RADIATION SAFETY

A. Introduction

1. This chapter describes the University of New England's management of ionizing radiation and establishes procedures related to control and safe use of radioactive materials. The program and procedures described in this chapter are also intended to facilitate compliance with the University's radioactive material license and applicable state and federal regulations. A copy of the radioactive material license and relevant regulations are available for review in the Environmental Health and Safety Office. The program and procedures contained herein apply to all users of ionizing radiation. The provisions and requirements outlined in this chapter are an integral condition of the radioactive material license.

B. Responsibilities

1. Environmental Health & Safety Department (EHS):

a. Manage the radiation safety program with the assistance of the Radiation Safety Officer.

b. Refer matters to the University Wide Safety Committee (UWSC) for review and approval, and advise on the overall status of the radiation safety program.

c. Ensure that annual radiation safety training is conducted with assistance of Radiation Safety Officer, department heads, supervisors, and faculty.

d. Act as liaison with Federal and State regulatory agencies.

e. Approve proposals for procurement, use, transfer, and disposal of radioactive materials.

f. Maintain permanent records of receipt, use, transfer, and disposal of radioactive materials.

g. Maintain files of Federal, State, and local licenses and registrations concerned with radiation sources.

h. Assist the RSO in the supervision of cleanup and decontamination of spills or other emergencies.

2. Radiation Safety Officer (RSO):

a. Ensure that the terms and conditions of the Radioactive Material License are met, and that all required records are maintained.

b. Interact with and ensure timely reporting to State Radiation Control Program Staff, Nuclear Regulatory Commission and other authorities as required.

c. Initiate applications for renewals and/or amendments of Radioactive Material License.

d. Act as a technical advisor to the UWSC and principal investigators. Assess radiological hazards and ensure the implementation of appropriate radiation safety precautions.

e. Work closely with faculty and staff to coordinate all applicable activities related to the management of the radiation safety program.

f. Conduct or oversee radiation safety training and documentation thereof.

g. Receive and monitor shipments of radioactive materials, delivering acceptable incoming shipments to the consignee and insuring that outgoing shipments conform to shipping regulations.

h. Ensure that radiation monitoring and survey instruments are calibrated annually and operate properly.

i. Operate a waste management program and document storage and disposal of all radiological waste, including decay in storage, and storage for shipment to licensed commercial vendors.

j. Prepare procedures for and supervise the cleanup and documentation of spills or other emergency activities.

k. Stop any unsafe operation or non-compliant activity and deny access of any individual to radiation sources in the interest of safety. Such action must be reported verbally and in writing to the EHS Director immediately.

3. Deans/Vice Presidents:

a. Implement and ensure compliance with this chapter.

b. Enforce the procedures set forth in this chapter.

c. Ensure that personal protective equipment and instruments are working properly and adequately performing their intended functions.

d. Assist the RSO and EHS Director in solving radiation safety problems.

e. Provide support as needed to the RSO and EHS Director in order to ensure compliance with existing laws and license requirements (maintenance of records, preparation of reports, etc,).

4. Authorized Users: An Authorized User is a person whose training and experience have been reviewed and approved by the Maine Radiation Control Program, who is named on the license, and who uses or directly supervises the use of licensed material

a. Ensure Authorized User is up to date on the UNE Radioactive Materials License prior to working with radioactive material.

b. Provide written confirmation including documented research proving there is no practical less hazardous alternative to the desired radioisotope to be used.

c. Keep his/her exposure as low as reasonably achievable (ALARA).

d. Wear assigned personnel monitoring devices in an approved manner.

e. Responsible for ensuring that the rules and regulations set forth by the RSO and this Safety chapter are implemented.

f. Clean up minor spills immediately and carry out emergency procedures as required.

g. Dispose of radioactive waste in the manner approved by this program.

h. See that sources, containers, and the area are properly labeled and posted.

i. Maintain required records and inventories.

j. Prevent unauthorized persons from having access to radiation sources.

k. Protect service personnel, allowing no maintenance or repairs of area facilities or equipment unless approved by the RSO.

l. Notify the RSO of unexpected difficulties, exposures, accidents or spills.

m. Explain the ALARA concept and the commitment to maintain exposures ALARA to all of those he/she supervises.

n. Ensure that those under his/her supervision who are subject to occupational radiation exposure are properly trained and educated in good health physics practices and in maintaining exposures ALARA.

o. Stop any unsafe operation or non-compliant activity and deny access of any individual to radiation sources in the interest of safety. Such action must be reported verbally and in writing to the EHS Director immediately.

