Carnegie Mellon University

Environmental Health and Safety (EHS)

Carnegie Mellon University Radiation Safety Committee

Radiation Safety Program

1. Introduction

Carnegie Mellon University (CMU) uses ionizing radiation emitted from radioactive material (RAM) for teaching and research purposes. Individuals that participate in the Radiation Safety Program (RSP) use ionizing radiation for the following purposes:

- theoretical analysis, exploration, and experimentation
- extension of investigative findings and theories of a scientific or technical nature into practical application for experimental and/or demonstration purposes, including but not limited to the experimental production, and testing of models, devices, equipment, and processes
- demonstration, teaching, and instruction in courses offered by the university to graduate and undergraduate students
- calibration of radiation survey, radiation monitoring and other radiation measurement equipment or devices
- radiation and radioactive materials covered by this safety plan will not be used for internal administration or external application to human beings

The above uses may present risks to the user, other individuals and the environment. Therefore, the university's RSP has two major objectives.

(1) Ensure personnel as low as reasonably achievable (ALARA) dose exposures.
(2) Achieve full compliance with local, state and federal laws and regulations governing the use of RAM and RPDs.

The United State Nuclear Regulatory Commission (USNRC) and the Pennsylvania Department of Environmental Protection (PADEP) regulate the uses of RAM and RPDs at Carnegie Mellon University. The following two licenses authorize these uses:

(1) USNRC/DOE special nuclear materials license
(2) PADEP specific license and RPD registration

These licensees authorize the use of byproduct material, special nuclear material, and naturally occurring or accelerator produced radioactive material (NARM) and the possession of x-ray generating equipment, respectively. The physical form and activity of the materials that the university possesses at any one time varies according to license(s) requirements.

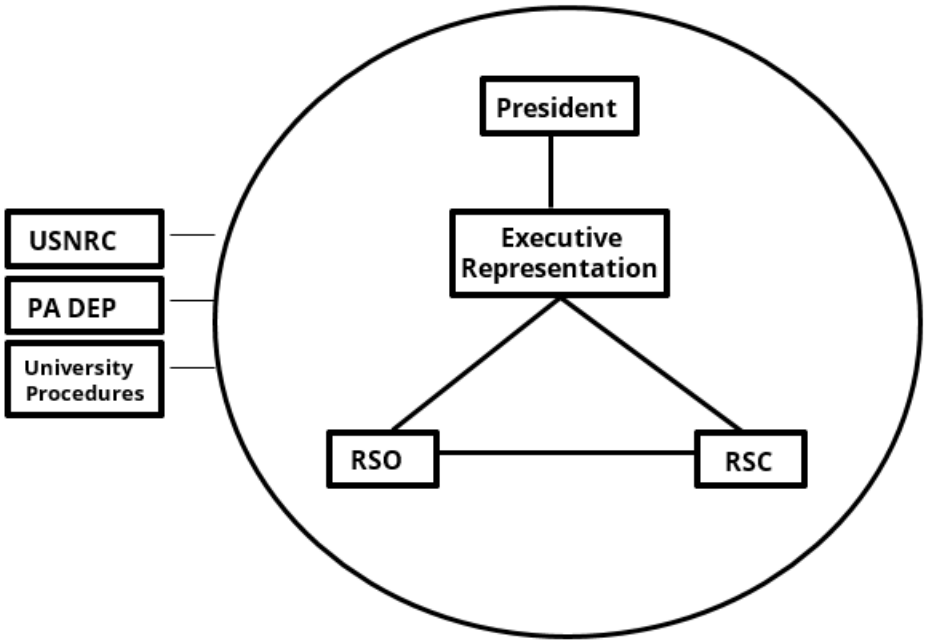
The above licenses are available for review and inspection in the Radiation Safety (RS) Office. The continued success of the program is dependent upon keeping exposures ALARA, complying with the rules and regulations, and the program's ability to adapt to changing research methods.

The Radiation Safety Officer (RSO) can address any questions or comments regarding this safety plan. Please contact the university's Environmental Health and Safety (EH&S) department for his/her contact information.

NOTE: Unless otherwise specified, CMU will use the procedures outlined in NUREG-1556 Vol. 11 Consolidated Guidance About Material Licenses. Contact the EHS at for more information.

2. Management Oversight

The following chart shows the organization of those responsible for directing the RSP at CMU. External regulatory requirements (i.e. USNRC and PADEP licenses) and CMU's procedures govern the RSP. While the RSP must meet the conditions specified by the licenses, CMU has the responsibility for designing, implementing, and maintaining the program.



Executive Management (EM), the Radiation Safety Committee (RSC), and the RSO and his or her staff, work as a team to oversee the program. Each plays critical roles within its area of responsibility. Below are the roles and responsibilities of EM, the RSC, and the RSO and his/her staff.

2.1 Executive Management

EM is at the senior level and has the ultimate responsibility for the licenses and the activities associated with the licenses and RSP. EM has the important role of implementing and managing the RSP.

EM or his/her delegate is a member of the RSC. He/she should attend all committee meetings. In all licensed programs involving the use of RAM, EM should be knowledgeable of the results of periodic audits and the annual review of the licensed program, to ensure all activities comply

with regulatory requirements and conditions of the license(s), and that all participants in the RSP conduct activities in a safe manner.

EM represents the highest level of management and has the authority to delegate resources including personnel for the program and appropriate funds in a timely manner. EM must be available to facilitate effective and immediate action on behalf of management, the RSC and the RSO, particularly in the event of an emergency. EM must have the authority to make prompt decisions without having to consult with higher management officials, including the authority to take whatever action is necessary to ensure that all RS practices are in accordance with the regulations and conditions of the license(s).

EM is involved in selecting the chairperson and members of the RSC and the RSO, and defines the role, duties and responsibilities of each. EM should support the RSC and the RSO, creating an atmosphere of cooperation and professionalism such that individuals feel comfortable raising RS concerns. Authority is enhanced through an authorized user's clear understanding that there is strong management support for and participation in, the licensed program. Individuals should understand management's expectations regarding internal enforcement of program requirements and the consequences for non-compliance.

2.2 Radiation Safety Committee (RSC)

2.2.1 Composition

The RSC is composed of faculty and staff trained and experienced in the safe use of radiation producing devices and radioactive materials. Membership on the RSC should represent each area of use under the license(s).

2.2.2 The Chair

Committee members rotate in Chairing the Committee, with a term lasting 1year. The Chairperson should have knowledge of RS issues, good leadership abilities, the authority and credibility by virtue of their position within the university, and a desire to serve as chairperson, which will facilitate the effectiveness of the RSC.

2.2.3 The Charter

The RSC has established a charter that outlines its purpose and duties. The RSC establishes a quorum for meetings, as defined in the *RSC Charter* (**see Appendix A**). An acceptable quorum consists of at least one-half of the committee's voting members.

2.2.4 Meeting Frequency and Content

The meeting frequency and content, as defined in the RSC Charter, is sufficient to ensure that the RSP is operating in compliance with the license(s), established procedures and regulations.

2.2.5 Minutes

The RSC maintains minutes of its meetings. The contents of the minutes shall include, at a minimum, that which the RSC charter specifies.

2.2.6 Responsibilities

2.2.6.1 Approval of Radionuclide Authorizations

One of the primary responsibilities of the Committee for the RSP is to evaluate new authorized users and new protocols involving the use of radioactive material. The RSC considers all available information in making decisions. This includes evaluating the training and experience of applicants who request authorization to use RAM at the university, using criteria developed by the RSC.

The RSC members are familiar with the regulatory training and experience criteria that apply to each type of use at CMU. The RSC authorizes the approval, rejection, and suspension of the use of RAM and RPD.

