - The description must include sufficient detail so that the Radiation Safety Committee will have a clear understanding of the intended use. Detailed protocols and experimental procedures no longer than three pages each may be included as appendices in the application. Do not include reprints of publications. Please be careful not to use language, jargon or phrases that are specific to your type of research.

D. Section 4 - Personnel, Experience and Training - List all personnel, including yourself, employees, and students, who will be present during the use of radioactive materials. Refer to Part 600 for definitions and rules regarding user categories. List the user status for each person. For authorized and general supervised users, include the training and experience for each user.

E. Section 5 - Location of Use - List all locations where radioactive materials will be used and whether they will be a restricted or unrestricted area (please refer to Part 305 for an explanation of restricted versus unrestricted areas). Indicate which rooms will be the main areas of use, which will be storage locations, which areas are equipment rooms, and which areas will have minimal use. Also, include a description of the facilities (fume hoods, freezers/refrigerators, other equipment) that are available and will be used for research with radioactive materials.

NOTE 1: A workplace, workspace, room, or laboratory where radioactive materials are used is defined as the entire space enclosed by fire-resistive boundaries.

NOTE 2: Some rooms or areas may be used by more than one authorized user. In these situations, a central use log must be maintained by all users that identifies the user(s), describes the activities that were conducted, and records the time and date. Applicants must

indicate in their applications if they will be using radioactive materials in a multi-user space. The radiation safety officer or designee can be contacted to determine if a space is being used by another user(s).

F. Section 6 - Radiation Detection Instrumentation - Include a description of the types of radiation detection instrumentation that will be used for analysis, surveying, and personnel monitoring. List the instruments by manufacturer, model number, and type of detector, if applicable.

G. Section 7 - Waste Disposal and Storage - Describe the type(s) of waste material that will be generated, the chemical or biological characteristics associated with the waste(s), and the method(s) of disposal. Please refer to Part 340 for waste disposal information.

H. Section 8 - Personnel Safety - Indicate if any personnel monitoring or bioassays are required and for what isotopes. Describe any special monitoring or safety practices that would be necessary for the types of activities conducted. Please account for routes of entry of radioactive materials (e.g., skin contact/absorption, ingestion, inhalation, etc.) and radiation exposures and how personnel will be protected (e.g., personal protective equipment, fume hoods, safety devices, etc.).

I. Section 9 - Signatures and Date - The authorized user(s) must sign and date the application. By signing the application, each authorized user affirms that he/she has read the University of Idaho Radiation Safety Manual and is aware of the requirements for using radioactive materials.

300.30 Departmental and College Responsibilities - The department chair and college dean must also review and sign the application. Approval by the department chair and college dean affirms that he/she is aware of the research being conducted by the authorized user and that adequate facilities and equipment are available for this type of research. Departmental and college approval also affirms that if the authorized user is unable to pay any costs resulting from the use, acquisition, and storage of radioactive materials (e.g., resignation or termination of employment, insufficient teaching or research funding, etc.), the department and/or college has an obligation to pay these costs.

300.40 Submittal of Application - The applicant will submit one copy of the Application to Use Radioactive Materials with original signatures to the radiation safety officer. The radiation safety officer will evaluate the application prior to review by the Radiation Safety Committee and recommend changes or corrections, if any, to the applicant.

300.50 Radiation Safety Committee Responsibilities:

A. The committee shall review each application and ascertain that:
   1. The applicant has suitable training, experience, facilities, and equipment to safely use and/or conduct experiments involving radioactive materials;
   2. Adequate operating and handling precautions are taken by the applicant; and
   3. The safety of personnel and the general public are protected.

B. The committee may request more information from the applicant before reaching a decision. The decision of the Radiation Safety Committee is final.

C. The committee shall notify the applicant in writing of the disposition of the application and shall specify terms under which the use of radioactive materials is authorized.

D. The committee shall also provide to the radiation safety officer, any instructions for personnel monitoring, surveying, required posting of caution signs, etc., it deems appropriate and as required by the Nuclear Regulatory Commission regulations.
E. Upon approval by the Radiation Safety Committee of the application to use radioactive materials, the authorized user shall receive a Radioactive Materials Authorization Form RSM-1M and a unique authorization number.

300.60 Changes in Authorized Use - Users who have been authorized to use radioactive materials must amend their authorization whenever there will be a change in the use of the radioactive materials. These changes include, but are not limited to, the following:

1. Changes in the type of radioactive material.
2. Changes in the possession limit of a radioactive material.
3. Changes in the intended use of a radioactive material (if the user is in doubt about what is a change in the intended use, please contact the radiation safety officer or clarification).
4. Changes in the location of use of a radioactive material.
5. Changes in the status of individual users (e.g., from a direct supervised user to a general supervised user).
6. Changes in waste disposal methods.

The user must request and receive approval from the Radiation Safety Committee prior to initiating the change.

The radiation safety officer is allowed to approve changes in the possession limit of a previously approved radioisotope, changes in the location of use, changes in the disposal limits for liquid radioactive waste, and changes in the status of an individual user. This approval will only be temporary until acted upon by the Radiation Safety Committee at the next scheduled committee meeting.

300.70 Renewal of an Authorization - The authorization issued by the Radiation Safety Committee is effective for three years. To renew an authorization, the user shall submit a full application to the Radiation Safety Committee via the radiation safety officer thirty days prior to the stated expiration date. The renewal application must include a cover page summarizing any changes from the previous application. In addition, the user may reference in the renewal application previously submitted experimental protocols and procedures if there have been no changes.

Part 305: Classification of Restricted Versus Unrestricted Areas and Uses

305.10 Introduction - The Nuclear Regulatory Commission bases many of its radiation safety requirements on the concept of restricted versus unrestricted. An authorized user will determine if their area will be classified as a restricted area or unrestricted area by following the requirements described below. The main differences between the two classifications are whether radioactive materials are used or just stored, the level of control needed for preventing access to radioactive materials by unauthorized personnel, and the limits allowed for radioactive contamination and exposure to radioactive materials.

There may be a hybrid of the two, where during the actual use of radioactive materials, the area is considered a restricted area. After the use is completed, if contamination levels and airborne concentrations of radioactive materials are below the unrestricted limits and access to the radioactive materials is controlled, the area can then be considered an unrestricted area.

305.20 Restricted Area or Use Requirements:

A. Use or Storage - Radioactive materials may be used or stored in a restricted area.
B. Access - Access to a restricted area must be controlled by the authorized user. If access is controlled, such as by locking the laboratory door(s) or by maintaining constant surveillance of the area, then radioactive materials within the area do not need to be secured (e.g., within locked cabinets, freezers, refrigerators, etc.).
C. Training - All personnel who enter a restricted area must receive training at a level appropriate to their duties within the restricted area (see Part 600.20 (A) and (C)).
D. Contamination Limits - Allowable contamination limits in a restricted area are specified in Part 900. Contamination levels exceeding these limits must be decontaminated.
E. Airborne Radioactive Material Concentrations - Allowable airborne radioactive material concentrations are specified in Part 900.

305.30 Unrestricted Area or Use Requirements:

A. Use or Storage - Only storage of radioactive materials is allowed in an unrestricted area.
B. Access - Radioactive materials present in an unrestricted area must not be accessible to the public, either by placing the radioactive materials in a locked area or by maintaining surveillance of the area.
C. Training - No specific training is required for unrestricted areas.
D. Contamination Limits - Contamination levels must not exceed the limits specified in Part 900 for unrestricted areas.
E. Airborne Radioactive Material Concentrations - Airborne radioactive material concentrations must not exceed the limits specified in Part 900 for unrestricted areas.
F. Exposure Limits - Radiation levels may not exceed 2 millirems per hour in an unrestricted area.

305.40 Release of Items or Equipment for Unrestricted Use - Items or equipment that had been previously used with radioactive materials must meet the decontamination requirements of Part 900 for unrestricted use. Work involving radioactive materials should plan to use items that can be disposed of as radioactive waste whenever possible.

305.50 Termination Surveys - When the use of radioactive materials is to be terminated within a laboratory or space due to users leaving the university, the work requiring the use of radioactive materials is completed and radioactive materials are not anticipated to be used again, a change in location from one space to another, or for some other reason, then a termination survey must be conducted by the radiation safety officer or designee.

A laboratory or other space may not be used until a termination survey has been completed by the radiation safety officer or designee and all contaminated areas have been cleaned.

The authorized user must account for all radioactive materials, including wastes, decontaminate any contaminated areas found during the termination survey, have all the required paperwork completed, return any radioactive waste containers and shields borrowed from the radiation safety officer or designee, and return all radiation monitoring badges.

It is the responsibility of the department head/chair to verify that the radiation safety officer or designee has been contacted prior to any of the above changes, that a termination survey has been conducted, and that the laboratory or space will not be used until approved by the radiation safety officer or designee.

Part 310: Acquisition of Radioactive Materials

310.10 Introduction - Radioactive materials may be obtained by several methods. The major source of radioactive materials is the purchase of radioisotopes and sealed sources from commercial vendors. Other sources include, but are not limited to, surplus or donated radioactive materials, neutron activation material, the transfer of materials from one user to another, and the transfer of material from another institution or organization to the University of Idaho.

Regardless of the method used to acquire radioactive material, users must have authorization from the Radiation Safety Committee or written permission from the radiation safety officer before they can obtain radioactive material.

310.20 Ordering Radioactive Materials - Personnel who have received authorization from the Radiation Safety Committee to use radioactive material can order materials by complying with the following steps:

A. Complete a requisition describing the radioactive material(s) to be ordered. Type "RADIOACTIVE MATERIALS" on the first line in the Description section of the requisition form. Departmental Purchase Orders (DPOs) may not be used to order radioactive material.

