ENVIRONMENTAL HEALTH & SAFETY

RADIATION SAFETY MANUAL

Cal Poly Pomona

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INTRODUCTION

California State Polytechnic University (Cal Poly Pomona), hereinafter referred to as The University, operates under a broad scope radioactive materials license issued by the California Department of Public Health – Radiologic Health Branch (RHB). The regulations contained in Title 17 of the California Code of Regulations (CCR), together with Title 10 of the Code of Federal Regulations (CFR), govern the use of all radioactive materials (RAM) and radiation generating equipment (RGE). The University's Radiation Safety Program incorporates the ALARA (As Low As Reasonably Achievable) principle as a core component of daily operations.

Purpose of the Manual

The purpose of this manual is to provide a framework for safe and compliant use of RAM and RGE across the University. It outlines the requirements of the University's radioactive materials license, establishes standards to ensure compliance with federal and state regulations, and defines the authority of the Radiation Safety Officer (RSO) and Radiation Safety Committee (RSC). This manual also reinforces the University's commitment to the ALARA principle by minimizing unnecessary exposure to radiation and by promoting best practices in teaching, research, and operational activities.

Enforcement and Compliance

Adherence to ALARA and all applicable regulations is mandatory. Failure to comply with ALARA may result in revocation of a use authorization or disciplinary action as determined by the RSC. Violations of Title 17 CCR and other radiation safety regulations may result in criminal charges and/or administrative action by the University. The RSC has the authority to investigate any misuse of RAM or RGE, suspend violators from radiation-related activities, and impound or restrict access to RAM or RGE for a defined period of time.

Document Maintenance

This manual is a living document, updated as needed by the RSO and/or RSC. Any changes that could affect personnel exposure require approval by RHB as a license amendment. Administrative updates that do not impact personnel exposure may be implemented by the RSO, with the RSC Chair recording approval on page 2 of this manual.

Governance and Oversight

Title 17 CCR requires broad scope licensees to establish both an RSO and an RSC. The RSC consists of at least seven members who represent authorized RAM users and University administration. Members of the committee are appointed by the University President or designee, based on recommendations from the RSO. Appointment of the RSO requires approval by the University President and confirmation by RHB.

The RSC convenes at meetings called by the Chair or the RSO to review and approve proposed uses of RAM and RGE, as well as to address matters requiring committee action. The committee is also responsible for investigating reported incidents of noncompliance or misuse and ensuring corrective action is taken to maintain compliance with all applicable regulations and license conditions.

Program Contact

Lance Coey, Biosafety & Radiation Safety Officer
Environmental Health & Safety
(909) 869-5054, lwcoey@cpp.edu

DEFINITIONS AND KEY TERMS

ALARA (As Low As Reasonably Achievable)	A guiding principle in radiation protection requiring that exposures to ionizing radiation be kept as far below regulatory limits as practical, considering economic and social factors.
AUTHORIZED USER	An individual who has completed the application process, met all training and experience requirements, and received approval from the Radiation Safety Committee to use radioactive materials or radiation generating equipment.
BACKGROUND RADIATION	The level of ionizing radiation present in the environment from natural and man-made sources, excluding contributions from the specific RAM or RGE being used.
BIOASSAY	An evaluation of the type, quantity, or concentration of radioactive material taken into the body, typically performed by measuring excreta or by whole-body counting.
DECLARED PREGNANT WORKER	A radiation worker who has voluntarily informed the Radiation Safety Officer in writing of her pregnancy. Such workers are subject to special exposure limits designed to protect the embryo/fetus.
DOSIMETER	A personal monitoring device (e.g., TLD badge, ring badge, electronic dosimeter) issued to measure an individual's occupational radiation exposure.
RADIATION GENERATING EQUIPMENT	Any device that produces ionizing radiation when energized, including x-ray machines, electron microscopes, and diffraction units.
RADIOACTIVE MATERIALS	Any material that emits ionizing radiation and is regulated under the University's broad scope radioactive materials license.
RADIATION SAFETY COMMITTEE	The University committee responsible for oversight of radiation safety, including reviewing authorizations, investigating incidents, and ensuring compliance with applicable regulations.
RADIATION SAFETY OFFICER	The individual appointed by the University President and confirmed by RHB to administer and oversee the University's Radiation Safety Program.
RADIATION USE AUTHORIZATION	Formal approval granted by the RSC allowing a specific individual or group to use RAM or RGE for teaching, research, or operational purposes.
RADIOLOGIC HEALTH BRANCH	The division of the California Department of Public Health that regulates the possession and use of RAM in the State of California.
SEALED SOURCE	A radioactive material that is permanently encapsulated to prevent release under normal handling conditions.
SURVEY METER	A portable radiation detection instrument used to measure dose rates or contamination levels in real time.
TOTAL EFFECTIVE DOSE EQUIVALENT	The sum of the deep-dose equivalent from external exposures and the committed effective dose equivalent from internal exposures in a year.

ROLES AND RESPONSIBILITIES

Radiation Safety Committee

The Radiation Safety Committee is responsible for oversight and governance of the University's Radiation Safety Program.