2.2.6.2 Policies and Procedures

The RSC has the flexibility to amend the RSP. The criteria for reviewing and approving such changes to the RSP include provisions for training staff before implementing and ensures that the proposed changes will not degrade the effectiveness of the currently approved program.

2.3 Radiation Safety Officer (RSO)

The RSO is responsible for the day to day management of the Radiation Safety Program and maintaining compliance with the regulations for the use of RAM. The RSO is responsible for crafting policies and procedures necessary for an effective and compliant program. The RSO is a member of the RSC and works closely with the RSC and EM in implementing the RSP. The RSO and his/her staff have full access to all activities involving the use of byproduct material. The RSO has the authority to terminate any activity in which health and safety appear compromised without consulting EM or the RSC, if required.

The RS office performs audits of all RAM and areas of use and individuals authorized to use RAM or RPDs to ensure that their work is in accordance with the license(s), regulations, and procedures. Specific duties and responsibilities of the RSO and his/her staff include:

- attendance at all RSC meetings
- performance of all routine monitoring and surveys in areas which RAM or RPDs are used
- oversight of ordering, receipt, surveys, and delivery of byproduct material
- oversight of packaging, labeling, surveys, etc., for all shipments of byproduct material leaving the institution
- oversight of the personnel monitoring program, including determining the need for and evaluating bioassays, monitoring personnel exposure records, and developing corrective actions for those exposures approaching maximum permissible limits
- training of all personnel
- implementation and maintenance of the waste disposal program
- performance of inventory and leak test for all licensable sealed sources
- follow up surveys after contamination cleanup
- investigation of all incidents and response to all emergencies
- performance of annual surveys and inventory of RPDs
- calibration of survey instruments
- correspondence with regulatory agencies
- maintenance of all required records

2.4 Authorized User

An authorized user is any individual who the RSC has granted approval to use RAM and has received the appropriate training as defined by the RSP. The status of these individuals varies and is as follows: radionuclide authorization holder and radionuclide user. Individuals have varying responsibilities that are dependent on his/her categorical classification.

2.5 Radionuclide Authorization (RA) Holders

A Radionuclide Authorization (RA) holder is any researcher whom the RSC has granted permission to perform activities as specified in the Radioactive Material License. Permission is granted by approval by the RSC of the completed Radioactive Materials Registration form in BioRAFT. For more information, please contact safety@andrew.cmu.edu.

The Radionuclide Authorization (RA) holder has the responsibility to know and abide by the following rules:

- Ensure that radionuclide users working under their RA have received Carnegie Mellon University's RS training and proper dosimetry, if required, before working with RAM.
- Provide protocol-specific training to radionuclide users prior to their use of RAM.
- Implement corrective actions to prevent recurrence of radiological program operating errors.
- Ensure that radionuclide users perform lab work in accordance with Carnegie Mellon University's RSP requirements.
- Immediately notify the RSO of significant radiological accidents (such as spills, personnel contamination or injuries from a RPD).
- Maintain an accurate and thorough radionuclide inventory for the laboratory on the *Radioactive Material Use Log* **(see Appendix B**).
- Coordinate RAM disposal with the RS office, as described in **Section M. Radioactive Waste Disposal**.
- Notify the RSO of all transfers of RAM to or from another laboratory or licensee, as described in **Section H. Material Use, Control and Transfer**.
- Submit the Radioactive Materials Registration modification request in BioRAFT for any modification to a previously approved and current Radioactive Materials Registration.
- Notify the RSO or his/her designate prior to the ordering equipment containing RAM. This includes any device that contains a generally licensed source (e.g. liquid scintillation counter, gas chromatograph, static eliminator, etc.)
- Survey and remove if needed, all areas with the potential for radioactive contamination prior to the entry of ancillary personnel.

2.6 Radionuclide Users

A Radionuclide User is any individual who the RSC has granted approval to use RAM and has received the appropriate training as defined by the RSP. Radionuclide users have the responsibility to know and abide by the following rules:

- Properly wear and store the personal monitoring devices when required.
- Familiarize oneself with the specifications listed in this safety plan and the applicable Radioactive Materials Registration.
- Maintain an accurate and thorough RAM inventory for the laboratory on the *Radioactive Material Use Log* (**Appendix C**)

- Collect, store and dispose radioactive waste in the laboratory, as described **Section M. Radioactive Waste Disposal**.
- Coordinate and document transfer of licensed material, as described in **Section H. Material Use, Control and Transfer**.
- Notify the RSO of spills, loss of RAM, or personnel contamination.
- Prevent unauthorized personnel from entering a restricted RAM area.
- Ensure and maintain positive control over license material at all times.
- Perform required contamination surveys, therefore ensuring exposures are ALARA and that researchers confine contamination to designated areas.
- Ensure that only the RS staff conducts radioactive waste removal.
- Perform procedures to segregate radioactive and non-radioactive waste.
- Perform personal contamination surveys following use of unsealed sources.
- Wear proper personal protection equipment, as indicated in the applicable RA. These items may include eyewear, gloves and lab coats while working with all unsealed/dispersible sources.
- If designated in the RA, wear proper personal protection equipment including eyewear and gloves while working with all sealed sources.
- Maintain ALARA dose exposure.
- Contact the RSO or his/her designate to order all license material.
- Follow general laboratory safety instructions as specified in Carnegie Mellon University's Lab Safety/Hazardous Waste Training and this safety plan while working with RAM.

2.7 Ancillary Personnel

Ancillary Personnel have the responsibility to know and abide by the following rules:

- Ensure that he/she has received and understands ancillary RS training from the RS office before entering a radiological work or storage area unattended.
- Obtain authorization from the laboratory supervisor or PI for initial entry into a RAM room.
- Notify the RSO and receive clearance prior to performing any maintenance involving plumbing, ductwork, or ventilation systems connected to radiological work areas.
- Emergency response personnel must ensure that any action taken is appropriate for the level of hazard and inform the RSO of the response to an emergency involving RAM or RPDs.
- Shipping and receiving personnel shall place RAM packages in a secure location or under direct surveillance and contact the RS office upon the arrival of RAM.
- The need for dosimetry, if any, will be determined by the RSO.

3. Surveillance

- The RSO and/or a member of the RSC designated by the RSC chairman, must review the RSP content and implementation at an interval not to exceed 12 months.
- An annual assessment of the Radiation Safety Program shall be conducted.

4. Facilities and Equipment

4.1 Restricted Areas versus Controlled Areas

There are no areas at CMU that are designated as restricted, for the purpose of maintaining compliance with exposure limits. However, there are areas, i.e. RAM use areas, that are required to be secured and access limited to only those with RAM User or Ancillary Training. The definition of Controlled Area is better suited for the security arrangements of all of the University's RAM Use areas.

4.2 Bench Top Work

Bench top work is authorized for most of the activities involving RAM at CMU. Volatile compounds are identified by the RSO when ordered and their usage is confined to certified fume hoods and glove boxes. Areas on benches where unsealed materials are used will be visibly designated and will be covered with absorbent paper.

4.3 Equipment Labeling Requirements

Any equipment that comes into contact with radioactive material, or the primary container of radioactive material, must be labeled with the words "radioactive materials" or the radiation trefoil.

4.5 Waste Containers

Containers used for the collection of RAM waste must be labeled as outlined in above in "Equipment Labeling Requirements." Other required information required for these containers includes radionuclide, estimated activity and chemical constituents of liquids. Waste containers will be of appropriate shielding material to maintain ALARA.

4.6 Plumbing and Ductwork

Designs minimizing the buildup of RAM in plumbing and ductwork should be considered whenever RAM use areas are considered for construction or renovations. Ductwork venting dedicated RAM hoods and waste waterlines draining RAM sinks should be labeled whenever possible to facilitate hazard identification by facilities workers and contractors.