B. Complete the Permit to Purchase Radioactive Materials Form RSM-2M and attach to the requisition.

C. Obtain the signature of the radiation safety officer or designee.

D. Follow the normal procedures for processing a requisition.

E. It shall be the responsibility of Purchasing Services to ensure all requisitions are accompanied by a completed Permit to Purchase Radioactive Materials Form RSM-2M before issuing a purchase order.

The purchase order must be addressed as follows:

Name of Authorized User
c/o Radiation Safety Officer
Environmental Health and Safety
University of Idaho
1108 West Sixth Street
Moscow, ID 83844-2030

F. For those departments processing requisitions electronically, complete the Permit to Purchase Radioactive Materials Form RSM-2M, obtain the radiation safety officer or designee's signature, and forward the form to Purchasing Services. Purchasing Services will match the requisition with the Permit to Purchase Radioactive Materials form.

G. Before processing an order for radioactive materials, a vendor must have in possession a valid copy of the university's radioactive materials license. Please contact the radiation safety officer or designee to verify if a vendor has a current copy of the university's radioactive materials license on file or requires a copy.

310.30 Receipt of Radioactive Materials:

A. All shipments of radioactive materials to the University of Idaho shall be received by the radiation safety officer, unless other arrangements have been approved by the radiation safety officer. The radiation safety officer or designee will inspect the package and record its receipt.

B. The radiation safety officer or designee will deliver the package to the authorized group. It shall be the duty of the radiation safety officer or designee to ensure that all shipments of radioactive materials received are processed and made available to the user within the same day of their delivery.

C. Deliveries of radioactive materials to the authorized user, except sealed sources, shall be accompanied by a "Checklist for Receipt of Radioactive Materials" form. This form describes procedures to be followed by the user when checking in and surveying the package and must be completed within the time limit specified on the form. The form must be returned to the radiation safety officer within three working days.

D. Any leakage of radioactive materials from the package, any severe contamination found within the package, or any other unusual event shall be reported immediately to the radiation safety officer or designee.

310.40 Neutron Activation - Users must obtain a release form from the radiation safety officer or designee before obtaining irradiated materials at Washington State University's nuclear reactor. Irradiated materials must first be brought to the Environmental Health and Safety Office after arriving on campus for check-in and monitoring requirements.

310.50 Facilities Located Outside of Moscow - Procedures for obtaining and receiving radioactive materials at university facilities located outside of Moscow shall be determined by the Radiation Safety Committee at the time of authorization.

310.60 Transfer of Radioactive Materials:

A. Radioactive materials may be transferred from an authorized user to the radiation safety officer for waste disposal.

B. Radioactive materials may be transferred from one user to another upon written approval of the radiation safety officer or designee, providing the receiving user is authorized to use the materials being transferred.

C. Approval from the radiation safety officer or designee shall be required before transferring radioactive materials to or away from the University of Idaho.

310.70 Surplus or Donated Radioactive Materials - Personnel obtaining surplus or donated radioactive material shall obtain approval from the radiation safety officer before acquiring this material. The radiation safety officer shall ensure the university is licensed to possess this type and amount of radioactive material and shall determine whether it is in the best interests of the university to accept this material.

310.80 Uranium- and Thorium-Containing Materials - On September 9, 2008, the Radiation Safety Committee discussed the use of depleted uranium compounds and the need to require users to obtain an authorization to use this type of material. The committee agreed that using depleted uranium compounds would not require authorization, if total quantities were 100 grams or less, and the user submitted information in writing to the radiation safety officer describing the

quantity of depleted uranium compounds, the types of chemical compounds, the location of use, and that all waste will be submitted to the radiation safety office for disposal.

Researchers using depleted uranium compounds in total quantities greater than 100 grams or using naturally occurring uranium or thorium containing compounds in any amount, will require an authorization from the Radiation Safety Committee.

310.90 Exempt Radioactive Materials - The Radiation Safety Committee does not consider any radioactive materials used for research or teaching purposes as exempt. All planned acquisition of radioactive material must be reported to the radiation safety officer. Certain commercially available sealed products (including items such as timepieces, static eliminators, lock illuminators, thermostat dials and pointers, night compasses, exit lights, and smoke alarms) may be exempt from authorization requirements. The radiation safety officer or designee may be contacted for further clarification.

Part 320: Radioactive Materials Inventory

320.10 Introduction - The radiation safety officer or designee maintains an inventory of all radioactive materials received, all wastes disposed of, and all radioactive materials and wastes stored in the radioactive waste storage building, the hazardous materials storage building, and the Engineering Isotopes Laboratory. Authorized users are required to notify the radiation safety officer whenever they dispose of radioactive materials via the sewer system or by gaseous release (see Part 340), or if they transfer radioactive material from one user to another (see Part 310.60).

320.20 Radioactive Materials Use Log - All users shall maintain a separate log showing the use of radioactive materials in possession, including the date the radioactive materials were received, the amount that was received, the date(s) it was used and the amount used on each date. This log must be kept in a clear and concise format that can easily be understood by the radiation safety officer or other inspector.

320.30 Sealed Sources - Sealed sources are those devices containing radioactive materials hermetically sealed in a glass or plastic vial, plastic or metal disc, sheet, rod, or in a double-encapsulated stainless steel cylinder. These sources need only be reported on the user's application to use radioactive materials. The radiation safety officer or designee will inventory these sources every six months and perform leak tests as required.

Part 330: Radioactive Materials Contamination Surveys

330.10 Introduction - Ensuring contamination does not exist during and after the use of radioactive materials is a key component of any radiation safety program. All users of unsealed radioactive materials must conduct contamination surveys as required below. Records of the contamination surveys, regardless of whether contamination is found, must be kept in a clear and concise format that can be easily understood by the radiation safety officer or other inspector. All records of personnel and area contamination surveys must be retained by the authorized user for 3 years.

330.20 Frequency of Surveys - Contamination surveys must be conducted of the immediate area, storage areas, and any other area that has a possibility of contacting radioactive material. The frequency of these surveys will be determined initially by the Radiation Safety Committee when a new application is reviewed and approved.

After an application is approved, survey frequency will be determined by the radiation safety officer every calendar quarter. The survey frequency is based on the amount of radioactive material purchased within the last twelve months, averaged over the twelve-month period (or the appropriate time period if the user has received authorization within the last twelve months). This survey frequency will then apply for the next calendar quarter.

These survey frequencies will be either daily, weekly, or monthly, depending on the above determinations. A daily survey is defined as conducting a survey within the twenty-four-hour period from the time radioactive materials were first used. A weekly survey is defined as conducting a survey within the seven-day period from the time radioactive materials were first used. A monthly survey is defined as conducting a survey within the thirty-day period from the time radioactive materials were first used.

330.30 Contamination Survey Methods - The method required for determining the presence of contamination is the wipe test and, for certain isotopes, survey by an appropriate radiation detection instrument. The following are the two methods of performing contamination surveys:

A. Wipe tests:

1. The wipe test shall consist of wiping an area ten centimeters by ten centimeters with a commercially available wipe, swab, filter paper or other suitable medium. There must be a suitable number of wipe tests taken to adequately survey the area of radioactive material use.
2. The samples must be counted in a detection device appropriate for the type of radiation emitted. The counting procedures must address the length of time each sample is counted, the energy of the isotope, and the accuracy of the measurement. The counting instrument's sensitivity (or minimum detectable activity) must also be sufficient to detect with confident accuracy the maximum allowable contamination level (see Part 900).
3. In addition to the wipe samples, a blank wipe and a standard must also be counted for each survey. For a large number of samples, use one blank for each ten to twenty samples.

4. The efficiency of the instrument must be calculated for each isotope, and the survey results must be reported in the units of **dpm per 100 cm^2**. The results of contamination surveys by wipe tests can be recorded on the Contamination Survey Form RSM-3 or the equivalent information can be recorded in a user's logbook.
5. Allowable levels of contamination are listed in Part 900.

B. Survey with radiation detection instruments (or survey meters):

1. The use of a survey meter is required for high-energy beta emitting (where E_{max} is equal to or greater than 200 keV) and gamma or x-ray emitting isotopes (see Part 900).
2. All survey meters and detectors must be approved by the radiation safety officer.
3. Prior to each survey, the batteries must be tested, and a check standard must be used to establish that the survey meter is operable and properly detecting the radiation field.
4. The area surveyed must be large enough to adequately cover the area of radioactive material use. In areas where a radiation field already exists, using a survey meter and detector for contamination surveys will not be possible.
5. The results of contamination surveys by survey meter can be recorded on the Contamination Survey Form RSM-3 or the equivalent information can be recorded in a user's logbook. Background radiation levels must also be recorded.
6. Allowable levels of contamination are listed in Part 900.
7. Survey meters and detectors must be calibrated annually. A certificate of calibration will be required as verification that the instrument has been properly calibrated.
8. Survey meters and detectors can be calibrated by returning the meter and detector to the manufacturer or other commercial vendor providing calibration services. While a user's meter and detector are being calibrated, a survey meter and detector may be borrowed from the radiation safety officer.
9. After calibration, the efficiency of the survey meter will be determined by the radiation safety officer.

330.40 Requirements for Decontamination:

A. If contamination is detected, the area or item must be cleaned and re-surveyed until contamination levels are below those specified in Part 900.

B. If the contamination cannot be removed by appropriate cleaning methods, and if it is contaminated with a short-lived radioisotope (i.e., less than 65-day half-life), the item, instrument or area may be stored or shielded and contamination allowed to decay to an acceptable level. This type of procedure must be approved by the radiation safety officer.

330.50 Personal Surveying - It is recommended that hands, shoes (including the bottoms), and the body be surveyed for contamination prior to leaving the area where radioactive materials are used.