5. Radiation Workers/Students:

a. Radiation Workers include faculty, staff or students working with radioisotopes under the supervision of an Authorized User.

b. The Radiation Worker must be 18 years of age or older and complete the same training as Authorized Users prior to entering an area where there is potential for exposure to radioisotopes.

c. Radiation Workers who are subject to occupational radiation exposure must conduct all work under the direction and supervision of the Authorized Users. The Authorized User must be available at all times for consultation in a reasonable amount of time, i.e. Telephone, Skype. Before conducting any work, Radiation Workers must be properly trained and educated in good health physics practices and in maintaining exposures ALARA.

d. All training must be documented and maintained by the RSO

6. University-wide Safety Committee:

a. Acts as an advisory board for proposed procedure changes and other safety concerns in regards to radiation safety.

C. Policies, Practices, Procedures:

1. The ALARA Program:

a. The ALARA (As Low As Reasonably Achievable) program seeks to keep exposure to radioactive materials as low as reasonably achievable. The program objectives are accomplished in several ways:

b. Prior to implementation of new procedures, Principal Investigators will confirm in writing, that the proposed material is the least hazardous material available or that alternatives are not reasonable or available.

c. The UNE Radiation Control Program establishes a threshold that triggers further investigation by the RSO if levels of exposure exceed 10% above maximum permissible exposure values.

d. The RSO will review procedures periodically and change them when it is apparent that it is both reasonable and achieves a lower possibility of exposure. Changes will be approved by the University-wide Safety Committee and forwarded to the State Radiation Control Office.

2. Application for Authorization:

a. Authorization must be received before ordering or using radioactive material or equipment containing sealed sources of radioactive material.

b. The requestor should have a thorough understanding of this safety chapter.

c. A Request for Authorization to Use Radioactive Isotopes form, should be filled out and submitted to the RSO or the EHS Director and the University-wide Safety Committee (UWSC) for consideration. This form can be found in Appendix M of the Safety Manual or it can be obtained from the RSO.

d. Revocation of Authorization: Authorization to use radioactive material may be revoked if, in the judgment of the EHS Director, good radiation safety practices are not followed. Items to be considered include:

i. Failure to comply with any of the rules put forth by this chapter

ii. Frequent spillage or exposure incidences above acceptable limits

iii. Disposal of material not in accordance with this chapter

iv. Eating, drinking, smoking, or applying cosmetics in restricted areas.

v. Inappropriate handling of radioactive material

3. Authorization for New Procedures or Materials:

a. Implementation of new procedures or use of new radioisotopes requires evaluation by the RSO well in advance of implementation or ordering.

b. Authorized users will consult with and receive the approval of the RSO and the EHS Director during the planning stage of an experiment and prior to use of radioactive materials for a new procedure.

c. Authorized Users will document that use of the chosen radioisotope is the least hazardous material available or that alternatives are not reasonable or available.

d. Authorized users will evaluate all procedures before using radioactive materials to ensure that exposures will be kept as low as reasonably achievable (ALARA).