Composition

- The committee is co-chaired by:
  - A faculty member (RAM/RGE user)
  - The Radiation Safety Officer (RSO)
- Permanent members include:
  - Radiation Safety Officer (EH&S)
  - Director of Environmental Health and Safety (EH&S)
- Voting members include:
  - Faculty representatives from the College of Agriculture, Animal and Veterinary Sciences (faculty and staff), College of Science (Chemistry, Biology, Physics), and College of Engineering (Chemical and Materials Engineering)
  - Student Health Services X-ray Technician
- Ex-Officio members include:
  - Assistant Director of EH&S
  - Risk Management Director or representative
- Additional members may be invited on an ad-hoc basis for specific expertise.

Faculty and staff members serve two-year terms with a minimum 50% annual attendance rate required to retain voting status. The faculty co-chair serves a three-year term. Appointments are confirmed by the University President or an EO1039-designated delegate, based on recommendations from the RSO.

Meetings

- The committee meets at least two times per year.
- Additional meetings may be convened by the Co-Chairs as needed.
- The RSO maintains all meeting minutes and records.

Authority and Responsibilities

- Review and approve:
  - Radiation Use Authorizations
  - Policies, procedures, and SOPs related to RAM and RGE usage
- Establish guidelines for safe handling, storage, operation, and disposal of radioactive materials and radiation-producing equipment.
- Oversee radiation monitoring practices and emergency preparedness measures.
- Investigate radiation-related incidents, near misses, or exposures, and recommend corrective actions.
- Evaluate program deficiencies, recommend improvements, and ensure effective corrective actions are implemented.
- Promote training initiatives and dissemination of safety information across University departments.

- Maintain familiarity with applicable regulations and CSU Executive Order 1039.
- Ensure meeting minutes and records are retained for regulatory and program review.

Disciplinary Authority

The RSC retains authority to take enforcement action when necessary to protect health, safety, and compliance. Disciplinary actions may include:

- Suspension of radiation use authorizations.
- Seizure or impoundment of RAM or RGE.
- Lockout of radiation-producing equipment.

Co-Chairs

- Collaborate to prepare agendas and ensure meetings align with the charge of the RSC.
- Communicate RSC recommendations to the Director of EH&S.
- The faculty co-chair represents the interests of faculty and academic departments.
- The RSO co-chair provides appointment letters, produces meeting minutes, and brings forward safety issues from industrial operations, teaching, research, and student activities.

Radiation Safety Officer

The Radiation Safety Officer is appointed by the University President, or by a delegate designated under CSU Executive Order 1039 and confirmed by the Radiologic Health Branch. The RSO is delegated the authority to implement and enforce the University's Radiation Safety Program and serves as co-chair of the Radiation Safety Committee.

Program Oversight

- Ensure occupational and student radiation exposures are maintained ALARA.
- Review exposures exceeding 10% of occupational limits; investigate exposures exceeding 20% and present findings at the next RSC meeting.
- Develop, distribute, implement, and update radiation protection procedures for RAM and RGE.
- Suspend any activity involving RAM or RGE that is considered unsafe.
- Verify that possession, use, and storage of licensed materials are consistent with license conditions, CCRs, and manufacturer instructions.
- Ensure licensed materials remain properly secured at all times.

Training and Personnel Monitoring

- Conduct or arrange training commensurate with individual duties involving RAM and RGE.
- Oversee the dosimetry program, including issuance, exchange, and maintenance of monitoring devices and exposure records.
- Implement bioassay programs when necessary to verify internal exposures remain below regulatory limits.
- Review occupational and academic exposure records and contamination surveys quarterly at RSC meetings.

Compliance and Reporting

- Ensure incidents such as exposures above regulatory limits, loss or theft of RAM, sealed

source leaks, equipment malfunctions, or emergencies compromising safety are reported promptly to RHB.
- Maintain compliance with Department of Transportation requirements for RAM transport and federal/state regulations for RAM disposal.
- Ensure all license conditions are met, including timely submission of license renewals, amendments, and associated fees.
- Identify program deficiencies or violations, develop corrective actions, and document their implementation.

Audits and Inspections

- Perform and document annual audits of the Radiation Safety Program.
- Conduct on-site evaluations of authorized use areas at least monthly, and more frequently as needed.
- Review and verify the qualifications of new users and ensure RSC review of proposed use authorizations.
- Evaluate new uses of RAM or RGE to confirm anticipated exposures are ALARA.

Records and Administration

- Maintain accurate and complete program records for regulatory and RSC review.
- Ensure commitments made in the license submittal and the Radiation Safety Manual are implemented.
- Maintain all RSC documents, provide appointment letters to members, and produce meeting minutes as co-chair.

Continuity of Operations

- In the event of the RSO ending employment, the University shall notify RHB promptly and submit qualifications of a replacement as soon as practical.
- In the sustained absence of the RSO, the RSC Chair or University President (or EO1039 delegate) may appoint a qualified individual to temporarily fulfill RSO duties, in accordance with 10 CFR § 35.24.

Radiation Users

Radiation Users are individuals authorized by the Radiation Safety Committee to use radioactive materials or radiation generating equipment under a Radiation Use Authorization. Each RUA designates one Authorized User as the Permit Holder, who is directly responsible for all aspects of radiation safety under the permit.

Permit Holders and Authorized Users

- Each RUA permit identifies one Authorized User as the Permit Holder.
- When multiple Authorized Users share a facility, a single permit is issued with one Permit Holder and additional Authorized Users listed.
- Faculty Authorized Users are trained and experienced faculty members approved by the RSC to supervise radiation use.
- Non-faculty Authorized Users may include qualified staff or doctorate-level personnel with sufficient training and experience.