4.7 Remote Handling Tools

Remote handling tools such as forceps and extension handles should be used whenever possible in the interest of maintaining ALARA.

4.8 Shields

Shields appropriate for the radionuclide will be used whenever adherence to the principle of ALARA is possible. Shielding will be used to minimize exposure from source material in use and in storage, and for radioactive waste materials.

4.9 Sinks

While there is no sink disposal of liquid radioactive waste at CMU, small amounts of radioactive material from tertiary and subsequent rinses and from the washing of contaminated lab ware, will contaminate certain sinks. Each laboratory requiring a sink for the above uses is required to dedicate a sink for these purposes. The sink must be posted with this or a similar warning:

"CAUTION, THIS SINK IS DESIGNATED FOR WASHING OF RADIOACTIVE LABWARE AND MAY CONTAIN LOW LEVELS OF RADIOACTIVE CONTAMINATION"

Routine hand washing should be discouraged at these sinks.

4.10 Engineering controls

4.10.1 Hoods

Work involving the use of volatile radionuclides will be performed in a certified, functional chemical fume hood. Such a hood must meet the labeling requirements as are outlined in "Equipment Labeling Requirements." Hoods will be lined with absorbent paper.

4.10.2 Glove boxes

Work involving the use of volatile radionuclides will be performed in an approved, certified, and functional glove box when installation of a chemical fume hood is impractical or impossible. The glove box must be appropriately filtered to prevent contamination, and the maintenance schedule for filter changes adhered to. Glove boxes must meet the labeling requirements as outlined in "Equipment Labeling."

5. Radioactive Materials Registration

Prior to the use or possession of radionuclides, a Radioactive Materials Registration must be granted. A brief outline of the procedure to obtain authorization to use radionuclides, including activated materials, follows:

- Under no circumstances shall a user order deliver, or transfer to CMU without proper authorization.
- The PI must complete the Radioactive Materials Registration and all applicable forms before any work using RAM commences.
- The application, along with its instructions can be obtained via safety@andrew.cmu.edu.
- All pertinent information of the operations and/or experiments to be carried out with RAM, qualification of users, radiological safety procedures, proposed methods of disposal for radiological wastes, facilities Radioactive Materials Registration.
- The RSO evaluates proposed operations and experiments, and recommends revisions where appropriate.
- The RSC chair and RSC departmental representative review the application and indicate their approval via BioRAFT.
- The RSO, RSC chair, and RSC departmental representative evaluate the request and grant approval provided the following conditions are satisfactory:
    - The application and RAM uses described therein are in accordance with CMU's RAM license requirements.
    - The RSC approves of the RS procedures described in the application.
    - Facilities are adequate for the procedures and use described in the application.
    - Personnel using material and occupying restricted areas have the necessary training.
    - Bioassays performed when requested by the RSO.
    - Personnel monitoring devices used when requested by the RSO.
    - Proper survey frequency and types of survey monitoring instruments are used.
    - Protocols used will ensure minimization of personal exposure and generation of contaminated waste materials.
    - The applicant has adequately demonstrated knowledge and proficiency in the use of radioactive materials, contamination control techniques, use of ALARA fundamentals and use of survey equipment.

- BioRAFT will inform the applicant of the approval/rejection of his/her application via an automated communication.
- In the event the Radioactive Materials Registration is rejected, the applicant may petition the RSC for reconsideration based on the terms outlined in the decision to reject the Radioactive Materials Registration.
- The RA is granted for a period of three years after which the Radioactive Materials Registration may be renewed.

The following describes each possible Radioactive Materials Registration Status and the required actions if applicable:

- **Active** – Radioactive Materials Registrations are granted for a period of three years, at which time the Radioactive Materials Registration may be reviewed by the RSC for renewal. Active Radioactive Materials Registration holders are responsible for adhering to all requirements and procedures set forth in this policy.
- **Inactive** - A lab may voluntarily request inactive status. This relieves the PI of all requirements of this policy.
  - Required actions –
    - The lab must zero out its inventory of radioactive stock and samples. Stock and samples of long lived radionuclides may be stored under the care of the RSO until the lab reactivates.
    - All labeled equipment and posted areas must be surveyed for contamination.
    - Once labeled equipment and posted areas are deemed to be free of contamination, these items and areas shall have all RAM labels and postings removed
  - Requirements for reactivation – The PI need only send a written request to the RSO to reactivate the Radioactive Materials Registration. All room postings and equipment labels required for RAM use must be in place prior to the lab receiving any RAM stock.
- **Archived**– This status is reserved for PI's whose Radioactive Materials Registration has expired and feel no need to renew.
  - Required actions –
    - The lab must zero out its inventory of radioactive stock and samples. Stock and samples of long lived radionuclides may be stored under the care of the RSO until the lab reactivates.
    - All labeled equipment and posted areas must be surveyed for contamination.
    - Once labeled equipment and posted areas are deemed to be free of contamination, those items and areas shall have all RAM labels and postings removed.
  - Requirements for reactivation – The Radioactive Materials Registration holder must reapply to the RSC for a new Radioactive Materials Registration
    - **Probationary/Suspended** – This status is reserved for Radioactive Materials Registration holders who have failed to adhere to the requirements of the RSP and have had the Radioactive Materials Registration holders revoked by the RSC. RAs may be suspended as outlined in **Section L. Violations** of the RSP.

- Required actions –
  - The lab must zero out its inventory of radioactive stock and samples. Stock and samples of long lived radionuclides may be stored under the care of the RSO until the lab reactivates.
  - All labeled equipment and posted areas must be surveyed for contamination.
  - Once labeled equipment and posted areas are deemed to be free of contamination, those items and areas shall have all RAM labels and postings removed.
- Requirements for reactivation – The PI must satisfy the conditions of the probation/suspension letter issued by the RSC to the PI.
  - **Radioactive Materials Registration renewal** – Radioactive Materials Registration are awarded for a period of three years, after which time they may be renewed for another three years. Renewals do not need RSC approval unless the renewed RA is amended. See approval process for amendments below.
  - **Amendments** – A revision or amendment to the original registration may be made by submitting via RioRAFT. An amendment includes alteration to one or more of the following: radionuclide, chemical or physical form of the radionuclide, activity limits for ordering/possession, location of use/storage, and/or research protocol. If the modification does not constitute an escalation in safety requirements or hazards, the RSO may approve the change. All other amendments require the approval of the RSC. Amendments need not be made if the only changes are addition or removal of personnel, but the Radioactive Materials Registration holder must notify the RSO of this change.

6. Training

There are two tracks of RS training. One track is for those persons who use RAM as part of their jobs or curriculum. Those who fit this description are called Radionuclide Users. Another track exists for those persons who have cause to enter areas posted for RAM use as part of their jobs or curriculum, but who do not actually use the material themselves. These people are called Ancillary Personnel.

6.1 Radionuclide User Training

Radionuclide users are trained in two phases. The first phase consists of an online training module. Upon satisfactory completion, the trainee is eligible to take part two, which is a practical application of demonstrated concepts. Radioactive Materials Registration holders and RAM Users must take both parts before they can order, possess or use any RAM Training for users consists of instruction in the following subject matter:

- Principles of radiation and radioactivity
  (1) radioactive decay
  (2) half-life
  (3) natural background radiation
- Applicable federal, state, and Carnegie Mellon University's radiation safety regulations
  (1) dose limits
  (2) area postings

- Hazards associated with the use of RAM
  (1) biological effects
  (2) acute vs. chronic effects
  (3) health risks
- Modes of exposure
- Procedure for reporting an actual or suspected exposure
- Contamination and radiation controls
  (1) surveys
  (2) exposure control, penetrability of different types of radiation, linear energy transfer (LET)
- RAM/waste/controls
- Personnel monitoring devices
  (1) dose monitoring methods
  (2) thermoluminescence detectors (TLDs)
- General RAM laboratory precautions and good practices
- User rights and responsibilities
- RAM use authorization and procurement
- RAM use and disposal inventory records
- RAM spill procedures
- Waste disposal and segregation
- Emergency actions
- Prenatal exposure policy

6.2 Annual Refresher Training

RAM users are required to receive refresher training annually. Refresher training focuses on providing a review of the basic principles of radiation safety compliance activities, and also acts as a vehicle to introduce policy and procedure updates. Refresher training will take the form of a newsletter or an in person training session.