4. Ordering, Receiving, and Accountability of Licensed Materials:

a. The following procedures are in place to ensure accountability of all radioactive materials licensed by the State of Maine that are owned and used by the University, under the control of the Radiation Safety Officer.

b. Packages of radioactive material received at UNE are not expected to exceed Type A quantity[1].

c. All orders for licensed radioactive materials must be authorized by the RSO or EHS Director, who will ensure that possession limits will not be exceeded.

d. Only the RSO and Authorized User are allowed to order radioactive materials.

e. The Authorized User will notify the receiving department in advance of the delivery of any radioactive material.

f. The Authorized User will make arrangements with the RSO to be present at time of delivery of radioactive material.

g. Delivery of radioactive material is permitted only at the receiving area of the UNE Facilities Building on 605 Pool Street, Biddeford, Maine.The person who receives the package must follow the steps listed below. Instructions for Receiving Packages Containing Radioactive Material:

i. Visual Inspection: The package must be visually inspected for any signs of shipping damage such as crushed or punctured containers, signs of dampness or package degradation.

ii. Prior to Leaving the Receiving Area:

- The package must be monitored[2] prior to leaving the mailroom if any one of the following conditions exists:

[1] Type A quantity is equal to 60 Curies C-14, 1000 Curies H-3, or 30 Ci of P-32

[2] When certain conditions exist to warrant monitoring, it must be conducted within 3 hours of receipt of the package (if received during normal working hours) or not later than 3 hours from the beginning of the next working day if received after working hours.

- The package has a Radioactive White I, Yellow II, or Yellow III label the package must be monitored for radioactive contamination on its' external surfaces.

iv. The package contains greater than a Type A quantity of radioactive material, (i. e., > 1000 Ci of Hydrogen 3, or > than 30 Ci of Phosphorus 32, or > 60 Ci of Carbon 14.

v. There is evidence of degradation of package integrity, such as crushed, wet or damaged.

vi. Damaged Packages:

- Do not touch any package suspected of leaking.
- Request the person delivering the package to remain until monitored by the RSO.
- Contact the RSO immediately. RSO must complete Receipt of Radioactive Materials Form.

vii. Undamaged Packages: Place the shipment in a secure area of the mailroom and contact the Authorized User or the RSO immediately.

- The packing report will be entered into the RSO inventory records. These records will be kept for as long as the material is possessed or until 3 years after transfer or disposal.

viii. Authorized users are required to keep a daily log of the amount of radioactivity used, disposed, and that which remains. It is recommended that Authorized Users use the Stock Aliquot Log form.

vix. An inventory of materials on hand, and disposed will be conducted bi-annually.

h. Security of Licensed Materials:

a. All locations where radioactive materials are stored or used must be secure from intentional or accidental unauthorized access or removal by following the requirements below:

i. Radioactive material will be stored in a locked container.

ii. The source may be stored in a separate container with its own lock, or locks may be installed on refrigerators or freezers where the material is stored.

iii. Laboratories in which radioisotopes are stored will be secure from unauthorized access whenever not occupied by an Authorized User, RSO, or Radiation Worker.

iv. Areas where radioisotopes are used or stored must be pre-approved by the RSO and reflected in this Radiation Safety Chapter, as part of License requirements.

v. Whenever licensed materials are in use in a controlled or restricted area, they must be under constant surveillance by the radiation worker to prevent others from becoming contaminated or exposed.

5. Classification of Areas:

a. Restricted Area - An area shall be designated as "Restricted" where there are any radioactive materials used or stored in quantities less than that listed below.

i. A placard with the radiation symbol and the words "CAUTION - RADIOACTIVE MATERIALS" is required to be posted in "Restricted" areas.

b. Radiation Area - An area shall be designated as a "Radiation Area" when a major portion of the body could receive in any one hour, a dose in excess of 5 millirems (0. 05 mSv) at 30 centimeters from the source or from any surface that the radiation penetrates.

i. A placard with the radiation symbol and the words: "CAUTION - RADIOACTIVE MATERIALS" must be posted in areas considered to be Radiation Areas[3]

c. High Radiation Area - An area shall be designated as a "High Radiation Area" when a major portion of the body could receive in any one hour a dose in excess of 100 millirems (1 mSv) at 30 centimeters from the source or from any surface that the radiation penetrates. For appropriate postings for High Radiation areas see 10-144A CMR 220, Part D, 28.