Students (Authorized User obligations)

- Students may work with radioactive materials or RGE only under the supervision of an Authorized User.
- The Authorized User must notify the RSO before students begin radiation work.
- Student activities are limited to materials and procedures approved in the RUA and may begin only after all required training is completed.

Authorized User Responsibilities

- Compliance
  - Follow California Radiation Control Regulations.
  - Adhere to CPP's Radioactive Materials License conditions.
  - Comply with the RUA and the CPP Radiation Safety Manual, including RSC policies.
  - Cooperate with RSO, RSC, and regulatory audits; provide access and implement corrective actions.

- Training, Supervision, and Communication
  - Provide and document radiation safety training appropriate to assigned tasks.
  - Post lab-specific emergency procedures and key contact information.
  - Provide annual refresher training and ensure access to Safety Data Sheets (SDSs).
  - Notify the RSO promptly of accidents, spills, abnormal incidents, personnel changes, significant procedural/lab changes, relocations, or planned RUA closeout/decommissioning.

- Safe Operations
  - Maintain control and security of RAM and RGE; restrict access to authorized personnel.
  - Provide and maintain required safety equipment (e.g., survey meters, shielding, PPE).
  - Ensure correct labeling/posting of sources, equipment, and use/storage areas.
  - Prepare, post, and enforce SOPs and safe work practices; hold regular lab safety meetings.
  - Ensure personnel dosimetry and bioassay are used when required and that results are addressed.
  - Manage inventories, use logs, and waste in accordance with license and University procedures.

Radiation Workers / Laboratory Personnel

Radiation workers include students, technicians, staff, and visiting researchers who perform work under the supervision of an Authorized User.

- Complete required radiation safety training before beginning work and maintain any required refreshers.
- Use assigned dosimeters and personal protective equipment (PPE) correctly; return/replace badges as directed.
- Follow approved SOPs, posted instructions, and the AU's direction; do not work unsupervised unless explicitly authorized.
- Immediately report spills, exposures, unsafe conditions, or lost dosimeters to the Authorized User and the RSO.
- Do not eat, drink, apply cosmetics, or engage in other prohibited practices in radiation use areas.
- Cooperate with audits and inspections as directed by the AU, RSO, or regulatory officials.

RADIATION USE GUIDELINES

Application Procedures

Any employee requesting unsupervised use of RAM or RGE must submit a complete application to the RSO for consideration as an Authorized User. The application consists of:

- Statement of Training and Experience (RHB Form 2050A)
- University Application for a Radiation Use Authorization (RUA)
- Employee Policy Acknowledgement (EHS Form F2017:004) confirming receipt and review of the Radiation Safety Manual

As part of the process, the applicant is issued a copy of this Manual. These forms are required for any project, investigation, or student laboratory activity involving RAM or RGE, including license-exempt or generally licensed quantities/devices. Incomplete applications will be returned without review.

Applications are approved only at RSC meetings (see Article I). Submit completed forms via the Environmental Health & Safety website and send to the campus RSO:

Website: https://www.cpp.edu/ehs/lab-safety/radiation-safety.shtml

RSO Email: lwcoey@cpp.edu

Note: If you are adding personnel or minor procedural details under an existing RUA, contact the RSO for the correct update pathway.

Qualifications

Employees proposed as Authorized Users—those who will use RAM or RGE or supervise their use by University personnel or students—must meet the minimum requirements outlined in Title 17, California Code of Regulations (CCR) §30255 and documented on RHB Form 2050A (Statement of Training and Experience). These include:

- A college degree (or equivalent) in the physical or biological sciences or engineering.
- At least 40 hours of relevant training and 6 months of practical experience covering: characteristics of ionizing radiation; dose quantities and limits; radiation detection and instrumentation; biological hazards of radiation; and procedures applicable to the specific RAM/RGE requested. These must be documented on RHB 2050A.

The AU must also demonstrate that facilities, equipment, and procedures are adequate to protect University personnel, contractors, students, the public, and property. The RSC/RSO will verify that proposed procedures and equipment are consistent with license authorizations, Title 17 CCR, and other applicable State/Federal requirements.

Use Authorizations (Approval and Renewal)

RUAs are issued for one-year intervals.

When an update is required

Submit a revised RUA (or Radionuclide Authorization) application before implementing any change to:

- Activities/quantities of radionuclides
- Chemical/physical form of radionuclides
- Research/operational procedures
- Location(s) of use or storage
- Type/quantity of equipment (including RGE)
- Facility modifications affecting radiation safety

If no changes occurred during the prior approval period, the AU may submit a memo to the RSO stating that no changes have occurred. If any corrective or disciplinary actions were issued by the RSO/RSC, the memo must summarize completed corrective actions to prevent recurrence.

A project may be renewed by memo for a maximum of two consecutive years. Prior to the third year, a full re-application is required regardless of changes.

Pre-renewal inspection

Before renewal, the RSO (or designee) will inspect authorized use areas, including verification of:

- Records of ambient dose rates and removable contamination for the period of use
- Availability and suitability of monitoring/safety equipment
- Training status of radiation workers (PPE, operating and emergency procedures, contamination control methods)
- Records for receipt, transfer, use, and disposal of RAM; RGE service/QA records as applicable
- Adequacy of the use area(s) for the RAM/RGE requested
- Accuracy of information provided in the renewal request

Restrictions

Declared Pregnancy (ALARA)

In alignment with 10 CFR 20 and the ALARA principle, the University limits radiation exposure to a declared pregnant worker and the embryo/fetus following voluntary declaration to the RSO.