6.3 Ancillary Training

Ancillary Training is conducted as an online presentation that focuses on recognizing radiation areas and emergency response. Ancillary training is required every two years. Ancillary personnel receive training in the following subject matter:

- Radiation
  (1) definition
  (2) modes of exposure
  (3) beneficial uses
  (4) background radiation
- Types of radiological posting, labels, and tags
- Contamination and radiological controls
- Potential hazards of RAM or RPDs
- Rights and responsibilities as an ancillary employee of CMU
- Appropriate action that the individual must take in response to an emergency

6.3.1 Exemptions

CMU reserves the right to acknowledge training from another institution upon the determination of its equivalence to training received at Carnegie Mellon University

and receipt of written documentation. In addition, any individual considering himself/herself for exemption must contact the RS office to schedule and take a written exam that encompasses fundamentals of RS and CMURSP requirements.

Ancillary personnel are exempt from training provided he/she only enter restricted areas while escorted by a trained user and that no RAM is in use while the untrained individual is in the restricted area.

7. Carnegie Mellon University's Ram Safety Rules

In order to satisfy the objectives of the RSP, the following safety rules must be practiced when working with RAM:

- Adhere to all requirements specified in the RSP.
- Wear assigned personnel monitoring devices when working with or around RAM.
- Wear protective clothing, as specified in the applicable Radioactive Materials Registration, when working with RAM (e.g., lab coat, rubber or disposable plastic gloves, protective eyewear, etc.) In addition, any exposed body parts (i.e. legs) must be covered when working with RAM.
- Separate long half-life waste material (longer than 120 days) from short half-life waste material and separate wastes by isotope.
- Separate waste materials into the following categories: glass, incinerable (paper, plastic), liquid, liquid scintillation vials, and sharps (needles, razor blades, etc.)
- Do not mix hazardous chemicals with RAM, unless indicated in RA.
- Frisk when leaving a RAM laboratory that is authorized to use or store unsealed/dispersible RAM.
- Conduct radiological work activities over surfaces lined with absorbent material.
- When moving bottles and flasks filled with radioactive liquid, stopper the bottle or flasks or otherwise contain the liquid material. Place the bottle or flask into a secondary container that is capable of holding the entire content volume.
- Handle concentrated solutions of radionuclides or sealed sources with long handled tools.
- Do not eat, drink, chew gum or tobacco, smoke, or apply cosmetics in a RAM area.
  - Do not store food or drink in a RAM area (e.g. RAM laboratories, refrigerators, freezers.)
  - Never pipette or perform any similar operation on RAM by mouth suction.
- Do not work with unsealed/dispersible RAM if you have an open wound or break in exposed skin that could be exposed to the material.
- Maintain positive control (i.e., RAM must be kept locked up or is under the direct control of a user) of RAM at all times.

8. Ram Material Use, Control and Transfer

CMU follows strict guidelines concerning the use receipt, distribution, control, and inventory of RAM.

8.1 Ordering of Radioactive Materials

- All orders for RAM must be approved by the RSO, or her/his designee, and the Radioactive Materials Registration holder or her/his designee, before it may be placed. Order requests can be made via BioRAFT.
- Only the RSO or her/his designee may place orders with vendors
- All approved orders must meet the requirements specified by the user's Radioactive Materials Registration, i.e. radionuclide, chemical form and ordering/possession limits.
- Records of each order will be placed in the "Radioactive Materials Order Book."
- Ordering generally licensed material (GLM) will reflect as closely as possible the established policy regarding procurement of RAM. Since facilities are not required to possess a PA DEP or NRC license to receive GLM, it is much harder to track these purchases. CMU already has a policy in place requiring RS approval of any purchase of RAM or of a product that produces radiation or contains a radioactive component. CMU departments that possess devices that contain GLM have been identified and are periodically reminded of the procurement procedure.
- The RSO or her/his designee will notify the MI Storeroom (or approved alternate location) on the 3rd floor of Mellon Institute that a RAM package will be anticipated.

8.2 Receipt of Radioactive Materials

- Per 10 CFR 20.1906, all RAM shipments at CMU shall be opened and inspected within 3 hours of receipt during normal working hours and within 18 hours of receipt if received after normal working hours.
- The requested RAM arrives at the MI Storeroom on the 3rd floor of Mellon Institute. If alternate locations are desired, the RSO must approve and specify on the completed BioRAFT order request.
- The MI Storeroom personnel will perform an initial surface contamination survey and will immediately notify the RS Office of the arrival of the RAM.
- The RSO or authorized designee performs contamination and radiation surveys of the exterior surface of the package.
  (1) The dose rate (mrem/hr) on the surface of the package is recorded in the RAM Receipts Logbook
  (2) Levels in excess of 200mr/hr at the surface or levels in excess of 10mr/hr at 3 feet from the package surface require immediate notification of the RSO.
- Wipe tests are performed on the outer and inner package of the RAM in a vented hood.
- The RSO or authorized designee will open the package(s) in the designated vented hood (317 MI) and perform a wipe survey of the package(s) interior and radionuclide container.
- The quantity and isotopic content of the package are verified with its respective BioRAFT order request.
- Smears are counted using a liquid scintillation counter and the results recorded in the RAM Receipts Logbook.
- If the RAM and surveys are within the accepted limits specified by 10 CFR 20.1906, the package(s) are delivered to the requesting laboratory.
- An approved Radionuclide User must be present and sign for receipt of the package or it will be returned to the RS Office.

8.3 Transfer of Radioactive Materials

- To transfer radioactive material from another licensee to CMU, you must have an approved *RA.* This includes free material from other institutions or vendors.
- The RSO will determine if CMU license(s) allows the possession and use of the requested amount and type of RAM.
- Laboratories must contact the RS Office to arrange the details of the transfer.

8.4 Maintaining an Inventory

- The RS Office provides *Radioactive Material Use Logs*, to the authorized user for each radionuclide order. The laboratory maintains this form to record use and disposal of RAM.
- Each user receives instruction for maintaining a proper RAM inventory during the initial user training session.
- When the RAM is completely used and the inventory balance for an individual shipment is zero, the radionuclide user places the vial in the dry waste container and places the applicable *Radioactive Material Use Logs* in the "Spent RAM" Section of their RAM Notebook.

8.5 Security

Carnegie Mellon University's licenses require that RAM be controlled in a manner to prevent unauthorized access or removal. A positive control of RAM is maintained at Carnegie Mellon University. Each RAM laboratory is kept locked or if the RAM laboratory is unlocked, the RAM is located in a locked containment (i.e. locked drawer, refrigerator, and freezer) or a user attends to the RAM to prevent unauthorized access or removal.

8.6 Inventory Verification

At a period not to exceed six months, the RS Office will conduct a physical inventory to account for all sources and/or devices received and possessed. Records of this inventory verification will be maintained for a period no less than five years from the date of verification. Each record will include the radionuclides, quantities, manufacturer's name and model numbers as well as the date of the verification.