6. Posting and Labeling Requirements:

a. A "NOTICE TO EMPLOYEES" Maine form HHE-845 must posted in a conspicuous place wherever radioactive materials are used or stored.

b. Emergency Procedures, including a contact list should be posted conspicuously in areas of radioactive material storage or use.

c. Each container of licensed or registered material, including refrigerators and freezers, must be labeled with the radiation symbol and the words, "CAUTION, RADIOACTIVE MATERIAL" or "DANGER, RADIOACTIVE MATERIAL".

7. Maximum Permissible Occupational Dose Limits:

a. Dose Limits for Adult Workers/Minors: Radiation Safety Controls are in place to protect radiation workers and others from occupational exposure. Following is a table of annual dose limits for occupationally exposed individuals.

[3] UNE in general, does not expect to store or use enough radioactive material in any of it's areas that would reach levels high enough to be designated Radiation Areas.

Annual Dose Limits for Occupationally Exposed Workers

Occupational Dose Limits	
Type of Limit	**Annual Dose Limit**
Whole body[a]	5 TEDE[b] rems
Lens of Eye	15 rems
Thyroid	50 rems
Individual Organs	50 rems
Skin	50 rems
Extremities	50 rems
Minors	10% of those limits listed above
[a] Whole body = head, trunk, legs above knees, and arms above elbows. [b] TEDE = Total Effective Dose Equivalent = Sum of the deep-dose (external dose) + the committed effective dose equivalent (internal dose).	

b. Workers who declare they are pregnant: Shall not receive in excess of 5 mSv (0. 5rem) dose equivalent to the embryo/fetus during the course of the entire pregnancy. See U. S. NRC Regulatory Guide 8.13 Instruction Concerning Prenatal Radiation Exposure.

c. Members of the Public/Ancillary Personnel: Include those who live, work, study, or may be near locations where material is used or stored and employees whose duties do not include the use of byproduct material but may work in the vicinity where such materials are used or stored.

d. The radiation dose received by individual members of the public may not exceed 1 mSv (1 rem) in one calendar year resulting from the licensee's possession and/or use of licensed materials.

e. The radiation dose in unrestricted areas from external sources does not exceed 0. 02 mSv (2 rem) in any one hour.

f. Surveys will be conducted of radiation levels in unrestricted and restricted areas to demonstrate compliance with the dose limits for individual members of the public[4]. These surveys will be conducted whenever a new radioisotope is introduced or a procedure is significantly changed, at the discretion of the RSO and the EHS Director.

8. Personnel Monitoring - Measure of External Dose

a. Personnel monitoring (dosimetry) will be in the form of film badges or finger badges provided by the Landauer Corporation or other National Voluntary Laboratory Accreditation Program (NVLAP) certified supplier.

[4] For more information on Dose Limits for Individual Members of the Public, reference 10-144A CMR 220 § D.14.

b. Personnel monitoring devices will be required for adult employees expected to exceed the Maximum Permissible Occupational Dose Limits by 10% or more.

c. Minors and declared pregnant workers[5] will be assigned monitoring devices if likely to receive in 1 year, from sources external to the body, a deep dose equivalent in excess of 1 mSv (0.1 rem). See table below:

Conditions Requiring Monitoring	
Type of Limit	**Adult / Minor Dose Limits**
Whole body[a]	0.5 TEDE[b] rems / 0.1 rem
Lens of Eye	1.5 rems / 0.15 rem
Thyroid	5 rems / 0.5 rem
Individual Organs	5 rems / 0.5 rem
Skin	5 rems / 0.5 rem
Extremities	5 rems / 0.5 rem
[a] Whole body = head, trunk, legs above knees, and arms above elbows. [b] TEDE = Total Effective Dose Equivalent = Sum of the deep-dose (external dose) + the committed effective dose equivalent (internal dose).	

d. If an employee is assigned a personnel monitoring device, it shall be worn at all times while working with or around radioactive materials.