- Enrollment: Declaration is voluntary and must be submitted in writing to the RSO. Upon declaration, the RSO will provide supplemental training if needed and arrange fetal dosimetry, which may take up to 15 days to receive. The worker will be instructed on proper use of the badge.
- Exposure Limit: The dose to the embryo/fetus is limited to 0.5 rem (5 mSv) for the remainder of the pregnancy. Exposures should be as uniform as practicable over the gestation period.
- Withdrawal: A worker may withdraw a declaration at any time by submitting written notification to the RSO. Upon withdrawal, the fetal dosimeter must be returned; standard dosimetry requirements remain in effect as directed by the RSO or this Manual.

License-Exempt Quantities

Activities involving license-exempt quantities of RAM (e.g., 10 CFR 30.71 Schedule B) and generally licensed devices are still subject to the RUA process and campus safety requirements. Contact the RSO for guidance on authorization.

Radioactive Iodine (I-125 / I-131)

Because of the thyroid's affinity for iodine, the use of radioactive iodine is subject to additional restrictions.

- Exposures and intakes are managed according to 10 CFR 20.1202 and campus ALARA goals.
- Conditions requiring thyroid bioassay or scan will be determined by the RSO based on the activity, form, and procedures used.
- Approval for the use of I-125 and I-131 is restricted and may require additional conditions such as verified fume hood performance, containment measures, or scheduled bioassays.
- Any suspected release or exposure must be reported immediately to the RSO (see Program Contact section of this Manual).

BASIC OPERATION PROCEDURES FOR AUTHORIZED USERS

Sources of Occupational Exposure

Occupational exposures may arise from improper use of radiation sources. The primary sources include:

- Radiation fields
- Removable surface contamination
- Airborne contamination

Radiation Fields

Authorized Users must maintain radiation fields at the lowest practicable levels and ensure appropriate postings and access controls.

- Unrestricted Areas: Per 10 CFR 20 Subpart D, public dose must not exceed 100 mrem/year, and exposure in an unrestricted area must not exceed 2 mrem in any one hour.
- Restricted Areas: Areas where dose may exceed these public limits must be posted as "Restricted Area" and secured with access controls.
- Radiation Areas: Any area with ≥ 5 mrem/hr at 30 cm must be posted "Radiation Area" and secured when not in use.
- High Radiation Areas: Any area with ≥ 100 mrem/hr at 30 cm must have signage and entrance controls per 10 CFR 20.1601. RSC approval of controls is required.
- Very High Radiation Areas: Any area with ≥ 500 rad/hr at 1 m requires the strictest controls. Access controls must be reviewed and approved by the RSC at the design stage.
- Airborne Radioactivity Areas: Areas exceeding Derived Air Concentrations (DACs) must be posted "**Airborne Radioactivity Area**" and secured. Contact the RSO for DAC guidance.
- Caution – Radioactive Material Areas: Areas storing RAM ≥ 10 × Appendix C values of 10 CFR 20 must be posted accordingly and secured.
- All Areas: Any location where RAM or RGE are used must display required postings (emergency procedures, contacts, operating procedures) as directed by EH&S.

Removable Surface Contamination

Contamination may result from spills or leaks and can lead to ingestion, inhalation, or skin absorption.

- Wipe tests must be performed periodically and whenever contamination is suspected.
- Wipe area: ~100 cm^2, analyzed using appropriate detection (liquid scintillation for low-energy beta emitters such as H-3, GM pancake detector for higher-energy beta emitters such as P-32).
- Instruments are available through the Radiation Safety Office.
- Maximum permissible removable contamination:
  - Alpha emitters: 220 dpm/100 cm^2
  - Beta/gamma emitters: 2,200 dpm/100 cm^2
- If exceeded: decontaminate area, collect cleaning materials as radioactive waste, isolate the source, and notify the RSO for clearance.

Airborne Contamination

Airborne contamination can be inhaled or absorbed.

- Derived Air Concentrations (DACs) are listed in 10 CFR 20, Appendix B.
- Authorized Users must include monitoring and mitigation strategies in their RUA application.
- Air sampling and analysis must be conducted where airborne radioactivity is possible, in consultation with the RSO.

Annual Limit on Intake (ALI): A radiation worker shall not exceed 1 ALI = 5 rem/year = 2,000 DAC-hours.
Derived Air Concentration Hours (DAC-hours): Exposure is the product of concentration × time; 2,000 DAC-hours corresponds to 1 ALI (5 rem CEDE).

Exposure Control Measures

Radiation dose can be controlled by applying the principles of:

- Time: Minimize time in radiation fields. Practice procedures without RAM present to improve proficiency.
- Distance: Maximize distance from sources; use tongs, reach rods, etc. Doubling distance reduces dose rate by a factor of four.
- Shielding: Place appropriate materials between worker and source.
  - **Beta emitters:** plastic, water, glass
  - **Gamma/x-ray emitters:** lead, steel, high-density materials
  - **Half-Value Layer (HVL):** Thickness that reduces intensity by half.
  - **Tenth-Value Layer (TVL):** Thickness that reduces intensity to one-tenth. For Cs-137, TVLs are ~50 cm water, 20 cm concrete, or 2.5 cm lead.