9. Personal Monitoring and Bioassays

9.1 Personal Monitoring

- Film Badges, thermoluminescent dosimeters, extremity dosimeters and direct reading dosimeters shall be used to provide monitoring in accordance with the appropriate Carnegie Mellon University's license(s) and regulating body (either the USNRC or PADEP).
- No personal monitoring will be required for work with hydrogen-3, sulfur-35, carbon-14, or alpha only emitting radionuclides.
- Radionuclide user must complete the *Dosimetry Application and Training Certification* form (**see Appendix C**) before issuance of dosimetry.
- A written justification by the RSO is required for all other situations where personal monitoring is not required.
- A personal monitoring processing service that has been certified by the National Voluntary Laboratory Accreditation Program (NVLAP) will be used. The current provider

of Carnegie Mellon University's dosimetry service is Mirion Technologies (GDS), Inc., 104 Union Valley Road, Oak Ridge, TN 37830, and the dosimetry processing frequency is once every three months, unless the RSO determines a need for a more frequent processing (e.g. declared pregnant worker).

9.2 Bioassays

- Bioassays will be conducted for personnel using quantities of RAM where the potential intake will exceed 0.1 Annual Limit Intake (ALI) for the radionuclide or combination of radionuclides used. The exception to this will be where radionuclide action levels are specified in regulatory guides such as for radioiodine in Regulatory Guide 8.20, "Applications of Bioassay for I-125 and I-131".
- In these cases the action levels specified in the regulatory guide shall be used. Research involving sealed sources does not require bioassay monitoring.

10. Survey Equipment and Instrumentation

10.1 Portable Survey Meters

- Instruments for radiation detection will be provided to RA holders by the RSO. Only those laboratories exclusively using 3H will not be issued survey instruments. All other labs will receive instruments appropriate for detection of the radionuclides that are in use.
- Laboratories in which sealed sources are used shall be provided with instruments that are calibrated to provide exposure rates (mR/hr).
- Survey instruments will be calibrated annually.
- Dose rate and exposure rate instruments will be calibrated by a facility meeting USNRC and ASTM standards.
- Whenever possible, instruments with readouts in counts per minute (cpm) and used for the detection of surface contamination, will be calibrated by CMU EHS staff following the proper procedure.

10.2 Liquid Scintillation Counters (LSC) and Gamma Counters

- LSC and gamma counters will be calibrated annually.
- Quality control checks including efficiency, reproducibility and accuracy will be run periodically throughout the year by the RSO and/or designee. Results of quality control checks will be provided via a reference sheet at each instrument.
- Users of liquid scintillation counters will have 3H, 14C standards and a reference sheet available for confirmation of machine performance.
- Users of gamma 125I (gamma counter) standards and a reference sheet available for confirmation of machine performance.

11. Surveys and Inspections

11.1 Purpose of Surveys

Surveys of RAM laboratories are performed in accordance with **USNRC NUREG 1556, Volume 11 Radiological Survey Methods and Criteria**. Surveys are taken to ensure the following objectives:

(1) Maintain ALARA dose exposure.
(2) Prevent the spread of contamination.
(3) Use material in accordance with the laboratories' *Radionuclide Authorization*.
(4) Assert the accountability of RAM possessed at CMU.

11.2 Survey Frequency

- *Post RAM use*
  - Those persons who use unsealed RAM shall perform a meter survey of their work area at the conclusion of their RAM use. A wipe test shall be performed if low energy radionuclides are used, otherwise a meter survey will suffice. This survey must be documented on the Material Use Log.
- *Weekly*
  - Those persons who use unsealed RAM shall perform and document a survey, consisting of a meter survey and wipe test, by the end of the calendar week in which the material was used. Records of weekly surveys will be maintained in the laboratory's RAM Notebook.
- *Monthly*
  - All laboratories that maintain an active inventory of unsealed RAM will be surveyed monthly by RS staff as part of a radiation safety audit. Records of monthly surveys will be maintained in the RS office for a period of not less 3 years. During the monthly survey, the RS Staff will be inspecting the following items:
    - Training of personnel
    - Proper use of Personal Protective Equipment (PPE) and Dosimetry
    - Use of inventory logs to track radioactive materials usage
    - Use of shielding
    - Accurate and appropriate performance and documentation of meter surveys and wipe tests
    - Proper storage of radioactive stock materials
    - Segregation of waste materials
    - Use of absorbent coverings to minimize contamination
    - Proper storage of radioactive wastes
    - Adherence to rules regarding food and drink storage, eating, drinking and applying cosmetics in areas authorized for the Radioactive Materials (RAM) use
    - Use of RAM in authorized areas
    - Proper labeling of equipment used in conjunction with RAM
    - Presence of removable contamination exceeding 200 cpm or dpm
      Security of the laboratory
    - Clearly defined RAM use area within the lab
    - Proper response when contamination is detected
      Presence of required postings and labels
- *Quarterly*

- All laboratories with an active Radioactive Materials Registration will be surveyed quarterly by RS staff as part of a radiation safety audit. Records of quarterly surveys will be maintained in the RS office for a period of not less than three years. During the quarterly survey, the RS Staff will inspect the items listed above in the monthly survey subsection.

- *Annually*
  - The RSO will annually evaluate areas adjacent to RAM use and storage areas that are accessible to members of the general public for the purpose of demonstrating compliance with the annual dose limit to members of the general public. All records of dose to individual members of the public will be maintained in the RS office for a period of not less than three years.

11.3 Sealed Sources

- Sealed sources are either leak tested or inventoried as required by the appropriate license and regulating body (either the USNRC or PADEP). Leak tests are performed either quarterly or semi-annually depending on the radionuclide properties and activity of the sealed source. The criteria for leak testing is as follows:
  - All sealed beta gamma-emitting sources shall be leak tested every six months. .
  - All alpha-emitting sources used for the purpose of alpha emission shall be leak tested at least every three months. Alpha-emitting sources not used for the purpose of alpha emission shall be leak tested every six months.
  - Sealed sources do not require leak testing if they contain only hydrogen-3; or they contain only a radioactive gas; or the half-life of the isotope is 30 days or less; or they contain not more than 100 microcuries of beta- and/or gamma emitting material or not more than 10 microcuries of alpha emitting material
  - Sealed sources do not require leak testing if they are in storage and not being used. However, when they are removed from storage for use or transferred to another person, and have not been tested within the last six months, they shall be tested before use or transfer. No sealed source shall be stored for a period of more than 10 years without being tested for leaked and/or contamination.
  - Sources containing licensed material with a half-life of 30 days or less do not require leak testing.
  - Sealed sources that are exempt under 10 CFR 31.5 do not require leak testing.
  - Records shall be kept of such leak tests in accordance with regulatory requirements
  - If leak tests indicate removable contamination levels in excess of 0.005 microcuries then the source(s) are removed from service, prepared for disposal, and the RSO notifies the proper regulatory body.

12. Violations

Failure to abide by the requirements of this RSP, by the statements in a Radioactive Materials Registration, or by the requirements set forth by the Radiation Safety Committee or radiation safety officer shall be considered a violation. The following escalating actions will be taken in the event of a violation (note: escalation results if violations occur on consecutive inspections):

- 1st Violation - The RSO will notify the Radioactive Materials Registration holder in writing that a violation has occurred and will provide 7 days for the Radioactive Materials Registration

holder to appeal. In addition, the RSO will work with the Radioactive Materials Registration holder to correct the deficiency.