e. When not in use, personnel monitoring devices will be stored outside of restricted areas where radioactivity levels are equal to background.

f. Personnel monitoring devices will be sent in for readings on a quarterly basis.

g. Reports of personnel monitoring device results will be reviewed by the Authorized Users and forwarded to the RSO for filing.

h. Workers who are monitored will be provided with the results of their monitors on an annual basis, unless dose limits are exceeded, at which time the employee will be notified immediately.

i. Determination of Prior Occupational Dose will be made for each individual required to be monitored. The determination shall include:

i. The occupational radiation dose received during the current year; and,

ii. Records of cumulative occupational radiation dose[6] will be obtained if possible.

j. Bioassay - Measure of Internal Dose: Bioassay procedures may be instituted by the Radiation Safety Officer when internal contamination is suspected, (ingested or absorbed) or if a Radiation Worker handles more than 8 mCi of H-3 (liquid) at a time. Refer to Bioassay Requirements for Tritium.

[5] Declared pregnant worker is defined as a woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception (10 CFR 20.1003). See x, Instructions Concerning Prenatal Radiation Exposure.

[6] Appropriate documentation is described in detail in 10-144A CMR 220, D.10.C.

k. Surveying - Measure of Residual Contamination:

l. Surveys shall be conducted and results of the surveys and equipment calibration records must be retained for 3 years after the record is made. The following surveys are required:

i. Conclusion of Sessions: A survey of the workbench and personnel survey must be conducted at the end of each session of experiments (except for Tritium use).

ii. Survey to be conducted at the conclusion of each procedure and every time the researcher leaves the workspace for any reason. Survey forms can be found by contacting EHS or the RSO for the Radiation Survey Form.

iii. Bi-Monthly Surveys: A survey of the work-bench will be conducted by Tritium users utilizing the swipe test and scintillation counting. Survey forms can be found by contacting EHS or the RSO for the Radiation Survey Form.

iv. Quarterly Surveys: Surveys of each laboratory space utilizing radioactive materials will be conducted by the RSO on a quarterly basis.

v. Random Surveys: Surveys may be needed in order to decommission a piece of equipment or a laboratory space, or to monitor a package containing radioactive material.

vi. Detection Equipment & Calibration: Instruments and equipment used for quantitative radiation measurements shall be calibrated for the type of radiation being measured at intervals not to exceed 12 months.

9. Laboratory Safety Procedures:

a. Each laboratory area where radioactive materials are used or stored will follow the safety precautions listed below:

i. Wear a laboratory coat or other protective clothing at all times in areas where licensed materials are used. When not wearing the lab coat, it should be kept in a designated area near the restricted area.

ii. Wear two pairs of disposable gloves at all times when handling licensed materials.

iii. Change gloves often during a procedure to minimize exposure and to avoid spread of contamination.

iv. After each procedure, and before leaving the area, monitor hands, shoes and clothing for contamination (performed in a low-background area)

v. Do not eat, drink, smoke, or apply cosmetics in any area where licensed materials are used or stored.

vi. Wear personnel monitoring devices, if required, at all times while in areas where licensed materials are used or stored.

vii. Dispose of radioactive waste only in designated, labeled and properly shielded receptacles.

viii. Never pipette by mouth.

xi. Store radioactive solutions in clearly labeled containers.

x. Keep stock solutions closed and secure at all times.

xi. Perform dry runs prior to the performance of unfamiliar procedures, in order to preclude unexpected complications.

xii. Request the presence of the RSO during new procedures performed for the first time.

xiii. Secure licensed material when it is not under the constant surveillance and immediate control of the user(s).

b. Special Procedures for Phosphorus-32 (P-32):

i. Low-density 10mm plastic shielding around workspace is required in order to keep Bremsstrahlung radiation to a minimum.

ii. Absorbent, disposable material covering the surface area of the workbench is required.

iii. Radiation "frisk" surveys for contamination on the person and the workbench are mandatory after each use of radioactive material. Results of each survey must be documented.