Exposure Limits

Radiation workers at the University must comply with occupational dose limits specified in 10 CFR 20.1201 and related sections. These limits apply on an annual basis unless otherwise noted.

Occupational Dose Limits

Dose Quantity	Limit	SI Equivalent	Citation
Total Effective Dose Equivalent (TEDE)	5 rem (5,000 mrem) per year	50 mSv (0.05 Sv)	10 CFR 20.1201(a)(1)(i)
Committed Dose Equivalent (CDE) – any organ or tissue	50 rem (50,000 mrem) per year	500 mSv (0.5 Sv)	10 CFR 20.1201(a)(1)(ii)
Lens Dose Equivalent (LDE) – eye	15 rem (15,000 mrem) per year	150 mSv (0.15 Sv)	10 CFR 20.1201(a)(2)(i)
Shallow Dose Equivalent (SDE) – skin or extremities	50 rem (50,000 mrem) per year	500 mSv (0.5 Sv)	10 CFR 20.1201(a)(2)(ii)

Special Populations

- Minors (<18 years old): Limited to 10% of the occupational limits listed above (10 CFR 20.1207). Written parental or guardian consent is required before assignment to radiation work.
- Declared Pregnant Workers: The embryo/fetus dose shall not exceed 0.5 rem (5 mSv) for the remainder of the pregnancy, consistent with 10 CFR 20.1208 and University procedures described

under *Restrictions – Declared Pregnancy*.

Procurement Procedures

Radioactive materials (RAM) and radiation-generating equipment (RGE) may only be obtained through an official purchase order. Procurement Cards (P-Cards) may not be used for this purpose. All purchases must comply with the conditions of the University's radioactive materials license, including radionuclide types, chemical forms, and possession limits.

The RSO reviews all requests before purchase to ensure compliance with license conditions. Older stock may be required to be disposed of before approval is granted in order to maintain license possession limits.

Requisition Requirements

All purchase requisitions must include the following approval statement and signature line:

RADIATION SAFETY OFFICER APPROVAL
(CA RADIATION MATERIAL LICENSE NO. _____)
RSO SIGNATURE _____ DATE _____

This approval line must be typed on requisitions submitted to:

- **University Procurement**
- **Enterprises Financial Services**

Purchase orders that do not contain RSO approval will be returned to the requestor. Approval must be obtained before the order is sent to the vendor.

Shipment and Receipt

- All shipments of RAM must be delivered directly to the EH&S Office during normal business hours (Monday through Friday, 8:00 a.m.–5:00 p.m.).
- Upon receipt, the RSO will inspect packages for leakage or excessive radiation levels, update the inventory, and release materials to the Authorized User.
- Shipments sent anywhere other than EH&S may result in administrative action and could affect the Authorized User's eligibility for future orders.

Receipt, Use, and Disposal Procedures

All incoming packages of radioactive material must be shipped directly to the RSO in the EH&S Office. Per 10 CFR 20, Appendix B, each package must be surveyed for radiation exposure rate and removable surface contamination within three hours of delivery during business hours, or within three hours of the next business day if delivered after hours.

Receipt Procedures

The RSO, or a designated staff member, is responsible for ensuring all shipments are safe before release to an Authorized User. This includes:

1. Checking exposure rate levels against manufacturer documentation and Department of Transportation (DOT) requirements.
2. Performing wipe tests to detect removable surface contamination.
3. Recording the receipt of RAM in the program's inventory system.
4. Updating the University radionuclide inventory with the received activity.
5. Confirming packaging materials are indistinguishable from background before disposal as regular

trash; materials above background will be managed by EH&S as radioactive waste.

6. Transferring materials to the Authorized User in accordance with transfer procedures (see Transfers section). All pick-ups occur at the EH&S Office.

Regulatory Limits

Shipments must meet the following limits under DOT regulations:

Parameter	Limit	Citation
Surface exposure rate	200 mrem/hr	49 CFR 172.403
Transportation Index (TI)	10 at 1 meter	49 CFR 172.403
Removable surface contamination – Alpha	2,400 dpm/100 cm^2	49 CFR 173.443
Removable surface contamination – Beta/Gamma	24,000 dpm/100 cm^2	49 CFR 173.443

Note: Wipe samples are collected over an area of 300 cm^2 in accordance with DOT requirements.

Authorized User Responsibilities

Authorized Users must maintain accurate records of all receipts, uses, and disposals of radioactive materials. Records must be kept in microcuries on the Radioactive Material Status Record, available from the RSO.

Animal Use

Use of radioactive materials in animal studies requires approval from both the Radiation Safety Committee and the Institutional Animal Care & Use Committee.

Authorization

- Principal Investigators (PIs) must first submit an IACUC protocol and indicate planned RAM use.
- PIs must meet with the RSO prior to IACUC submission to discuss license conditions and RSC requirements.
- RSC review and approval may occur only after IACUC approval is granted.
- RAM may only be administered to animals owned by the University.