330.60 Decontamination Guidelines - The following are some guidelines for preventing radioactive contamination or for decontaminating a contaminated area:

A. Work surfaces should be covered with an absorbent/plastic-backed laboratory paper. For additional protection, trays should also be used when handling radioactive materials. If

radioactive materials are spilled, the resulting contamination of the work surfaces or other items will be minimized or eliminated.

B. To decontaminate work surfaces or items that have come in contact with radioactive materials, there are many commercially available detergents that are effective in removing radioactive contamination. These are available in ready-to-use formulations, concentrated solutions and in aerosol foams.

C. If detergents are not effective in removing contamination, then dilute acid or caustic solutions may be necessary. Please use caution when working with these types of solutions and wear the proper personal protective equipment.

D. If contamination cannot be removed, see Part 330.40 and/or contact the radiation safety officer or designee.

Part 340: Radioactive Waste Disposal Procedures

340.10 Introduction - Radioactive waste can be classified as solid, liquid, gaseous or biological. In addition to being classified as radioactive waste, some wastes may also meet the definition of an EPA hazardous waste. This type of waste is considered a "mixed waste" and must be properly disposed of according to both radiation safety and hazardous waste regulations. Each type of radioactive waste requires different procedures for handling, reporting, and disposal. The Radiation Safety Committee must approve all waste disposal procedures.

The Environmental Health and Safety Office may be contacted for information on hazardous waste management and classification of hazardous waste. Records of measurements and calculations for determination of activities for solid, liquid, or gaseous waste, or aqueous waste released to sewer must be retained until termination of the authorization, at which time the records must be transferred to the radiation safety officer.

340.20 Solid Radioactive Waste Disposal:

A. The definition of solid radioactive waste is **any solid material that incorporates, has contacted, or is suspected to have contacted radioactive material.** Liquids or biological materials cannot be disposed of with solid radioactive waste. Scintillation vials and other sample containers may be disposed of as solid radioactive waste provided they are **thoroughly** dried of all liquid waste (Part 340.30). Solid waste containing liquid residue will not be accepted by the radiation safety officer.

   NOTE: For vials or containers that previously held a hazardous liquid, the vial or container must not contain any liquid. For vials or containers that previously held a non-hazardous liquid, the vial or container may just be drained, for a minimum of one hour. For gel-like material, please contact the radiation safety officer.

   All solid radioactive material regardless of half-life must be collected and disposed of by Environmental Health and Safety personnel.

B. Disposal procedures:

   1. Obtain a suitable waste container lined with at least a 4-mil polyethylene liner. The radiation safety officer or designee will supply liners and waste containers.
   2. Remove or deface from any item the radiation symbol or word "radioactive" prior to disposal.
   3. Do not mix waste containing different isotopes without the approval of the radiation safety officer or designee. The radiation safety officer or designee may be contacted for assistance in determining the proper isotope separation for solid waste.
   4. When the container is full or is ready to be disposed of, complete a Radioactive Waste Disposal Form RSM-4 (one form per container), make two copies, attach one copy to the container, retain one copy for your files, and mail the original to the radiation safety officer.
   5. Update radioactive material records and inventory.

6. If the waste is a sealed source or an instrument containing a sealed source, please contact the radiation safety officer or designee for information on disposal.

C. Sharps - Sharps are objects, such as broken glass, needles, syringes, scalpel blades, glass pipets, plastic pipet tips, etc., that could cause injury and/or puncture or cut through the waste container liner. For the safety of all people involved, **never** place these objects in the radioactive waste container by themselves. Always place them in a cardboard, plastic, metal, or other suitable container. The sharps container can then be disposed of in the solid radioactive waste.

D. Container shielding - The lead shielding ("pigs") shipped with some radioisotopes can be recycled back to the vendor. This lead shielding must be free of contamination and must not be disposed of with the solid radioactive waste. Contact the radiation safety officer or designee for information on how to recycle the lead shielding.

340.30 Liquid Radioactive Waste Disposal:

A. The definition of liquid radioactive waste is **any liquid that has radioactive material suspended or incorporated into it.** Liquid waste can be either aqueous or contain organic solvents. Special care must be taken when disposing of liquid radioactive wastes as many organic solvents are also considered an EPA hazardous waste.

B. Disposal procedures:

1. Liquid radioactive wastes not meeting the definition of an EPA hazardous waste may be disposed of via the sanitary sewer system if all the following criteria are met:

   a. The material is soluble, or readily dispersible, in water; and

   b. The Radiation Safety Committee has approved the procedure; and

   c. The material will not exceed the limits specified in Part 900 (NOTE: Individual authorization limits may be increased by the Radiation Safety Committee or radiation safety officer based on total university use and disposal. Contact the radiation safety officer for additional information.); and

   d. The material is flushed with copious amounts of water.

   e. A contamination survey must also be conducted of the sink and immediate area after the disposal of liquid radioactive waste.

   f. A Radioactive Waste Disposal Form RSM-4 must be completed for the waste disposed of and submitted to the radiation safety officer within five working days after the sewer release occurred.

2. Liquid radioactive waste meeting the definition of an EPA hazardous waste must be collected and properly disposed of by the following procedure:

   a. Obtain a glass container, not larger than one gallon. Metal or plastic containers are not allowed as waste containers.

   b. Place liquid waste in the glass container. Leave enough room in the container to account for thermal expansion of the liquid. Scintillation vials containing liquid will not be accepted by the radiation safety officer. These vials must be emptied into the larger glass container. The empty vials may be cleaned and reused, or disposed of

as solid waste, in which case they must be thoroughly dried in a fume hood prior to placement in a waste container.

c. When the container is full or is ready to be disposed of, complete a Radioactive Waste Disposal Form RSM-4 (one form per container), make two copies, attach one copy to the container, retain one copy for your files, and mail the original to the radiation safety officer.

3. The radiation safety officer may require the user to store high activity, short-lived radioactive liquid waste until it has decayed to an acceptable level.

4. Update radioactive material records and inventory.

5. Users are encouraged to consider using commercially available nonhazardous, "biodegradable" liquid scintillation solvents that may be disposed of via the sanitary sewer system as described in Part 340.30(B)(1).

340.40 Gaseous Radioactive Waste Disposal:

A. The definition of gaseous radioactive waste is **any gas, aerosol, mist, or dust produced that contains a radioactive material.**

B. Disposal procedures:

1. All releases of gaseous radioactive waste must:

a. Be approved by the Radiation Safety Committee; and

b. Not exceed, at the release point to the atmosphere, the unrestricted limits specified in Part 900.

2. During the release of gaseous radioactive waste, exposure to personnel may not exceed the restricted limits specified in Part 900 for restricted areas, or unrestricted limits for unrestricted areas.

3. A Radioactive Waste Disposal Form RSM-4 must be completed for the waste disposed of and submitted to the radiation safety officer within five working days after the release occurred.

4. Update radioactive material records and inventory.

340.50 Biological Radioactive Waste Disposal:

A. The definition of a biological radioactive waste is **any waste generated from the incorporation of a radioactive substance into a living organism or system.** A living organism or system includes, but is not limited to, animals, plants, tissues, cell cultures, animal or plant parts, viral material, or bacterial organisms.

If a biological waste is considered infectious, it must be treated to render the waste non-infectious prior to disposal.

B. Disposal procedures:

1. If the waste can easily be converted into a liquid form:

a. Homogenize the waste into a liquid form.

b. Follow the procedures in Part 340.30 for disposing of non-hazardous liquid radioactive waste.

2. Decay of radioactive material - If the radioisotope has a short enough half-life to allow the radioactive material to decay to safe levels, freeze the waste in a properly marked freezer and hold the waste until it has decayed to the levels specified by the radiation safety officer or designee.

3. Carbon-14 and hydrogen-3 (tritium) animal tissue:

   a. Animal tissue containing carbon-14 or hydrogen-3 (tritium) in concentrations of 0.05 microcuries per gram or less may be disposed of as a non-radioactive biological waste.

   b. Waste disposed of in this manner may not be used as food for humans or as animal feed.

4. Other disposal methods - To dispose of biological waste that cannot be disposed of by any of the procedures described above, please contact the radiation safety officer.

5. Update radioactive material records and inventory.

C. Sterilization - Bacterial organisms, cultures or other biological materials must not be sterilized by a procedure that can potentially cause the radiolabeled material to become airborne. Examples of procedures that are not allowed include autoclaving or high heat sterilization methods. The Radiation Safety Committee may approve the use of these types of sterilization methods if it can be demonstrated by the user that radioactive material cannot become airborne during the sterilization process.

340.60 Disposal of Waste at Facilities Located Outside of Moscow - Waste disposal procedures for university facilities located outside of Moscow shall be determined by the Radiation Safety Committee at the time of authorization.

Part 400: Obtaining Authorization to Use Radiation-Producing Equipment

400.10 Introduction - Any person who wishes to use radiation-producing equipment shall first obtain authorization from the Radiation Safety Committee. A written request following the format in Part 400.20 shall be submitted to the Radiation Safety Committee via the radiation safety officer. The request will be reviewed by the radiation safety officer prior to any action taken by the Radiation Safety Committee.

400.20 Format for Application To Use Radiation-Producing Equipment:

A. **Section 1 - User Information** - Provide the information listed below.

1. Name
2. Department
3. Office
4. Phone Number

B. **Section 2 - Type of Radiation-Producing Equipment Requested** - List type of equipment, manufacturer, model and serial number, date of manufacture, peak operating voltage, maximum current, and tube type.

C. **Section 3 - Description of Intended Use of Radiation-Producing Equipment** - The description must include sufficient detail so that the Radiation Safety Committee will have a clear understanding of the intended use. Detailed protocols and experimental procedures no longer than three pages each may be included as appendices in the application. Do not include reprints of publications. Please be careful not to use language, jargon or phrases that are specific to your type of research. A checklist describing the operating procedures, including testing for safety features and interlocks, for each radiation-producing device must be included with the application.