- 2nd Violation - The RSO will notify the Radioactive Materials Registration holder in writing that a violation has occurred and will provide 7 days for the Radioactive Materials Registration holder to appeal. If the Radioactive Materials Registration holder does not appeal or does not produce compelling evidence for the violation to be removed, the RSO and RSC chair will meet with Radioactive Materials Registration holder and request written corrective action plan which will be submitted to the RSC for approval
- 3rd Violation - The RSO will notify the Radioactive Materials Registration holder in writing that a violation has occurred and will provide 7 days for the Radioactive Materials Registration holder to appeal. If the Radioactive Materials Registration holder does not appeal or does not produce compelling evidence for the violation to be removed, the Radioactive Materials Registration will be reviewed for possible suspension by committee and the Radioactive Materials Registration holder's Department Head will be informed.

13. Radioactive Waste Disposal

13.1 General

- Waste will be collected from the generator upon request.
- It is the responsibility of the generator to have the container closed and properly tagged.
  - Request and Prepare RAM Waste for pickup.
- Disposing of waste via sanitary sewer is prohibited.
- Generators should be encouraged to use only the containers provided to them by Radiation Safety for RAM waste collection.
- Do not mix chemicals with RAM Waste without approval from the RSO.

13.2 Segregation

- All waste must be segregated by the generator.
- Solids must be separated from liquids.
- Waste containing organic chemicals must be separated from those containing inorganic compounds.
- All waste must be separated by radionuclide whenever possible.
- Sharps must be collected in a separate hardened container.

13.3 Decay In Storage

- RS Office will employ Decay in Storage (DIS) strategies for solid and liquid radioactive unsealed wastes with half-lives less than 120 days.
- RS Office will employ Decay in Storage (DIS) strategies for sealed source waste with half-lives less than 300 days.
- Wastes will be containerized by half-life for decay. Those wastes with a half-life of less than or equal to 14 days (Phosphorus-32) will be stored together, as will wastes where their half-life is between 60 days and 90 days (Iodine-125), and wastes where their half-life is between 90 and 120 days (Sulfur-35).
- The waste will be stored in larger containers for at least 10 half-lives.

- Each DIS container will be assigned a unique number and an inventory sheet maintained for the container that will include the control numbers of all waste that is stored within, along with the date the waste was placed in the container.

13.4 Offsite Disposal of RAM Waste

- Those unsealed wastes where half-life is greater than 120 days will be logged as above and stored for offsite disposal.
- Those sealed source waste where half-life is greater than 300 days will be logged as above and stored for offsite disposal.

13.5 Carcasses and Tissue Samples

- Carcasses and tissue samples will be segregated as indicated above, but will be stored, whether for decay or to await transportation offsite, in a frozen state.

13.6 Mixed Wastes

- Mixed RAM waste that meets the criteria for DIS, will be decayed on site, sampled and turned over to Chemical Safety for disposal as hazardous waste.
- Mixed waste not meeting the criteria for DIS will be stored to await offsite disposal.

13.7 Record keeping

- Each bag or bottle collected from a generator will be issued a control number and details (type of waste, activity, volume, date, etc.) of the waste entered into a log.
- All storage containers will be assigned a unique number.
- Sealed sources will be placed in the waste room's sealed source inventory.
- A second log sheet will be used to record the control number of each item placed into the storage container.
- Disposal information will be recorded on the storage container log sheet.
- Quarterly reporting requirements for offsite waste disposal shall be addressed.

14. Emergencies

An outline of emergency procedures for fire, injury, RAM spills, and personnel contamination follows:

14.1 Fire

- Warn others in the affected space and vacate the area. Do not attempt to put out the fire.
- Activate the fire alarm by engaging the closest pull station if the alarm is not sounding.
- If you have training you can fight a small trashcan fire. Know your limitations. Otherwise, evacuate the building immediately
- Shut door behind you as you leave.
- Call university police at (412) 268-2323. Give the location and type of fire, your name and telephone extension and the presence of RAM or hazardous chemicals in the affected area.
- Assemble all personnel from the affected area in a location that is close to the building.
- Call EHS at (412) 268-8182 and explain the nature of the emergency.

14.2 Injury

- If it is a minor injury (i.e. small cut), provide first aid.

- If it is a major injury (i.e. broken leg, heart attack), call university police at (412) 268-2323. Give the location and name of the injured individual, the nature of the injury, your name and telephone extension, and inform whether RAM is involved.
- Call EHS at (412) 268-8182 or EHS at (412) 268-8182 and explain the nature of the emergency.
- Complete an accident report and return to EHS.

14.3 Spill

- Stop the source of the RAM spill.
- Warn others in the area of the spill.
- Isolate the area to prevent the entry of other personnel.
- If personnel contamination has occurred, follow the procedures listed under "Personnel Contamination."
- Minimize exposure by covering the spill and maintaining distance from the spill area.
- Secure windows, fume hoods, doors, and other ventilation sources.
- Call EHS at (412) 268-8182 or call university police at (412) 268-2323 if there is no answer or if it is after normal working hours.
- Assemble at a location as close to the affected area as is practical. If further exposure is minimal, then remain in the lab.

14.4 Personnel Contamination

- Warn others in the area of contamination.
- Remain in the laboratory
- Call EHS at (412) 268-8182 or call university police at (412) 268-2323 if there is no answer or if it is after normal working hours. The RSO or designate will respond, in person, to all personnel contamination situations.
- If the contamination is minor (i.e., hands or forearms) wash the RAM off in a laboratory sink with warm water and soap. Survey the affected area. If clean, wait for the RSO or designee to survey the affected area for release.
- If the area is still contaminated, wash the affected area again and survey. By this time the RSO or designate should be available for further instructions.
  NOTE: Only the RSO or designate can make the determination for releasing the affected individual.
- If the contamination is major and the RSO is not immediately available perform the following:
  (1) Remove all affected clothing. Have a lab-mate get you a "clean" lab coat if necessary.
  (2) Survey your hands and feet (shoes, if they weren't affected) and move to a nearby unaffected area.
  (3) Perform a survey of the area of the body where the spill occurred to ensure that no skin contamination occurred.
  (4) If there is skin contamination, proceed to the shower on the 3rd floor of Mellon Institute (or location as dictated by the RSO or designate). Wash the affected area with warm soap and water, dry off the affected area and survey the affected area.
    (a) If the area is no longer contaminated wait for the RSO or designate to survey area for release.

(b) If the area is still contaminated, RSO or designate will give further instructions.

The RSO will make every effort to perform the above listed actions in a professional manner with the utmost concern for the affected individual. All efforts will be made to have a chaperone in case the affected individual is of the opposite sex of the RS Office personnel providing assistance.

15. Transportation

Department of Transportation (DOT) requirements will be observed whenever licensed materials are transported. Radiation Safety Staff will maintain DOT credentials for shipping/transporting RAM.

16. Reporting Requirements

The table below outlines the NRC/DEP notifications and/or reporting requirements for the occurrence of the events listed:

Event	Telephone Notification	Written Report	Regulatory Requirement
Theft or loss of material	Immediate	30 days	10CFR 20.2201(a) (1) (I)
Whole body dose greater than 0.25 Sv (25 rems)	Immediate	30 days	10CFR 20.2202(a) (1) (I)
Extremity dose greater than 0.5 Sv (250 rems)	Immediate	30 days	10 CFR 20.2202(a) (1) (iii)
Whole body dose greater than 0.05 Sv (5 rems) in 24 hours	24 hours	30 days	10CFR 20.2202(a) (1) (I)
Extremity dose greater than 0.5 Sv (50 rems) in 24 hours	24 hours	30 days	10CFR 20.2202(b) (1) (iii)
Whole body dose greater than 0.05 Sv (5 rems)	none	30 days	10CFR 20.2203(a) (2) (I)
Dose to individual member of the general public > 1 mSv (100 mrems)	none	30 days	10CFR 20.2202(a) (2) (iv)
Defect in equipment that could create a substantial safety hazard	2 days	30 days	10CFR20.21(d) (3) (I)
Unplanned fire or explosion that affects the integrity of any licensed material or device, container or equipment with licensed material	24 hours	30 days	10CR30.50 (b)(4)

17. Declaration of Pregnancy

17.1 Background Information

Carnegie Mellon University (Carnegie Mellon) complies with federal regulations to minimize potentially damaging ionizing radiation exposure to the embryos/fetuses of declared pregnant women working in radiologically restricted areas of the university.