Housing and Care

- Animals used in RAM studies must remain in the Authorized User's laboratory.
- Authorized Users are responsible for compliance with all applicable animal care regulations.
- Treated animals must be tracked and clearly tagged by the Authorized User.
- All cages housing treated animals must display radiation warning labels that include:
  - Authorized User name
  - Radionuclide
  - Activity
  - Date of assay
  - Physical/chemical form

Waste and Carcass Management

- Carcasses, bedding, and other contaminated materials must be turned over to the RSO unless the AU demonstrates they are free of RAM.
- Carcasses of treated animals must be managed as radioactive waste.
- Urine and feces from treated animals must also be managed as radioactive waste unless shown to

be indistinguishable from background.
- Animals must be handled on absorbent-lined trays to contain spills during injection or administration.

Environmental Controls

- Adequate ventilation and/or air filtration must be used where airborne concentrations may exceed acceptable levels (see *Sources of Occupational Exposure – Airborne Contamination*).

Training

The Authorized User is responsible for training all personnel who handle treated animals. Training must include at least:

- Use of gloves, lab coats, scrub suits, and other appropriate PPE
- Proper use of ventilation or filtration equipment if airborne contamination is possible
- Safe use of animal handling equipment

Waste Disposal Procedures

All radioactive waste is managed by Environmental Health & Safety (EH&S) and transported to the Campus Hazardous Materials Facility for disposal in compliance with the University's license, state, and federal regulations. Authorized Users are responsible for properly preparing waste for collection.

General Requirements

- Waste must be collected for transport to the Hazardous Materials Facility as soon as practical after generation.
- Excess waste may not be accumulated or stored in authorized use areas.
- EH&S personnel will transport all radioactive waste; Authorized Users may not move waste independently.

Container Preparation

- Radionuclides must be stored in separate containers unless co-mingling is specifically authorized by the RSO.
- Each container must be clearly labeled with:
  - Radionuclide(s)
  - Activity
  - Date
  - Physical and chemical form
  - Authorized User's name
- Containers must be strong and compatible with contents to withstand accidental drops or handling.
- Dry waste must be separated from liquid waste.
- Liquid scintillation vials and cocktail must be separated from other liquid wastes.

Contamination and Radiation Levels

- Waste must be packaged so that surface contamination and exposure rates are within acceptable limits for safe handling.
- If there is uncertainty, Authorized Users must verify conditions with the RSO before requesting collection.

Security of Radioactive Materials

All authorized use areas containing radioactive materials or radiation-generating equipment must be secured when unattended. This requirement ensures compliance with 10 CFR 20.1801–20.1802 and protects against loss, theft, or unauthorized use.

Access to these areas is limited to Authorized Users and their supervised personnel. Anyone with key or card access to an authorized area must be informed by the Authorized User of the location of RAM/RGE within the space and the associated hazards. Students and staff may not use or handle RAM or RGE except under the direct supervision of an Authorized User.

Contaminated objects such as pipettes, vials, or reusable glassware may not be given to other personnel for cleaning or disposal unless this activity is explicitly covered under an approved use authorization. RAM and RGE must never be transferred to individuals who are not authorized under the University's Radiation Safety Program.

Labeling Requirements

All containers of radioactive material must be clearly labeled to alert personnel to the presence of radiation and to prevent accidental exposure or misuse. In accordance with 10 CFR 20.1904, labels must bear the standard radiation trefoil symbol along with the words "Caution, Radioactive Material" (or "Danger, Radioactive Material" where appropriate).

Each label must also include the following information:

- Radionuclide(s) present
- Activity (in microcuries, millicuries, or SI equivalent)
- Date of assay or activity measurement
- Surface radiation level, if greater than 2 mrem/hr
- Physical and chemical form of the material
- Authorized User's name
- Any special handling precautions or hazards

Labels must be durable, legible, and affixed in a way that remains visible during storage and use. If radioactive material is transferred between containers, the new container must be labeled immediately.

Transfers (On-Campus)

Radioactive material (RAM) may not be transferred between Authorized Users without prior approval from the RSO. The RSO will verify that the material is added to the receiving user's authorization and removed from the transferring user's authorization. All changes to use authorizations must follow the requirements described in the *Radiation Use Authorization* section of this Manual.

Once approval is granted, on-campus transfers must meet the following conditions:

Containers

- RAM must be enclosed in a durable, unbreakable container with a liquid-tight lid capable of preventing spills if overturned or dropped.
- Plastic liquid scintillation vials with screw caps are considered unbreakable; however, they should be placed in a secondary container or vial rack to provide additional protection during transport.

Carts

- Containers must be transported on a sturdy, four-wheeled cart with raised sides to contain any potential spills.

Vehicle Transport

When RAM or RGE is transported on private University roads:

- RGE must be shipped in appropriate crates or containers.
- RAM must be shipped in DOT-approved containers.
- Vehicles must be in good working order and equipped with a fire extinguisher and spill kit.
- All packages and equipment must be secured to prevent shifting during transport.
- Vehicles and materials must be locked and secured if left unattended.
- In the event of loss or theft, the RSO, local law enforcement, and RHB must be notified immediately.

DOSIMETRY

Personnel monitoring devices (dosimeters) are used to measure occupational exposure to radiation and ensure compliance with federal regulations. In accordance with 10 CFR 20.1502, dosimeters are required when individuals may receive more than 10% of the annual occupational dose limit. The RSO maintains permanent exposure records in compliance with 10 CFR 20.2106.

Dosimeter Enrollment

Workers, including students, are enrolled in the University's dosimetry program if they are likely to receive more than 10% of the annual occupational whole-body dose limit.