D. **Section 4 - Personnel, Experience and Training** - List all personnel, including yourself, employees, and students, who will be present during the use of radiation-producing equipment. Refer to Part 600 for definitions and rules regarding user categories. List the user status for each person. For authorized and general supervised users, include the training and experience for each user.

E. **Section 5 - Location of Use** - List all locations where radiation-producing equipment will be used.

NOTE: A workplace, work space, room or laboratory where radiation-producing equipment is used is defined as the entire space enclosed by fire-resistive boundaries.

F. **Section 6 - Radiation Detection Instrumentation** - Include a description of the types of radiation detection instrumentation that will be used for surveying. List the instruments by manufacturer, model number, and type of detector, if applicable.

G. **Section 7 - Personnel Safety** - Indicate if any personnel monitoring is required. Describe any special monitoring or safety practices that would be necessary for the types of activities conducted. Include the construction of the room where the radiation-producing equipment will be used, and what type of activities are being conducted above, below, and to the sides

of the area. Describe any safety features of the radiation-producing equipment and measures used to limit access to the area containing the radiation-producing equipment.

H. **Section 8 - Signatures and Date** - The authorized user(s) must sign and date the application. By signing the application, each authorized user affirms that he/she has read the University of Idaho Radiation Safety Manual and is aware of the requirements for using radiation-producing equipment.

400.30 Departmental and College Responsibilities - The department chair and college dean must also review and sign the application. Approval by the department chair and college dean affirms that he/she is aware of the research being conducted by the authorized user and that adequate facilities and equipment are available for this type of research. Departmental and college approval also affirms that if the authorized user is unable to pay any costs resulting from the acquisition, use, maintenance and repair of radiation-producing equipment (e.g., resignation or termination of employment, insufficient teaching or research funding), the department and/or college has an obligation to pay these costs.

400.40 Submittal of Application - The applicant will submit one copy of the Application To Use Radiation-Producing Equipment with original signatures to the radiation safety officer. The radiation safety officer will evaluate the application prior to review by the Radiation Safety Committee and recommend changes or corrections, if any, to the applicant.

400.50 Radiation Safety Committee Responsibilities:

A. The committee shall review each application and ascertain that:

1. The applicant has suitable training, experience, facilities, and equipment to safely use and/or conduct experiments involving radiation-producing equipment;
2. Adequate operating and handling precautions are taken by the applicant; and
3. The safety of the personnel and the general public are protected.

B. The committee may request more information from the applicant before reaching a decision. The decision of the Radiation Safety Committee is final.

C. The committee shall notify the applicant in writing of the disposition of the application and shall specify terms under which the use of radiation-producing equipment is authorized.

D. The committee shall also provide to the radiation safety officer any instructions for personnel monitoring, surveying, required posting of caution signs, etc., it deems appropriate and as required by the Idaho Radiation Control regulations.

E. Upon approval by the Radiation Safety Committee of the application to use radiation-producing equipment, the authorized user shall receive a Radiation-Producing Equipment Authorization Form RSM-1E and a unique authorization number.

400.60 Changes in Authorized Use - After an applicant has received approval of the initial application from the Radiation Safety Committee, the authorized user is required to obtain approval from the Radiation Safety Committee prior to each change in the use of radiation-producing equipment.

400.70 Renewal of an Authorization - The authorization issued by the Radiation Safety Committee is effective for three years. To renew an authorization, the user shall submit a full application to the Radiation Safety Committee via the radiation safety officer thirty days prior to the stated

expiration date. The renewal application must include a cover page summarizing any changes from the previous application. In addition, the user may reference in the renewal application previously submitted experimental protocols and procedures if there have been no changes.

Part 410: Acquisition of Radiation-Producing Equipment

410.10 Introduction - Radiation-producing equipment may be obtained by several methods. Equipment may be purchased from commercial vendors, may be surplus or donated, transferred from one user to another, or transferred from another institution or organization to the University of Idaho.

Regardless of the method used to acquire radiation-producing equipment, users must have authorization from the Radiation Safety Committee or written permission from the radiation safety officer before they can obtain radiation-producing equipment.

410.20 Ordering Radiation-Producing Equipment - Personnel who have received authorization from the Radiation Safety Committee to use radiation-producing equipment can order equipment by complying with the following steps:

A. Complete a requisition describing the radiation-producing equipment to be ordered. Type "RADIATION-PRODUCING EQUIPMENT" on the first line in the Description section of the requisition form. Departmental Purchase Orders (DPOs) may not be used to order radiation-producing equipment.

B. Complete the Permit to Purchase Radiation-Producing Equipment Form RSM-2E and attach to the requisition.

C. Obtain the signature of the radiation safety officer.

D. Follow the normal procedures for processing a requisition.

E. For those departments processing requisitions electronically, complete the Permit to Purchase Radiation-Producing Equipment Form RSM-2E, obtain the radiation safety officer signature, and forward the form to Purchasing Services. Purchasing Services will match the requisition with the Permit to Purchase Radiation-Producing Equipment form.

F. It shall be the responsibility of Purchasing Services to ensure all requisitions are accompanied by a completed Permit to Purchase Radiation-Producing Equipment Form RSM-2E before issuing a purchase order. The purchase order should be addressed to the authorized user.

410.30 Transfer of Radiation-Producing Equipment:

A. Radiation-producing equipment may be transferred from an authorized user to the radiation safety officer.

B. Radiation-producing equipment may be transferred from one user to another upon written approval of the radiation safety officer, providing the receiving user is authorized to use the radiation-producing equipment being transferred.

C. Approval from the radiation safety officer shall be required before transferring radiation-producing equipment to or away from the University of Idaho.

410.40 Surplus or Donated Radiation-Producing Equipment - Personnel obtaining surplus or donated radiation-producing equipment shall obtain approval from the radiation safety officer before acquiring this equipment. The radiation safety officer shall ensure the university is

licensed to possess this radiation-producing equipment and shall determine if it is in the best interests of the university to accept this equipment.

410.50 Exempt Radiation-Producing Equipment - Certain radiation-producing equipment is considered exempt by the Idaho Radiation Control Regulations. Contact the radiation safety officer for additional information.

Part 420: Radiation-Producing Equipment Operating Procedures

420.10 Introduction - Ensuring radiation-producing equipment is operated correctly, is adequately shielded, has appropriate interlocks and safety features, and is routinely monitored for radiation leakage and proper operation of safety features are key components of any radiation safety program.

420.20 Radiation-Producing Equipment Operation Instructions - Specific operating and emergency procedures including testing of safety features and interlocks shall be posted in the radiation-producing equipment area, and all personnel shall be familiar with and comply with these instructions. A copy of the Certificate of Registration issued by the Idaho Department of Health & Welfare must be posted on or immediately adjacent to each radiation-producing machine.

420.30 Radiation-Producing Equipment Use Log - All users shall maintain a separate log showing the use of radiation-producing equipment in possession, including the date the equipment was used, the purpose and personnel present on that date. This log will be kept in a clear and concise format that can easily be understood by the radiation safety officer or other inspector.

420.40 Frequency of Surveys - Frequency and type of surveys will be according to those approved by the Radiation Safety Committee at time of authorization, or to the applicable section(s) of the Idaho Radiation Control Regulations for the type of radiation-producing equipment in question. Surveys must be made of all new installations, and after any significant service to the equipment (replacement of x-ray tube, beam filtration changes, etc.).

420.50 Leakage - If leakage is found in excess of the limits specified in the applicable section(s) of the Idaho Radiation Control regulations for the type of radiation-producing equipment in question, the equipment must be made inoperable and the radiation safety officer or designee notified immediately. Such equipment shall not be used until the problems causing the leakage are corrected, and further surveys confirm leakage is below the allowable limits.

420.60 Radiation-Producing Equipment Inspection, Servicing and Maintenance - All users shall follow any equipment control measures specified by the manufacturer and/or Radiation Safety Committee. The authorized user shall also comply with all other applicable sections of the Idaho Radiation Control Regulations for the type of radiation-producing equipment in question. All adjustments, maintenance and servicing necessary for safe use of the equipment must be performed on a regular basis as recommended by the manufacturer, and records shall be kept by the authorized user for review by the radiation safety officer or other inspector. Any changes to the equipment set-up which could affect the potential radiation hazard must be approved by the radiation safety officer or designee. Certain aspects of radiation-producing equipment must be monitored frequently:

A. Operational Specifications - Orientation of the radiation beam, voltage, current, time, permanent filter and maximum aperture shall be in agreement with the manufacturer's recommendations for the specific application.

B. Shutters and Locks - Shutter mechanisms and interlocking devices shall be inspected by the radiation safety officer or designee at least every six months for proper operation.

C. Warning Devices and Radiation-Monitoring Equipment - All visual and audible warning devices and monitoring equipment shall be inspected by the radiation safety officer or designee every six months for proper operation.

D. Survey Meter:

1. The use of a survey meter is appropriate for x-ray emitting equipment.
2. All survey meters and detectors must be approved by the radiation safety officer.
3. Prior to each survey, the batteries must be tested, and a check standard must be used to establish that the survey meter is operable and properly detecting the radiation field.
4. The area surveyed must be large enough to adequately cover the area of possible leakage.
5. The results of leakage surveys can be recorded on the Contamination Survey Form RSM-3 or the equivalent information can be recorded in a user's log book. Background radiation levels must also be recorded.
6. Survey meters and detectors should be calibrated annually. A certificate of calibration will be required as verification that the instrument has been properly calibrated.
7. Survey meters and detectors can be calibrated by returning the meter and detector to the manufacturer or other commercial vendor providing calibration services. While user's meter and detector are being calibrated, a survey meter and detector may be borrowed from the radiation safety officer.