To ensure compliance, this policy mandates training for all employees and students who work in radiologically restricted areas regarding the effects of radiation on a developing embryo/fetus. It also mandates a procedure, to be implemented by the radiation safety officer, for ensuring that the radiation exposure of a woman who officially declares her pregnancy does not exceed the level set by federal regulations.

17.2 Information and Training

The radiation safety officer shall provide training sessions in which all students and employees, including supervisors, who are to work in restricted radiation areas are informed, orally and in writing, about this Prenatal Radiation Exposure Policy and about potential radiation and non-radiation effects on a developing embryo/fetus. At these sessions, attendees are given the opportunity to have questions answered. The radiation safety officer may, at his or her discretion, administer an oral and/or written exam in order to confirm attendees' understanding of the subject matter.

The radiation safety officer obtains from each attendee a signed acknowledgment of understanding of the Prenatal Radiation Exposure Policy. No employee or student may enter a radiologically restricted area before attending such a training session and signing such an acknowledgment of understanding. Any declared pregnant employee or student who performs work that results in radiation exposure at other, non-Carnegie Mellon University locations is responsible for informing the Radiation Safety Office of those activities.

17.3 Declaration of Pregnancy

Any employee or student who works in a radiologically restricted area of the university and determines she is pregnant may officially declare her pregnancy to the radiation safety officer. To be considered an official declaration of pregnancy, this must be in writing and contain the estimated date of conception. An official declaration of pregnancy form can be obtained from the radiation safety officer. A pregnant woman has no obligation to officially declare her pregnancy.

17.4 Limiting Exposure

Upon receiving an official declaration of pregnancy, the radiation safety officer shall work with the declared pregnant woman's supervisor to review the work being performed by the declared pregnant woman and determine whether exposure is likely to exceed 500 millirems during the pregnancy and/or likely to substantially vary from month to month during the pregnancy. If exposure greater than 500 millirems or significant variation is determined to be likely, the radiation safety officer and supervisor shall identify and implement appropriate precautions and engineering controls to limit radiation dose and/or decrease month-to-month variations.

The radiation safety officer shall also, upon receiving an official declaration of pregnancy, complete a dose assessment on the declared pregnant woman, including sending her whole body radiation dosimeter to an approved laboratory for processing, and possibly including bioassay by urinalysis. The radiation safety officer shall communicate to the declared pregnant woman the results of the dose assessment.

Once a month, the radiation safety officer shall monitor the external occupational dose to a declared pregnant woman using a whole body radiation dosimeter, unless the radiation safety officer considers it unlikely that the embryo/fetus will receive, from sources outside the body of the declared pregnant woman, a dose in excess of 100 millirems during the course of the pregnancy.

The radiation safety officer shall monitor the occupational intake, by bioassay if necessary, of radioactive material by a declared pregnant woman, unless the radiation safety officer considers it unlikely that the declared pregnant woman will receive a "Committed Effective Dose Equivalent" in excess of 100 millirems during the course of the pregnancy, in accordance with Title 10, Code of Federal Regulations, Part 20, "Standards for Protection Against Radiation."

If the declared pregnant woman's exposure approaches 350 millirems prior to the end of the gestation period, the radiation safety officer shall recommend to the declared pregnant woman and her work supervisor that she reduce her use of radioactive materials. If the declared pregnant woman's exposure reaches or exceeds 450 millirems prior to the end of the gestation period, the radiation safety officer shall notify her supervisor, remove her radiation dosimeters and rescind her authorization to use radioactive material for the remainder of her pregnancy.

Declared pregnant women desiring to further limit their exposure may do so. Any resulting changes in work routine are to be coordinated with their work supervisor.

17.5 Records

The radiation safety officer shall maintain all official declarations of pregnancy and exposure records in accordance with Title 10, Code of Federal Regulations, Part 20, "Standards for Protection Against Radiation.

18. Revisions

Date	Documented Changes	Initials
07/2019		
5/5/2021	Updated Format and Accessibility Update	MAS
4/6/2022	Updated formatting, replaced “Radionuclide Authorization” and “RA” with “Radioactive Materials Registration,” added information on BioRAFT, adjusted appendices, updated table of contents	AJL
5/4/2023	Reviewed, but no updates needed	AJL
5/1/2024	Reviewed, but no updates needed	AJL

Appendix A: Radiation Safety Committee Charter

1. Establishment

There is established at Carnegie Mellon University, a Radiation Safety Committee (RSC), which operates under the authority of the university's provost. This is the same RSC provided for in the Pennsylvania Department of Environmental Protection (PADEP) License 37-00602-03. This charter specifies the authority, membership, responsibilities, and duties of the RSC.

2. Authority

The RSC develops and recommends radiation safety policy and monitors the progress and continuity of the radiation safety program. In accordance with the requirements of the various university radioactive materials licenses, the committee reviews and either approves or denies applications for proposed usage of sources of ionizing and non-ionizing radiation. The RSC reports to the provost of Carnegie Mellon University. The mission of the RSC is to:

2.1 Ensure the safe use of sources of ionizing radiation

2.2 Ensure that sources of ionizing radiation are used in compliance with the U.S. Nuclear Regulatory Commission, Pennsylvania Department of Environmental Protection, and Carnegie Mellon University regulations and license conditions.

2.3 Ensure that the use of sources of ionizing radiation is consistent with ALARA, "as low as reasonably achievable", philosophy

2.4 Identify radiation safety program problems and implement solutions

2.5 Address safety issues associated with non-ionizing radiation producing devices, as deemed necessary by the RSC.

3. Membership

The committee shall consist of individuals who by their knowledge and experience are qualified to make judgments and recommend policy in the area of radiation safety. Committee membership shall include an authorized user from each department and each type of use permitted by the license or registration or an individual from each department whose training and experience provides them with knowledge and insight necessary to support the goals of the committee, the radiation safety officer, a representative of executive management, and a representative of at least one administrative unit. Additional members may be included as deemed appropriate or as required by the Pennsylvania Department of Environmental Protection. The university's provost in consultation with the various chairpersons, directors, and department heads shall appoint committee members. The chairperson and vice-chairperson are selected from among the authorized user representatives on an annual, rotating-basis.

An authorized user is an individual to whom the RSC has previously granted approval to use sources of ionizing radiation for his/her research.

An executive management representative is an individual at the senior management level whom the university provost delegated to represent him/her.

An administrative unit representative is an individual from a department who is interested in the safe use of radionuclides or radiation producing devices (e.g., university police, purchasing department, etc.), but does not have direct involvement with radiation related activities.

One or more additional members may originate from any of the previously mentioned areas and whose membership the committee requested at the discretion of the committee.

Authorized user representatives, the radiation safety officer and the executive management representative are all voting members. Voting status for additional members will be determined based on the individual's status as defined above and assigned upon commencement of membership. Representatives of administrative units are not voting members.

4. Meetings

The committee shall meet at least once per calendar quarter or at the request of any member. To establish a quorum and to conduct business, at least one-half of the committee's voting membership must be present, including the radiation safety officer and the executive management representative. In the event that the executive management representative is unable to attend, the radiation safety officer, or his/her designee, may serve in that capacity. Committee meeting content shall satisfy, at a minimum, the requirements specified by the Pennsylvania Department of Environmental Protection.