Requesting a Dosimeter

To request a dosimeter, individuals must contact the Environmental Health and Safety Office. The RSO may request additional information about anticipated work activities and the related authorization. Dosimeters may be assigned to current or prospective Authorized Users, as well as to students participating in instructional activities.

Classroom Use

For instructional courses involving RAM or RGE, instructors (Authorized Users) may be issued a group of dosimeters for distribution to students.

- Dosimeters are sequentially numbered and color-coded by class.
- Students must complete a dosimeter request form and return it to the instructor.
- A copy of each form must also be submitted to the RSO before the student begins work.
  The information provided on the request form allows the RSO to link any recorded exposure to the specific individual and activity during the monitoring period.

Wearer Responsibilities

Accurate exposure data depends on dosimeters being worn and handled correctly. Wearers are responsible for the following:

- Use only dosimeters issued by the Radiation Safety Office.
- Complete a request form so exposure data can be properly tracked.
- Wear only your assigned dosimeter and confirm the ID number before use.
- Do not remove dosimeters from campus or take them outside designated work or instructional areas.
- Never wear control dosimeters; these are used only for background measurement.
- Return dosimeters to their designated storage location at the end of each day.

Proper Use of Dosimeters

Dosimeters provide reliable exposure monitoring only when worn correctly:

- Whole-body dosimeters: Worn on the upper torso between the waist and neck, ideally at the center of the chest. If shielding garments (e.g., lead aprons) are used, wear the badge at the collar, outside the apron and thyroid shield, with the window facing the source.
- Ring dosimeters: Worn on the hand expected to receive the greatest dose, with the label facing the source (palm side). Standard practice is to use the non-dominant hand for tasks involving direct handling of RAM or RGE.

Lost Dosimeters

Lost or missing dosimeters compromise exposure tracking and may require dose reconstruction to estimate radiation received during the monitoring period. Reconstruction is conducted at the discretion of the RSO or, when appropriate, the RSC.

If a dosimeter is not found within 30 days, a replacement badge will be issued and a $50 replacement fee applied:

- Employees: The fee is charged to the employee's department office.
- Students: The fee must be paid within 30 days. Failure to pay will result in an academic hold.

Exposure Reports

The RSO reviews exposure data after each dosimeter read period to track individual and program-wide radiation doses associated with the use of RAM and RGE.

Most dosimeters have a minimum detection threshold of 10 mrem per wear period. Doses below this threshold are considered background radiation and are recorded as zero.

Exposure reports are maintained as permanent records and are available to all monitored individuals. Workers may access their results by:

- Contacting the RSO directly, or
- Using the secure **Self-Dose Check** portal: https://myradcare.radetco.com/dosecheck.aspx

Dosimetry Exemptions

In some situations, individual dosimetry is not required because potential exposures are demonstrably negligible. For example, operators of well-shielded X-ray diffraction devices may be exposed to radiation levels far below occupational limits (e.g., 0.01 µSv per hour).

Exemptions are granted only by the RSO and are evaluated on a case-by-case basis. In lieu of personal monitoring, the RSO may assign an area dosimeter to track exposure levels for the work environment.

Exemptions are not automatic and must be formally approved prior to beginning work.

Exposure Notifications and Follow-up

The RSO reviews dosimetry results after each monitoring period. If an individual's exposure exceeds 10% of the applicable regulatory limit during a calendar quarter or instructional period, the wearer will be notified.

The RSO will review the individual's work practices and conditions of use to determine whether additional controls, training, or corrective actions are needed to ensure exposures remain ALARA.

Bioassay

A bioassay is a method of measuring radiation exposure from radioactive material that has entered the body, such as by inhalation, ingestion, or absorption. Bioassay testing may involve urine sampling, thyroid counting, or other techniques depending on the radionuclide.

For most laboratory-scale uses of RAM at the University, personnel bioassay is **not required**. The RSO evaluates each use authorization to determine whether bioassay monitoring is necessary.

Bioassays will be implemented if conditions meet criteria outlined in federal guidance, including:

- Radioiodine use, as described in NRC Regulatory Guide 8.20 (*Applications of Bioassay for Radioiodine*).
- Tritium use, as described in NRC Regulatory Guide 8.32 (*Criteria for Establishing a Tritium Bioassay Program*).

When required, the RSO will arrange for the appropriate testing and analysis to ensure exposures remain below regulatory limits. All bioassay results are maintained as official program records by the RSO and are available for regulatory and committee review.

SAFE HANDLING AND EMERGENCY PROCEDURES

Laboratory Safety Rules

All personnel working with RAM or RGE must follow established laboratory safety practices to ensure exposures are maintained ALARA and contamination is prevented.

General Rules

- No eating, drinking, or smoking in laboratories or authorized use areas.
- Use remote handling devices (tongs, forceps) whenever practical.
- Practice procedures with non-radioactive materials before working with RAM to improve proficiency and minimize exposure time.
- Monitor hands and clothing when work has concluded.
- Wear assigned dosimeters unless specifically exempted by the RSO.
- Evaluate potential exposures before beginning an experiment. Survey the work area for contamination; if contamination is found, follow spill cleanup procedures with appropriate PPE and re-survey before proceeding.