Part 500: Personnel Monitoring

500.10 Introduction - Personnel monitoring, or dosimetry, is an important safety practice when using radioactive material or working with radiation-producing equipment. Thermoluminescent dosimeters (TLDs) are the primary method of detection used for monitoring doses received from radiation. These can be obtained from commercial vendors as badges to measure whole-body doses or as rings to measure extremity doses. Bioassays may also be performed to monitor any internal exposure to radioactive materials. All exposure measurements are expressed in units of mrem (millirems).

500.20 Determining If Personnel Monitoring Is Required:

A. Thermoluminescent dosimeters are not capable of detecting all types of radiation. Radiation that does not have sufficient energy to penetrate the dosimeter will not be recorded. For this reason, personnel monitoring is not required in all cases. The following lists the types of radiation and whether monitoring is required (also, refer to Part 900):

Type of Radiation	Monitoring Required?
Alpha emitters	No
Beta emitters,	
where E_{max} is less than 200 keV	No
where E_{max} is equal to or greater than 200 keV	Yes
Gamma emitters	Yes
X-ray emitters from radioactive sources or X-ray equipment	Yes
Neutron emitters	Yes

B. All personnel who may potentially be exposed to radiation requiring personnel monitoring must be supplied with a personal dosimeter.

500.30 Obtaining Personal Dosimeters:

A. The authorized user can order a TLD badge or ring by submitting a written request to the radiation safety officer or designee. The following information is needed for each individual for whom a TLD is requested:

1. Name
2. Social Security Number

3. Date of Birth
4. Gender

B. TLDs are supplied to the university on a monthly or quarterly basis by a commercial vendor. The badges and rings are usually assembled and labeled by the vendor during the middle of the month and mailed to the university a week prior to the first of the month. Any changes in personnel monitoring should be made before the vendor mails the TLD badges. Once a TLD badge or ring is sent, it is considered used and the authorized user will be charged for the TLD badge whether or not it is actually used. In most cases, new badges or rings can usually be obtained in five working days.

C. The cost for personnel monitoring will be charged back to the authorized user. The authorized user will be charged replacement fee for lost badges or rings. Contact the radiation safety officer or designee for current prices of personnel monitoring services.

D. When an individual no longer requires a personal dosimeter because he/she is not using radioactive material or radiation-producing equipment or has left the university, it is the responsibility of the authorized user to notify the radiation safety officer and cancel the personal dosimeter.

500.40 Use of Dosimeters:

A. Personal dosimeters are assigned to one individual and are not to be used by any other individual during the monitoring period. Authorized users are responsible for ensuring dosimeters are used by the appropriate individual and are worn properly.

B. Control badges are used to determine the background radiation levels for each user group. This radiation dose is subtracted from the individual TLD badge to determine the occupational dose received. It is essential that the control badge be stored in an appropriate location and not be exposed to any source of radiation.

C. User groups having frequent personnel changes are allowed to request spare TLD badges. The spare TLD badges can be used for individuals needing monitoring for a short time only (i.e., less than a month) or until a permanent TLD badge can be obtained. The authorized user must submit a monthly written report to the radiation safety officer documenting the individual who used the spare badge, their social security number and date of birth, or that the spare badge was not used. Once a spare badge has been used by one individual, it may not be used by any other individual during the monitoring period.

500.50 Use of Other Monitoring Devices

In special situations, the Radiation Safety Committee may allow or require pocket ionization chambers to be used. Although not as accurate or as sensitive as TLD monitoring, they provide immediate information on radiation exposures.

A. For single exposures of large groups of individuals (e.g., lecture demonstrations, orientation tours), monitors may be worn by a few representative individuals only, provided the total dose of any one individual is not expected to exceed five millirems during the event.

B. It shall be the responsibility of the authorized user to read the pocket ionization chambers and to provide the radiation safety officer with a written record of the individuals monitored and the doses received.

500.60 Allowable Occupational Radiation Doses:

A. The following are the **maximum radiation doses individuals are allowed to receive per year** when working with radioactive materials or radiation-producing equipment:

Allowable Occupational Dose Limits (in rems)

Body Part	Per Year
Whole body (head and trunk, active blood-forming organs, or gonads)	5
Lens of the eyes	15
Skin and extremities (hands, forearms, feet, and ankles)	50

B. Minors - The allowed occupational dose limits for minors (less than eighteen years old) are ten percent of the above occupational dose limits.

C. Protection of an Embryo/Fetus:

1. Nuclear Regulatory Commission regulations require that the occupational dose to an embryo/fetus during the entire pregnancy not exceed 0.5 rem. This dose limit only applies to a female who voluntarily informs her employer (i.e., informs the authorized user and the radiation safety officer) that she is pregnant and the estimated date of conception, or intends to become pregnant. Such an employee is then "declared pregnant" and is entitled to additional safety precautions during the term of pregnancy.
2. Additional information or consultation on prenatal radiation exposure and safety precautions is available from the radiation safety officer. Any such requests will be held strictly confidential.

D. It is a requirement that the amount of radiation received by an individual be kept as low as possible. Any situation where an individual receives a whole body dose of more than fifty millirems of penetrating radiation per month or per quarter, depending on the monitoring period, will be investigated by the radiation safety officer to determine why this dose was received and what steps can be taken to minimize radiation doses.

500.70 Dosimetry Results -The authorized user will be sent the dosimetry results of the previous monitoring period. The authorized user is responsible for ensuring each individual being monitored is notified of their dosimetry results. The dosimetry results should be treated as confidential, and the authorized user should allow each monitored individual to know only their results.

500.80 Bioassay Requirements - Bioassays aid in determining the extent of an individual's dose received from internally deposited radioactive materials. Bioassays are required when individuals use tritium or iodine radioisotopes at specified quantities and/or within certain time periods. It is the authorized user's responsibility to indicate in the application to use radioactive materials whether bioassays will be required for the type of activities being conducted.

Individuals using tritium or iodine radioisotopes under conditions described below are required to participate in the bioassay program.

The radiation safety officer will maintain the procedures and equipment for conducting the necessary bioassays.

A. **Tritium (^{3}H)**

1. A tritium bioassay is required whenever an individual uses unsealed tritium isotopes in single or cumulative quantities greater than 100 millicuries within a one-month period.
2. Type of bioassay - Analysis of urine sample.
3. Prior to working with tritium in the above specified amounts, the individual must obtain a bioassay to establish a baseline level of tritium within the body.
4. All bioassay samples should not be collected until at least two hours after termination of the potential exposure to allow for equilibration of tritium within the body.
5. The first routine bioassay sample should be taken within twenty-four hours after termination of the potential exposure, if possible, but not later than seventy-two hours.
6. Succeeding routine bioassay samples must be collected at two-week intervals as long as the individual continues to work with tritium in the amounts specified above.
7. The urinary tritium sample concentration that will trigger corrective action is five μCi per liter.
8. A tritium bioassay may also be required because of an accidental exposure to tritium (e.g., laboratory accident, skin contact, ingestion, inhalation, etc.).

B. **Radioactive Iodine (^{125}I)**

1. A radioactive iodine bioassay is required whenever an individual uses unsealed iodine isotopes in single or cumulative quantities greater than one millicurie within a three-month period.
2. Type of bioassay - External monitoring of the thyroid.
3. Prior to working with iodine isotopes in the above specified amounts, the individual must obtain a bioassay to establish a baseline level of radioactive iodine within the body.
4. All bioassays should not be performed until at least six hours after termination of the potential exposure to allow for accumulation of iodine in the thyroid.
5. The first routine bioassay must be taken within seventy-two hours after termination of the potential exposure.
6. Succeeding routine bioassays must be taken at two weeks intervals as long as the individual continues to work with radioactive iodine in the amounts specified above.
7. All users handling radioactive iodine or who are sufficiently close to the actual use must participate in the bioassay program.
8. The thyroid radioactive iodine-125 concentration that will trigger corrective action is 0.12 μCi.

9. A bioassay may also be required because of an accidental exposure to radioactive iodine (e.g., laboratory accident, skin contact, ingestion, inhalation, etc.).

Part 600: Training and User Categories

600.10 Introduction - Individuals will be allowed to use radioactive materials or radiation-producing equipment with varying levels of authority depending on their experience and training with radioactive materials and in radiation safety. The authorized user will list all personnel using radioactive material or radiation-producing equipment and their user status in his/her original application to use radioactive materials or radiation-producing equipment. The authorized user must notify the radiation safety officer of any personnel changes that occur after obtaining a radioactive materials or radiation-producing equipment authorization.

600.20 Training Requirements:

A. **Radiation Safety Orientation Workshop** - All individuals who plan to use radioactive materials or will be working in areas that use radioactive materials will be required to attend an orientation workshop. This workshop will cover the basics of our radiation safety program; hazards associated with radioactive materials; basic safe working practices; the concept of ALARA and allowable exposure limits, including a "declared pregnant" worker; what to do and who to contact in an emergency; where information is available on rules and regulations, license information, and user authorizations; and the reporting of unsafe conditions. This orientation will satisfy the training requirements for entering a restricted area.

B. **Radiation Safety Training Course** - Individuals who would like to work with radioactive materials under limited supervision or would like further training in radiation safety may attend the radiation safety training course. This training will cover the basics of health physics, including the characteristics of the different types of radiation and the health and biological effects; the university's radiation safety manual; safe working practices, including personal protective equipment, use of fume hoods, animal handling, and preventing exposure from radioactive materials and radiation; emergency response guidelines; dosimetry and monitoring, including bioassay requirements; and the characteristics of the radioisotopes commonly used at the university. To successfully complete this course, the individual must attend all training sessions and pass a course test at a level of seventy percent or better.