iv. Extremity monitors are recommended for procedures that involve one millicurie or more of P-32[7].

v. The use of eye protection is required.

vi. The use of wrist protection is recommended.

c. Decommissioning of Equipment or Laboratories: If any laboratory, equipment or restricted space having been used for the storage or handling of radioactive materials is no longer used for that purpose, it must be decommissioned prior to being disposed of or transferred for use for non-radioactive purposes.

a. The decommissioning process includes testing for contamination, and decontaminating where necessary.

b. Documentation of the results will be filed with the Radiation Safety Officer.

c. Equipment or spaces will not be released for non-radioactive use or disposal unless testing results are equal to background, or the RSO approves of release.

[7] This requirement and others in this section are based upon the Nuclear Regulatory Commissions' document titled NUREG – 1556, Vol. 7, P.

10. Waste Disposal and Proper Waste Management:

a. Waste Storage must be Secure: Storage areas for radioactive waste must be secure at all times to protect against unauthorized removal or unintentional exposure. Storage areas must be posted with the appropriate signage, at a minimum "CAUTION, RADIOACTIVE MATERIALS".

b. Waste Minimization: Radioactive waste is extremely expensive to have disposed. Therefore, minimization of radioactive waste is a priority in order to keep costs as low as possible. Waste minimization begins by keeping non-radioactive waste out of the radioactive waste stream. Procedures will be monitored to ensure non-radioactive waste is not being mixed with radioactive waste. Non-radioactive containers and packing materials should have labels removed or destroyed prior to disposal.

c. Waste Removal from Laboratories: Movement of radioactive waste from laboratories to storage areas must be performed or at least overseen by the RSO.

i. Authorized Users should contact the RSO in advance to arrange for removal of radioactive waste, unless they have been given express authorization to move waste.

ii. Routes of delivery of radioactive waste to the appropriate storage area should be as short and direct as possible. Occupational and public exposure must be taken into account in considering the best possible delivery route.

iii. Each delivery of radioactive waste to storage areas must be documented appropriately.

d. Temporary Storage of Radioactive Waste Awaiting Shipment:

i. Long-lived waste (greater than 120 day half-life) will be stored on site until there is enough to warrant a cost effective shipment offsite.

ii. Solidify liquid radioactive waste - All waste planned for shipment must be in the form of solid waste.

- Liquid waste planned for shipment offsite will be solidified utilizing an absorbent material such as vermiculite or clay.
- All solidified waste will be double bagged.
- Vials of scintillation waste may be placed in absorbent material. Caps may be left on the vials, as long as they are crushed in the waste storage room, prior to being shipped.
- The volume of solid radioactive waste should be minimized to the greatest extent possible. Therefore all waste will be crushed whenever feasible prior to final shipment.

- Solid waste will be shipped by a licensed hazardous material transporter, and transferred to an authorized recipient as provided by D. 38 of the Maine Rules Relating to Radiation Protection or the U. S. Department of Energy.

e. Decay in Storage (DIS): Liquid or solid wastes with a half-life of 120 days or less may be decayed (under supervision of the RSO) for 10 half-lives and then disposed as non-radioactive waste[8] .

i. Containers - DIS waste must be stored in suitable, well marked containers that provide adequate shielding[9]. They must also be of appropriate size to make transport as easy and efficient as possible. Containers will be pre-approved by the RSO.

ii. Seal and Label - A full DIS container of waste must be sealed and labeled by the Authorized User. The label will include the following pieces of information:

- Name of the Authorized User; and
- Name of the isotope; and
- Date waste is moved into Decay in Storage Area.
- Date when 10 half-lives of the longest lived radioisotope will have transpired.

iii. Segregation - Short-lived waste planned for DIS will be stored separately from long-lived waste to be shipped offsite. Also, liquid waste must be stored separately from solid waste.

iv. Procedures for certification of non-radioactive waste.