Approval of any item presented to the committee for a vote, with the exception of amending this charter, will require a simple majority of the total of all voting members of the committee, regardless of the number of voting members in attendance. Votes may be conducted electronically if necessary.

5. Committee Duties and Responsibilities

Assume responsibility for the radiation safety aspects of all university programs and activities involving sources of ionizing and non-ionizing radiation.

5.1 Be familiar with all pertinent radiation-related regulations, license applications, licenses, and license amendments.

5.2 Prescribe procedures, conditions, requirements, and restrictions as necessary to protect university staff and employees, the public, and the environment from hazards associated with sources of ionizing radiation. Such policies and procedures, conditions, restrictions, and requirements shall be consistent with state regulations, license conditions, or recognized consensus standards.

5.3 Review and approve, or disapprove, applications to acquire, or use sources of ionizing and non-ionizing radiation consistent with the limitations in the regulations, licenses,

the ALARA philosophy, and based on safety. Authorized users must obtain committee approval before any project involving sources of ionizing radiation is initiated.

5.4 Ensure that the training and experience of proposed authorized users, the radiation safety officer, and other individuals are sufficient to enable the individuals to perform their duties safely and in accordance with the regulations and license conditions.

5.5 Review quarterly the radiation safety officer's summary report on the occupational radiation exposure records of all personnel, giving attention to individuals or groups of workers whose occupational exposure exceeds threshold levels established by the radiation safety office. The radiation safety office uses previous occupational exposures from a particular group of individuals having similar work practices to determine the threshold for that working group. Threshold levels may vary amongst groups.

5.6 Review quarterly, with the assistance of the radiation safety officer, all incidents involving sources of ionizing radiation with respect to cause and subsequent actions taken. An Incident is any operational error that results in noncompliance with the university's radiation safety program or an event that has the potential to cause radiological concern for individuals directly or indirectly associated with the event.

5.7 Ensure that all affected individuals are appropriately instructed as required by regulation or license conditions by establishing and maintaining a comprehensive radiation safety program.

5.8 Ensure that licenses are amended if required prior to approving any changes in facilities, equipment, policies, procedures, and personnel.

5.9 Review the annual radiation safety program audit report and, with the assistance of the radiation safety officer, recommend remedial actions to correct any deficiencies identified.

5.10 Through the radiation safety officer, serve as the university's liaison with state agencies in matters of registration and licensing.

5.11 Approve written record of activities, actions, decisions, recommendations, transactions, communications, and reports involving the work of the committee. Committee minutes must include the date of the meeting, members in attendance and absentia, summaries of deliberations and discussions, recommended actions and the results of all votes, and required program reviews.

5.12 Through the radiation safety officer, promptly provide each member with a copy of the meeting minutes, and retain one copy for the duration of the license or registration.

The RSC shall establish *ad hoc* and standing subcommittees as necessary. The RSC chairperson shall appoint the ad hoc subcommittees.

Individuals may appeal actions of the RSC to the university's provost with the knowledge of the director or department head of the affected unit involved.

The chairperson of the RSC and the radiation safety officer are authorized to act as agents of the committee. Any action taken by the chairperson or radiation safety officer on behalf of the committee shall be reported in a timely manner, but no later than at the next meeting and shall be subject to committee approval or disapproval.

6. Radiation Safety Officer Duties and Responsibilities

The radiation safety officer is responsible for managing the radiation safety program; identifying radiation safety problems; initiating, recommending, or providing corrective actions; verifying implementation of corrective actions; and ensuring compliance with regulations and license conditions. To meet these responsibilities, the radiation safety officer is authorized to:

6.1 Ensure that day-to-day operations involving sources of ionizing radiation are conducted according to policies and procedures designed to adequately protect public health and safety and maintain exposures ALARA. To accomplish this, the radiation safety officer shall have unhampered access to all activities involving sources of ionizing radiation.

6.2 Terminate an unsafe activity immediately without consulting with executive management or the RSC. Promptly notify appropriate individuals and offices such as principal investigators, departmental chairpersons, the chairperson of the RSC, and executive management.

6.3 Establish, maintain, and audit written policies and procedures to implement the various aspects of the radiation safety program.

6.4 Under the direction of the radiation safety officer, the radiation safety staff, consistent with the protection of university staff, the public, and the environment, is authorized to:

6.4.1 Carry out unannounced radiation safety-related inspections, surveys and audits of any university facility.

6.4.2 Recommend the immediate shutdown or cessation of work where it is evident that health hazards exist to the extent of endangering life or property or to the extent that continued operation would result in a violation of state, or university policy, procedure, rule, regulation, or license condition and promptly notify the radiation safety officer.

7. Amendment of RSC Charter

A recommendation to the provost of Carnegie Mellon University to amend the RSC charter requires a 2/3 majority of the voting members of the RSC.

An amendment of the RSC charter requires, to become effective, a license amendment approved by the PADEP.

Appendix B: Radioactive Materials Use Log

Authorized User: Location of Use:

Receipt Date: Radionuclide:

Activity: Compound:

Lot #: Volume:

Catalog #: Assay Date:

Date	Activity Used (uCi)	Activity Remaining	Volume Used (uL)	Volume Remaining (uL)	Dry Waste (uCi)	Liquid Waste (uCi)	LSV Waste (uCi)	Post Use Survey <200 cpm (Y/N)	Initials

Delivered By:_____ Received By:_____
Date:_____ Date:_____

Appendix C: Dosimetry Application and Training Certification Form

Please provide all of the requested information. **Print clearly!** Notify the Radiation Safety Office if any of this information changes. **You should report to the Radiation Safety Office for an Exit Interview when you will no longer be using dosimetry.**

NAME: _____ , _____ **SSN:** _____
Last First

Male ☐ Female ☐ Non-binary ☐ Date of birth: _____

Please respond to all of the following concerning radiation exposure through employment or educational research (do NOT include dental or medical x-rays or medical procedures).

	Exposure?	Estimated Amount
Have you had previous occupational exposure	[ ] Yes [ ] No	_____
Current calendar quarter	[ ] Yes [ ] No	_____
Current calendar year	[ ] Yes [ ] No	_____

If you answered Yes to any of these questions, please indicate the address(es) or phone number where we can obtain this information.

_____

_____

Dosimetry Usage Area: Bldg: _____ Rm: _____ Department: _____Phone:_____

[ ] One Time Only [ ] Issue Quarterly

Radionuclide Authorization #_____

PI NAME: _____ PI SIGNATURE: _____

Send Annual Exposure Report: [ ] Home [ ] Campus

Home Address: _____

☐ **I have received training in the CMU Radiation Safety Program.**
☐ **I have received a copy of the Safety Plan for the Use of Radioactive Materials and Radiation Producing Devices and have been instructed to read all applicable sections.**

☐ **I have received a copy of Regulatory Guide 8.13, Instruction Concerning Prenatal Radiation Exposure and CMU Prenatal Radiation Exposure Policy and have read and understood the Regulatory Guide and the Policy.**

☐ **A representative of the Radiation Safety Office has reviewed the results of my radiation safety-training quiz with me.**

☐ **I have had the opportunity to ask questions concerning any aspect of the Radiation Safety Program.**

Name: _____ Signature: _____ Date: _____

****

This area for Radiation Safety Office Only

DOS TYPE	BINARY #'S	ID #'S	
_____	_____	_____	ISSUED BY: _____
_____	_____	_____	DATE: _____
_____	_____	_____	DELETED: _____

Information transferred to badge supplier [ ] PARTICIPANT#: _____

Comments: _____

Requested Exposure History: [ ] Yes [ ] No _____