C. **Maintenance Staff Training Course** - Maintenance personnel (custodial, shops, and other service personnel) who have reason to enter an area using radioactive materials but who do not work with radioactive materials will be required to attend a training course. This course will discuss the basics of radiation; health and biological effects; radioactive symbols, signs and markings; the types of radioactive materials used; and, what to be aware of and who to contact before conducting any work, such as working on plumbing systems, ventilation systems, fume hoods, repairing equipment, custodial activities, etc. This training course will satisfy the training requirements for entering a restricted area.

D. **Analytical X-Ray Safety Training Course** - Individuals who would like to work with analytical x-ray equipment will be required to attend an analytical x-ray safety training course. This course will cover the physics and characteristics of x-rays; the components of

analytical x-ray machines; health and biological effects of x-rays; and safety precautions and safety features of x-ray machines.

E. **Visitors, Students, Salespeople, and Other Guests** - Individuals who only rarely enter an area using radioactive materials will not be required to have any training provided they are always accompanied by an authorized or general supervised user.

F. **Radioactive Materials Transportation Course -** Personnel who transport radioactive materials on public roads will be required to attend a radioactive materials transportation course. This training is a requirement of the Department of Transportation and the Nuclear Regulatory Commission and covers general transportation information, job-specific information, emergency response and notification procedures, and driver information.

600.30 Definitions of Users:

A. **Authorized User** - An employee of the University of Idaho who is deemed qualified by the Radiation Safety Committee to purchase, possess, and use radioactive material or radiation-producing equipment as specified in the authorization issued. An authorized user shall have:

1. At minimum, a bachelor-level college degree (or equivalent training and experience) in physical or biological science, or engineering; and
2. At minimum 40 hours of training and experience including but not limited to: the safe handling, characteristics, units, detection instrumentation, and biological hazards related to radiation.

Documentation of education and training will be required by the Radiation Safety Committee.

The authorized user is responsible for arranging or providing training and instruction in the safe procedures of all radioactive material and radiation-producing equipment practices to all personnel conducting activities in his/her facilities. The authorized user is required to document all such training.

B. **Primary Supervised User** - An employee or student of the University of Idaho who has experience and training in the use of radioactive materials or radiation-producing equipment. A primary supervised user can use radioactive materials and radiation-producing equipment under the supervision of, but not necessarily in the presence of, the authorized user and may also provide training to other personnel listed in the same authorization. This person must meet the following requirements:

1. Successfully complete the University of Idaho's radiation safety training course;
2. Have already received approval by the Radiation Safety Committee as a general supervised user; and
3. Receive approval by the Radiation Safety Committee as a primary supervised user. Approval must be requested in writing by the authorized user and must document the training and experience the proposed primary supervised user has received in the use of radioactive materials or radiation-producing equipment. The authorized user must also certify that he/she has observed the techniques and procedures used by this person and state that this person has the knowledge and experience to train other personnel in the use of radioactive materials or radiation-producing equipment.

C. **General Supervised User** - An employee or student of the University of Idaho who has experience and training in the use of radioactive materials or radiation-producing equipment and radiation safety may be approved by the Radiation Safety Committee as a general supervised user. A general supervised user can use radioactive materials and radiation-producing equipment under the supervision of, but not necessarily in the presence of, the authorized user. This person must meet the following requirements:

1. Successfully complete the University of Idaho's radiation safety training course;
2. Receive training from the authorized user or primary supervised user in the safe handling and use of radioactive materials and radiation-producing equipment as specified in the authorization issued; and
3. Receive approval by the Radiation Safety Committee as a general supervised user. Approval must be requested in writing by the authorized user. The request must document the training and experience the proposed general supervised user has received in the use of radioactive materials and radiation-producing equipment.

D. **Direct Supervised User** - An employee or student of the University of Idaho who may use radioactive materials or radiation-producing equipment only in the physical presence of, and under the supervision of, an authorized user, a primary supervised user, or a general supervised user.

E. **Analytical X-Ray Equipment Operator** - An employee or student of the University of Idaho who has experience and training in the use of radiation-producing equipment and radiation safety and is recommended by the authorized user may be approved by the radiation safety officer to operate a specific analytical x-ray machine with minimal supervision. Before approval can be granted, the individual must take the analytical x-ray safety training course offered by the radiation safety officer.

F. **Exceptions**:

1. Those persons who only use soil density gauges and neutron moisture probes and have received a commercial eight-hour safety training course in the use of these instruments, may substitute this training for the requirement listed in 600.30(B)(1).
2. Those persons who only use electron capture detectors that contain a sealed radioactive source are exempt from the general supervised user and direct supervised user requirements (all other requirements, such as obtaining authorization to use radioactive materials, etc., must be complied with).

Part 610: Authorized User Responsibilities

610.10 Introduction - The authorized user is expected to maintain control and to properly use the radioactive materials or radiation-producing equipment under their authorization. An authorized user must protect university employees, students, the public, and the environment from unnecessary exposure to radiation or radioactive materials.

610.20 Responsibilities - The following are the responsibilities of the authorized user:

A. Ensuring compliance with the Radiation Safety Manual and all applicable state and federal regulations.

B. Allowing the radiation safety officer or designee or other inspectors access to areas under their control for the purpose of inspecting, surveying or other matters pertaining to the use of radioactive materials or radiation-producing equipment.

C. Training personnel in the proper procedures and safety practices for using radioactive materials or radiation-producing equipment and maintaining documentation of all such training.

D. Ensuring all personnel follow proper training procedures and comply with the Individual User Responsibilities (Part 620) listed in the Radiation Safety Manual.

E. Informing personnel of proper accident or emergency procedures, supplying necessary materials to perform those procedures.

F. Promptly reporting accidents or incidents involving radioactive materials or radiation-producing equipment.

G. Ensuring that contamination surveys and waste disposal procedures are conducted as required, and maintaining the user's log as required.

H. Notifying the Radiation Safety Committee or radiation safety officer of any personnel changes and corresponding personnel dosimetry monitoring requirements.

I. Operating electron capture detectors in accordance with the manufacturer's instructions. Verifying that the detector and instrument are compatible and ensuring the exhaust from the detector is properly vented.

J. Making available to each user a copy of the university's Radiation Safety Manual, the authorized user's Radiation Safety Committee authorization, and the authorized user's application and related documents.

K. Verifying that any shop, maintenance, custodial, service personnel, or any private contractors, can perform their duties in a contamination-free work environment. If contaminated equipment must be serviced, the radiation safety officer or designee must be contacted to supervise the necessary work.

L. Receiving approval from the Radiation Safety Committee or radiation safety officer for any changes, including new procedures, new isotope use, change in facilities, etc., in the authorized use of radioactive materials or radiation-producing equipment prior to the actual change in use.

M. If planning to be absent from the university for more than thirty consecutive days, designating another authorized user to be responsible for his/her use of radioactive

materials or radiation-producing equipment. This designated user must be qualified in the use of radioactive materials or radiation-producing equipment as allowed in the radioactive materials or radiation-producing equipment authorization and must be approved by the Radiation Safety Committee.

N. The authorized user must submit for approval a written request signed by the original authorized user, the designated authorized user, and their department executives, to the Radiation Safety Committee assuring that the designated authorized user accepts and recognizes the associated responsibilities.

O. Requesting a final survey of his/her workplace when terminating the use of radioactive materials or radiation-producing equipment. The authorized user shall ensure all radiation-producing equipment, radioactive materials and/or radioactive waste are accounted for, any personal dosimeters used are returned, and any required recordkeeping has been completed (see Part 305.50).

Part 620: Individual User Responsibilities

620.10 Introduction - Each individual who uses radioactive materials or radiation-producing equipment at the University of Idaho has a responsibility to use the material and equipment in a safe manner that is consistent with the provisions of this manual. It is expected that proper safety practices will be followed when working with radioactive materials or radiation-producing equipment.

620.20 Responsibilities - The following safety practices are the responsibility of each user:

A. Complying with the concepts of ALARA.

B. Using personal dosimeters when required and in a proper manner.

C. Wearing the proper protective clothing when needed. The minimum protective clothing allowed when working with any radioactive materials will be gloves, a lab coat, and, where appropriate, eye/face protection.

D. NOTE 1: The type of glove used must be appropriate for the chemical properties associated with the radioactive material.

E. NOTE 2: Eye/face protection shall be consistent with both the chemical and physical hazards associated with the radioactive material, the way the radioactive material is used, and the location where the radioactive material is used.

F. Conducting the required contamination surveys.

G. Using shielding, lead aprons or gloves, or mechanical devices when necessary to reduce radiation exposure while handling radioactive materials.

H. Never exposing personnel to a direct beam from radiation-producing equipment and maintaining a distance of one meter minimum from the radiation-producing equipment tube or irradiated target while the unit is operating unless unit is adequately shielded.

I. Never pipeting by mouth, always using a mechanical pipeting device to transfer radioactive materials.

J. Minimizing exposure to airborne radioactive materials by not exceeding the levels specified in Part 900 and/or conducting procedures that might release radioactive materials into the air within a proper containment system (e.g., a fume hood or glove box).

K. Washing hands and arms after handling radioactive materials.

L. Not placing fingers, hands, or other items in the mouth, on the lips, or around the mouth, in an area where radioactive materials are used or stored.

M. Not having food, drink, or associated utensils in areas where radioactive materials are used or stored.

N. Following good laboratory practices. Keep areas free of equipment and materials not required for the immediate procedure. Areas should be protected with disposable absorbent material and/or trays or pans to contain any spillage in the event of an accident.

O. Marking all areas where radioactive materials are used, as required.

P. Marking and labeling all containers, instruments and other items that are being used with radioactive materials, as required.

Q. Maintaining control of an area where radioactive materials are used or stored. Control can consist of locking or maintaining surveillance of an area where radioactive materials are used or stored and/or preventing access or entry by unauthorized individuals.