- Check radiation detection survey meter for proper operation.
- Remove any shielding from around the container.
- Survey the contents of each container in a low background area.
- Monitor all surfaces of the container.
- Document the meter reading, date, and container in storage area DIS Log Book.

iv. If surveys indicate residual radioactivity, return the container to DIS area.

- If surface readings are indistinguishable from background, the contents shall be certified by the RSO to be non-radioactive and scheduled for

[8] Reference Model Procedure for Disposal by Decay in Storage, NUREG-1556, Vol. 7.
[9] Adequate shielding for DIS containers is defined as Exposure at 30 cm from the container must be less than or equal to 2mrem/hr (0.02mSv/hr).

disposal as ordinary rubbish or wastewater (after it has been determined that it is not a hazardous waste).

- Containers of certified non-radioactive waste scheduled for disposal must have all radioactive waste labels removed or destroyed.

D. Training:

1. Individuals whose assigned duties involve exposure to radiation and/or radioactive material (from both licensed and unlicensed sources), and in the course of their employment are likely to receive in a year[10] an occupational dose in excess of 100 mrem (1mSv) shall be trained by the Radiation Safety Officer. The following general subjects will be included in the training.

2. Authorized Users, Radiation Workers:

a. Health protection problems associated with exposure to radiation and precautions and procedures to minimize exposures.

b. Understanding of the radionuclides used in the laboratory and their properties with relation to safety issues (i. e., shielding requirements, energies, half-life, units of measure, etc.).

c. Understanding of UNE procedures, such as ordering, receiving, opening packages, use, storage, transfer, and disposal.

d. Responsibility to report promptly to the licensee any condition which may lead to or cause a violation of the license, or unnecessary exposure.

e. Emergency Response Procedures.

f. Advised as to the radiation exposure reports, which workers may request, if they are being monitored.

g. Proper use and operation of detection equipment that will be used in the laboratory (i. e., GM or liquid scintillation instruments).

h. Record keeping requirements specific to the radionuclide.

i. Posting and labeling requirements for radionuclides to be used.

j. License limits and license requirements of the UNE Radioactive Material License.

3. Ancillary Personnel:

a. Training is required for ancillary personnel, such as custodians or clerks who may enter or work near restricted areas from time to time.

[10] Licenses must take into consideration assigned activities during normal and abnormal situations involving exposure to radiation and/or radioactive materials. The extent of the training must be commensurate with the potential radiological health protection problems present in the workplace. [10 CFR §19.12].

b. Their training must be adequate to allow them to recognize radiation hazards and avoid or minimize their exposure to radiation and radioactive materials. Specifically, ancillary personnel will be training on the following subjects:

i. Health protection problems associated with exposure to radiation.

ii. Precautions or procedures to minimize exposures and the protective devices utilized.

iii. Ordering, receiving, opening packages, use, storage, transfer, and disposal procedures at UNE.

iv. Responsibility to report promptly to the licensee any condition which may lead to or cause a violation of the license, or unnecessary exposure.

v. Response to unusual occurrences such as spills or emergency activities.

4. Frequency of Training: Training shall be conducted at frequencies listed below:

a. Prior to assuming duties with, or in the vicinity of, radioactive materials.

b. Whenever there is a significant change in duties, regulations, or the terms of the license.

c. Annually (refresher training).

E. Emergency Procedures:

1. A Radioactive Material Incident is defined as any spill or accident involving possible bodily contamination or ingestion of radioactivity, over-exposure to radiation, contamination of equipment, spread of contamination, or difficulty in cleaning up a contaminated area. Those spills or accidents involving bodily injury should be reported to the Security Department and shall seek emergency medical attention immediately.

2. Where a Radioactive Material Incident occurs, the following steps should be followed :(1) take immediate steps to control the spread of radioactive contamination, (2) decontaminate personnel and the immediate area, and (3) notify the Radiation Safety Officer (RSO) or the EHS Director immediately.

3. Additional Requirements: As noted earlier in this chapter, Emergency Procedures (including a contact list) and an Emergency Spill Kit shall be available in all areas where radioactive materials are used or stored.