R. Reporting accidents and incidents involving radioactive materials or radiation-producing equipment, as required.

S. Ensuring that all areas, containers, instruments, and other items that have been used with radioactive materials are below the limits of contamination as specified in Part 900 and/or by the radiation safety officer or designee before using them for non-radioactive applications (see Part 305).

Part 700: Signs and Notice Requirements

700.10 Introduction - Areas where radioactive material or radiation-producing equipment are used or stored must be identified and posted as required by the Nuclear Regulatory Commission regulations or Idaho Radiation Control Regulations. Such identification allows individuals and emergency response units to understand the hazards of an area before entering that area.

700.20 Required Notices - Each area authorized for radioactive material use shall be conspicuously posted with the Nuclear Regulatory Commission "Notice To Employees" (NRC Form 3) and the University of Idaho "Notice To Employees" signs. The radiation safety officer or designee shall be responsible for providing and posting these notices.

700.30 Required Signs - Each area where radioactive materials are authorized for use or storage shall be conspicuously marked with a sign containing the radiation symbol and the wording "Caution - Radioactive Materials". This sign shall be posted at the entrance to an area using or storing radioactive materials and at places within the area where radioactive materials are routinely used or stored (e.g., fume hoods, freezers, refrigerators, waste containers). The authorized user is responsible for identifying these areas. The radiation safety officer or designee will be responsible for providing signs to each user.

Any area in which radiation-producing equipment is located or is being used must be posted with the "Caution - Radiation" sign, and the notice "Caution - Radiation: This equipment produces radiation when energized" shall be attached next to the controls.

700.40 Required Labeling:

A. Areas where radioactive materials are used, containers of stock material, waste containers, instruments, and other articles used with radioactive materials must be clearly labeled with the following information: the radiation symbol, and the words "CAUTION - RADIOACTIVE MATERIAL". Compliance with labeling requirements shall be the responsibility of the authorized user. The labeling must be visible at all times and must not degrade under normal working conditions.

B. In addition, each container exceeding the activity level listed in Part 900 must be labeled with the radioisotope, the activity and the date of activity, and the chemical composition of the material.

C. Radioactive labels and/or markings must be removed or defaced from decontaminated packages, containers, or other items before they can be released for unrestricted use.

700.50 Radiation Areas - Areas where an individual might receive a radiation dose of five or more millirems but less than one hundred millirems in any one hour shall be marked with a sign containing the radiation symbol and the wording "Caution - Radiation Area". The radiation safety officer or designee shall be responsible for providing and posting these signs.

700.60 Electron Capture Detectors:

A. Each electron capture detector containing a radioactive source must have a label attached showing the identity and activity of the radioactive material, the date the activity of the radioisotope was determined, the radiation symbol, and the words "Caution - Radioactive Material".

B. Each gas chromatograph containing an electron capture detector with a radioactive source shall be conspicuously marked on the outside of the gas chromatograph with the following:

"This equipment contains a radioactive source registered with the University of Idaho radiation safety officer. Notify the radiation safety officer before removing the source from this location or upon any custodial change."

Part 750: Transportation of Radioactive Materials

750.10 **Introduction** - The Nuclear Regulatory Commission and the Department of Transportation regulate the transportation of radioactive material. These regulations specify the requirements for packaging, labeling, marking, manifesting, and surveying radioactive materials being prepared for shipment. Therefore, no radioactive materials may be transported beyond the property boundary of any University of Idaho facility without the approval of the radiation safety officer or designee.

750.20 **Transfer of Radioactive Materials** - Before transferring any radioactive material to another organization, the radiation safety officer must have in possession a copy of the organization's radioactive materials license prior to the shipment of that material. The transportation of radioactive materials between on-campus facilities must be in a manner that does not permit the release of material in any form to the environment or unnecessary exposure to personnel, even in the event of a minor accident.

750.30 **Training** - All personnel who transport radioactive materials on public roads must receive Department of Transportation training in the shipment of radioactive materials. Please see Part 600.20(F).

Part 800: Reporting Radiation Incidents

800.10 Introduction - Accidents and incidents involving personnel exposures, radioactive contamination of personnel or facilities, and/or failure of equipment containing radioactive materials or producing radiation must be reported to the radiation safety officer as described below. Reporting of accidents and incidents will allow the radiation safety officer or designee to ensure individuals have been properly decontaminated and have received appropriate medical attention, areas have been decontaminated, releases to the environment have been controlled, and any reporting requirements to federal, state, and local authorities have been complied with.

800.20 Reporting of Accidents or Incidents:

A. Any accident or incident as described below shall be reported to the radiation safety officer immediately:

1. Any accident or incident involving skin contact with radioactive material by an individual.
2. Any accident or incident involving exposure of an individual to airborne radioactive materials more than the limits specified in Part 900.
3. Any accident or incident involving the release of more than one millicurie of radioisotope.
4. Any accident or incident involving widespread radioactive contamination (i.e., an area greater than four ft^2).
5. Any accident or incident involving radioactive contamination of a public area.
6. Any accident or incident involving the unapproved release of radioactive material to the environment.
7. Any accident or incident involving a radiation dose or suspected dose of more than one hundred millirems.
8. Any situation involving lost, stolen or missing radioactive material or radiation-producing equipment.
9. If, during check-in procedures of a package of radioactive materials, contamination is detected on the surface of the outer package or if the container of radioactive material is broken, leaking, or severely contaminated.

B. If there is any doubt as to whether an accident or incident should be reported, then it should be reported to the radiation safety officer.

800.30 Reporting Defects or Failure of Equipment - Any defect or failure occurring in a piece of equipment which contains radioactive material or can produce radiation must be reported to the radiation safety officer. A defect or failure is a situation which may or did cause unnecessary radiation exposure, a loss of radioactive material, or a release of radioactive material.

Part 850: Violations

850.10 Introduction - Failure to abide by the requirements of this radiation safety manual, by the statements in an authorized user's application to use radioactive materials or radiation-producing equipment, or by the requirements set forth by the Radiation Safety Committee or radiation safety officer shall be considered a violation.

850.20 Categories of Violations - There are three levels of violations, Level One violations being the least severe and Level Three violations being the most severe. The radiation safety officer will report all violations to the Radiation Safety Committee, and the committee will determine the level of violation.

A. Level One Violation - A Level One violation is one defined as not endangering a person, facility, or the environment. This type of violation is usually reserved for failure to comply with recordkeeping and other paperwork requirements.

B. Level Two Violation - A Level Two violation is one defined as possibly endangering a person, facility, or the environment. Examples of this type of violation include, but are not limited to, the following:

1. Failure to follow proper radioactive waste disposal procedures.
2. Failure to follow proper transportation procedures for radioactive materials.
3. Failure to perform and/or document contamination surveys.
4. Using radioactive materials or radiation-producing equipment in a manner that has not been approved of by the Radiation Safety Committee.
5. Failure to obtain personal dosimeters when required.
6. Obtaining radioactive materials or radiation-producing equipment without being authorized by the Radiation Safety Committee or in a manner not approved by the radiation safety officer.

C. Level Three Violation - A Level Three violation is one defined as endangering a person, facility, or the environment. Examples of this type of violation include, but are not limited to, the following:

1. Failure to report an accident or incident as required.
2. Failure to clean a contaminated area as required.
3. Failure to provide and/or use personal protective equipment when handling radioactive materials or using radiation-producing equipment.
4. Failure to provide and/or use appropriate facilities or equipment when handling or storing radioactive materials.

850.30 Penalties:

A. The Radiation Safety Committee may impose penalties in response to a violation(s) based on the severity of the violation(s). These may include, but are not limited to, the following:

1. Requiring increased recordkeeping or surveying.
2. Requiring additional radiation safety training.

3. Deny certain individuals authorization to use radioactive materials or radiation-producing equipment.
4. Restricting the use of radioactive materials or radiation-producing equipment.
5. Revoking a radioactive materials or radiation-producing equipment authorization.

850.40 Response to a Violation - The authorized user will receive a written Notice of Violation from the Radiation Safety Committee reporting the item(s) that is in noncompliance, their level of violation and associated penalty, and action that must be taken to resolve the violation. The authorized user shall have thirty days from receipt of the notice to respond in writing to the Radiation Safety Committee describing the following:

A. Why the violation occurred;

B. What action was taken to investigate the violation;

C. What is being done to ensure compliance; and

D. Documentation that the violation was corrected.

A copy of the Notice of Violation will also be sent to the department chair and college dean.

Failure to properly respond to the Notice of Violation will require the authorized user to appear before the Radiation Safety Committee and explain why he/she did not reply within the allotted thirty days. Failure to properly respond to a Notice of Violation will be considered a violation and may result in additional penalties.

850.50 Repeat or Multiple Violations - Recurrence of the same violation within a one-year period or multiple violations may result in the violation(s) being considered as a higher-level violation and allow the Radiation Safety Committee to impose stricter penalties.

850.60 Appeal of a Violation or Penalty - An individual may request the Radiation Safety Committee to further review a violation and/or penalty received by that individual. The request must be in writing and explain why the violation and/or penalty may be in error or explain possible other mitigating circumstances. Any decision made by the committee on an appeal will be final.