4. Reporting and Notification of Incidents: In the case of any unusual occurrence or incident, the Authorized User should contact the Radiation Safety Officer immediately, who will then notify the State of Maine Radiation Control Program Inspectors if applicable in accordance with the rules below[11] :

5. Reports of Stolen, Lost, Missing Licensed or Registered Sources:

[11] This section found in Maine Rules Relating to Radiation Protection, 10-144A CMR 220, D.52.

a. An immediate telephone report to the licensing agency is required if an amount greater than or equal to1000 mCi H-3, or 100 mCi C-14, or 10 mCi P-32 is lost, stolen or missing under such circumstances that it appears that an exposure could result to individuals in unrestricted areas;

b. A telephone report shall be made to the licensing agency within 30 days, if material found missing in an aggregate quantity greater than 10 mCi H-3, or 1 mCi C-14, or 100 uCi P-32.

c. An immediate telephone report shall be made to the licensing agency for a stolen, lost, or missing radiation machine.

d. A written report to the licensing agency is required within 30 days of making any telephone report.

6. Notification of Incidents:

a. Immediate Notification will be made to the licensing agency where an individual receives 25 rem total effective dose, or 75 rem lens dose equivalent, or 250 rads of a shallow dose equivalent to skin or extremities, or total organ dose equivalent.

b. Twenty-four Hour Notification for loss of control of a licensed or registered source that may have caused or threatens to cause an individual to receivein a period of 24 hours a total effective dose equivalent exceeding 5 rem, or a lens dose equivalent exceeding 15 rem, or a shallow-dose equivalent to skin, extremities or total organ exceeding 50 rem.

c. Reports of Exposures: Report of exposures, radiation levels and concentrations of radioactive material exceeding the limits require written reports to follow up on any of the notifications listed above or in the case of any occupational dose limit exceeded.

d. Reports to Individuals: Reports to individuals will be made of any incidence of overexposure of the occupational exposure limits. The report shall be made simultaneous to the report to the licensing agency[12].

F. Record Keeping

1. Provisions of the Radioactive Control Program: License provisions including those referenced by the license, such as the Radiation Control Program Manual, shall be retained until the license is terminated.

2. Training records of topics covered by this chapter will be maintained by the Department of Human Resources for a minimum of three years, unless otherwise specified.

3. Annual Audit of Radioactive Control Program: The Radiation Safety Officer will conduct an annual audit of the Radiation Safety Program, including on-site observations of practices and procedures. This record will be kept on file for 3 years after the record is made.

[12] For additional reporting requirements and contents of reports, see 10-144A CMR 220, D53-D58.

4. Receipt, Transport, Storage, and Disposal Records: Shall be retained until the license is terminated.

5. Radioactive Material Use Log: Will be entered into the RSO inventory records. These records will be kept for as long as the material is possessed or until 3 years after transfer or disposal.

6. Bi-Annual Inventory of Radioactive Materials: An inventory of all radioactive materials (including waste) shall be conducted and documented by the RSO at least twice annually. The bi-annual inventory shall be retained for 3 years after the record is made.

7. Personnel Monitoring: If conditions require individual monitoring of external and internal occupational dose[13] these records must be recorded at intervals not to exceed one year, and must be retained until the license is terminated. At that time, the records will be stored permanently, or transferred to the licensing agency.

8. Laboratory Monitoring, Surveys, Calibration:

a. Records of Routine Nature - Such as bi-weekly, and quarterly laboratory surveys, and records of instrument calibration shall be kept for 3 years after the record is made.

b. Non-routine Records:

- Records of the results of surveys conducted, measurements taken, or calculations used to determine individual dose equivalents from external or internal doses, or releases, or bioassays, or air sampling surveys shall be retained until the license terminates.

- Upon termination, the licensee shall store these records permanently, or transfer them to the licensing agency.

[13] Conditions requiring individual monitoring of external and internal occupational dose can be found at Maine Rules Relating to Radiation Protection, 10-144 CMR 220 Part D.18.