Part 900: Individual Nuclide Information

900.10 Tritium ^{3}H

Type of Radiation	Beta
Energy of Radiation	19 keV E_{max}
Half-Life	12.28 years (long-lived)
Shielding	Not required
Range (In Air)	Approximately 6 mm
Dosimetry	Not required
Bioassay	Required
Sewer Releases Allowed	8.0 mCi/month/authorized user group
Air Concentration Allowed	Restricted area - 1 x 10^{-7} µCi/ml Unrestricted area - 2 x 10^{-8} µCi/ml
Recommended Contamination Survey Method	
Wipe tests:	Liquid scintillation counting
Survey meter:	Not applicable
Allowable Contamination Levels	
Wipe tests:	Restricted area - 20,000 dpm/100 cm^2 above background Unrestricted area - 2,200 dpm/100 cm^2 above background
Survey meter:	Not applicable
Activity Level Required for Labeling	1000 µCi or greater

900.20 Carbon-14 ^{14}C

Type of Radiation	Beta
Energy of Radiation	156 keV E_{max}
Half-Life	5730 years (long-lived)
Shielding	Not required
Range (In Air)	Approximately 30 mm
Dosimetry	Not required
Bioassay	Not required
Sewer Releases Allowed	1.5 mCi/month/authorized user group
Air Concentration Allowed	Restricted area - 3 x 10^{-9} µCi/ml Unrestricted area - 6 x 10^{-10} µCi/ml
Recommended Contamination Survey Method	
Wipe tests:	Liquid scintillation counting
Survey meter:	Not applicable
Allowable Contamination Levels	
Wipe tests:	Restricted area - 20,000 dpm/100 cm^2 above background Unrestricted area - 2,200 dpm/100 cm^2 above background
Survey meter:	Not applicable
Activity Level Required for Labeling	100 µCi or greater

900.30 Phosphorus-32 ^{32}P

Type of Radiation	Beta
Energy of Radiation	1710 keV E_{max}
Half-Life	14.3 days (short-lived)
Shielding	Acrylic plastic, 3/8" thick
Range (In Air)	Approximately 610 cm
Dosimetry	Required
Bioassay	Not required
Sewer Releases Allowed	0.15 mCi/month/authorized user group
Air Concentration Allowed	Restricted area - 5 x 10^{-10} µCi/ml Unrestricted area - 1 x 10^{-10} µCi/ml
Recommended Contamination Survey Method	
Wipe tests:	Liquid scintillation counting
Survey meter:	Thin-window GM detector
Allowable Contamination Levels	
Wipe tests:	Restricted area - 2,000 dpm/100 cm^2 above background Unrestricted area - 220 dpm/100 cm^2 above background
Survey meter:	Restricted area - 11,000 dpm/100 cm^2 above background Unrestricted area - 1,100 dpm/100 cm^2 above background
Activity Level Required for Labeling	10 µCi or greater

900.40 Phosphorus-33 ^{33}P

Type of Radiation	Beta
Energy of Radiation	249 keV E_{max}
Half-Life	25.4 days (short-lived)
Shielding	Acrylic plastic, 1/4" thick
Range (In Air)	Approximately 60 cm
Dosimetry	Required
Bioassay	Not required
Sewer Releases Allowed	0.15 mCi/month/authorized user group
Air Concentration Allowed	Restricted area - 4 x 10^{-9} µCi/ml Unrestricted area - 8 x 10^{-10} µCi/ml
Recommended Contamination Survey Method	
Wipe tests:	Liquid scintillation counting
Survey meter:	Thin-window GM detector
Allowable Contamination Levels	
Wipe tests:	Restricted area - 2,000 dpm/100 cm^2 above background Unrestricted area - 220 dpm/100 cm^2 above background
Survey meter:	Restricted area - 11,000 dpm/100 cm^2 above background Unrestricted area - 1,100 dpm/100 cm^2 above background
Activity Level Required for Labeling	100 µCi or greater

900.50 Sulfur-35 ^{35}S

Type of Radiation	Beta
Energy of Radiation	167 keV E_{max}
Half-Life	87.4 days (short-lived)
Shielding	Not required
Range (In Air)	Approximately 30 cm
Dosimetry	Required (check with RSO)
Bioassay	Not required
Sewer Releases Allowed	0.15 mCi/month/authorized user group
Air Concentration Allowed	Restricted area - 3 x 10^{-9} µCi/ml Unrestricted area - 6 x 10^{-10} µCi/ml
Recommended Contamination Survey Method	
Wipe tests:	Liquid scintillation counting
Survey meter:	Not applicable
Allowable Contamination Levels	
Wipe tests:	Restricted area - 20,000 dpm/100 cm^2 above background Unrestricted area – 2,200 dpm/100 cm^2 above background
Survey meter:	Not applicable
Activity Level Required for Labeling	100 µCi or greater

900.60 Calcium-45 ^{45}Ca

Type of Radiation	Beta
Energy of Radiation	257 keV E_{max}
Half-Life	163 days (long-lived)
Shielding	Acrylic plastic, 1/4" thick
Range (In Air)	Approximately 60 cm
Dosimetry	Required
Bioassay	Not required
Sewer Releases Allowed	0.15 mCi/month/authorized user group
Air Concentration Allowed	Restricted area - 1 x 10^{-9} µCi/ml Unrestricted area - 2 x 10^{-10} µCi/ml
Recommended Contamination Survey Method	
Wipe tests:	Liquid scintillation counting
Survey meter:	Thin-window GM detector
Allowable Contamination Levels	
Wipe tests:	Restricted area - 2,000 dpm/100 cm^2 above background Unrestricted area – 220 dpm/100 cm^2 above background
Survey meter:	Restricted area - 11,000 dpm/100 cm^2 above background Unrestricted area - 1,100 dpm/100 cm^2 above background
Activity Level Required for Labeling	100 µCi or greater

900.70 Chromium-51 ^{51}Cr

Type of Radiation	Gamma
Energy of Radiation	320 keV
Half-Life	27.7 days (short-lived)
Shielding	Lead, half-value layer thickness = 1.7 mm
Range (In Air)	Significant
Dosimetry	Required
Bioassay	Not required
Sewer Releases Allowed	0.15 mCi/month/authorized user group
Air Concentration Allowed	Restricted area - 3×10^{-8} μCi/ml Unrestricted area - 6×10^{-9} μCi/ml
Recommended Contamination Survey Method	
Wipe tests:	Gamma counter or thin-window GM detector
Survey meter:	GM detector
Allowable Contamination Levels	
Wipe tests:	Restricted area - 20,000 dpm/100 cm^2 above background Unrestricted area – 2,200 dpm/100 cm^2 above background
Survey meter:	Restricted area - 110,000 dpm/100 cm^2 above background Unrestricted area – 11,000 dpm/100 cm^2 above background
Activity Level Required for Labeling	1000 μCi or greater

900.80 Cadmium-109 ^{109}Cd

Type of Radiation	Gamma/x-ray
Energy of Radiation	22 – 88 keV (gamma)
Half-Life	464 days (long-lived)
Shielding	Lead, half-value layer thickness = 0.4 mm
Range (In Air)	Significant
Dosimetry	Required
Bioassay	Not required
Sewer Releases Allowed	0.15 mCi/month/authorized user group
Air Concentration Allowed	Restricted area - 7×10^{-11} µCi/ml Unrestricted area – 1.4×10^{-11} µCi/ml
Recommended Contamination Survey Method	
Wipe tests:	Gamma counter or thin-window GM detector
Survey meter:	Thin-window GM detector thin crystal scintillation detector
Allowable Contamination Levels	
Wipe tests:	Restricted area - 2,000 dpm/100 cm^2 above background Unrestricted area – 220 dpm/100 cm^2 above background
Survey meter:	Restricted area - 11,000 dpm/100 cm^2 above background Unrestricted area – 1,100 dpm/100 cm^2 above background
Activity Level Required for Labeling	1 µCi or greater

900.90 Iodine-125 ^{125}I

Type of Radiation	Beta/Gamma
Energy of Radiation	27 – 35 keV (gamma)
Half-Life	60 days (short-lived)
Shielding	Lead, half-value layer thickness = 0.04 mm
Range (In Air)	Significant
Dosimetry	Required
Bioassay	Required
Sewer Releases Allowed	0.08 mCi/month/authorized user group
Air Concentration Allowed	Restricted area - 3 x 10^{-10} µCi/ml Unrestricted area - 6 x 10^{-11} µCi/ml
Recommended Contamination Survey Method	
Wipe tests:	Gamma counter or liquid scintillation counting
Survey meter:	Thin-window GM detector or thin crystal scintillation detector
Allowable Contamination Levels	
Wipe tests:	Restricted area - 2,000 dpm/100 cm^2 above background Unrestricted area – 220 dpm/100 cm^2 above background
Survey meter:	Restricted area - 11,000 dpm/100 cm^2 above background Unrestricted area – 1,100 dpm/100 cm^2 above background
Activity Level Required for Labeling	1 µCi or greater

900.91 Uranium-238 (Natural or depleted) ^{238}U

Type of Radiation	Alpha
Energy of Radiation	4.2 MeV
Half-Life	4.5 billion years
Shielding	Not required for quantities less than 7 kg
Range (In Air)	Insignificant (internal hazard only)
Dosimetry	Not required
Bioassay	Not required
Sewer Releases Allowed	0.15 mCi/month/authorized user group
Air Concentration Allowed	Restricted area - 6 x 10^{-10} µCi/ml Unrestricted area - 2 x 10^{-12} µCi/ml
Specific Activity	DU: 5.0 x 10^{-7} Ci/g NU: 7.1 x 10^{-7} Ci/g

Recommended Contamination Survey Method

Wipe tests:	Liquid scintillation counting
Frequency:	Biannual Monthly if more than 100g used/month After sewer releases
Survey meter:	GM detector

Allowable Contamination Levels

Wipe tests:	Restricted area - 20,000 dpm/100 cm^2 above background Unrestricted area – 2,200 dpm/100 cm^2 above background
Survey meter:	Restricted area - 110,000 dpm/100 cm^2 above background Unrestricted area – 11,000 dpm/100 cm^2 above background

Activity Level Required for Labeling	1000 µCi or greater

900.99 Other Nuclides - For nuclides not listed, contact the radiation safety officer for necessary information.