Additional Requirements for Work with Unsealed Sources

When using unsealed radioactive materials, the following controls must be observed in addition to the general rules:

- Wear a lab coat and disposable gloves (nitrile recommended).
- Never pipette by mouth.
- Cover work surfaces with absorbent, plastic-backed paper (bench coat or chux).
- Store and transport containers on trays capable of containing spills.
- Follow ventilation requirements outlined in the Radiation Use Authorization. Most academic operations do not require special ventilation.
- At the end of use, perform a contamination survey. Any contamination above background must be decontaminated before leaving the area.

Unsafe Practices to Avoid

- Do not store food, drinks, or cosmetics in refrigerators, freezers, or cabinets used for radioactive materials.
- Do not work alone with RAM or RGE. Always ensure another trained person is present or nearby.
- Do not use open flames or ignition sources near volatile radionuclides.
- Do not use makeshift shielding or containment. Always follow approved methods.

Emergency Procedures

Every location where RAM or RGE is used must display the Radiation Emergency Poster, which lists key emergency contacts, including the Authorized User/PI, the RSO, and University Police. Contact numbers must always be current and visible.

In the event of a medical emergency, spill, or suspected exposure:

1. Call University Police at 911 (from a campus phone) or (909) 869-3070 (cell).
2. Notify the laboratory instructor or Principal Investigator.
3. Notify the Radiation Safety Officer (see Program Contact section of this Manual).

Spill Procedures

In the event of a spill or suspected contamination involving radioactive materials, immediate action is required to limit spread and exposure.

Minor Spill – typically <100 µCi of a low-toxicity radionuclide, no airborne release, and no personal contamination.

1. Alert others in the area.
2. Confine the spill with absorbent material or shielding.
3. Restrict access until decontamination is complete.
4. Notify the Authorized User and RSO immediately.
5. Perform cleanup only if trained and safe to do so, following posted spill response procedures.

Major Spill – large activity, airborne release, widespread contamination, or any personal exposure.

1. Alert and evacuate all personnel from the area.
2. Close/seal the room and post warnings.
3. Call University Police (911 from campus phone or (909) 869-3070 from cell).
4. Notify the Authorized User and RSO immediately.
5. **Do not attempt cleanup. Await EH&S/RSO response.**

Personnel Decontamination

If a person is contaminated or suspected of being contaminated with radioactive material:

- Provide first aid or emergency medical care immediately. Do not delay medical treatment because of contamination.
- Notify the RSO and University Police once the individual has been stabilized.

General Guidance

- Remove contaminated clothing as soon as possible and place it in a labeled bag.
- Wash affected skin gently with warm water and mild soap. Do not scrub harshly. If contamination remains after several washes, stop and await further instruction.
- Keep the individual under observation until cleared by the RSO or emergency responders.

Specific Cases

- **Skin:** Wash gently with warm water and mild soap, repeating up to three times.
- **Hair:** Shampoo while tilting the head back to prevent contamination of face/eyes.
- **Eyes:** Rinse thoroughly with clean water from the inner corner outward.
- **Whole Body:** Shower promptly with mild soap and water. Dry and re-monitor.
- **Wounds:** Rinse the wound, apply a sterile dressing, and seek immediate medical care. Assume all wounds acquired in RAM areas are contaminated until cleared.

Internal Contamination (Suspected Ingestion, Inhalation, or Absorption)

- Notify the RSO and University Police immediately.
- Do not induce vomiting unless directed by medical staff.
- Only medical providers may decide on specialized treatments (e.g., chelation).

Medical Support

Depending on circumstances, the receiving hospital may consult the Radiation Emergency Assistance

Center/Training Site (REAC/TS) in Oak Ridge, TN, for expert support.

TRAINING REQUIREMENTS

Authorized Users

Authorized Users must complete Radiation Safety Training before working independently with radioactive materials (RAM) or radiation-generating equipment. Training is designed to meet the requirements of Title 17 CCR §30255 and the conditions of the University's broad scope radioactive materials license (Type B and C).

The Radiation Safety Officer ensures that training is available, current, and sufficient to meet regulatory and license requirements. Training content is updated as needed to reflect changes in:

- Federal and State regulations
- License conditions
- University policies
- Operating and emergency procedures

Training may be provided in person or online. Refresher training is required periodically as determined by the RSO.

Authorized Users must complete:

- Radiation Safety Training
- Non-Ionizing Radiation Safety Training, only if their work also involves non-ionizing sources (e.g., lasers, UV, RF equipment).

Students and Graduate Students

Authorized Users are responsible for notifying the RSO when a student or graduate student will participate in a project involving RAM or RGE.

The RSO, or designee, will evaluate the student's role and provide appropriate training before the student begins work. Students may not begin hands-on activities until required training is complete and documented.

Student training typically includes:

- Radiation Safety Training
- Laboratory Safety Fundamentals
- Non-Ionizing Radiation Safety Training, only if their project involves non-ionizing sources.

All students and graduate students must work under the direct supervision of an Authorized User and may not serve as Permit Holders.

AUDITS

Quarterly Surveillance

- The RSO (or designee) conducts quarterly wipe surveys of all authorized use areas where RAM is used or stored.
- Sealed source inventories and leak test records are verified at the same time.
- Survey results and inventory checks are documented and retained for regulatory review.

Note: *Quarterly inspections and wipe surveys are operational checks and do not replace the Annual Radiation Safety Program Audit.*

Annual Radiation Safety Program Audit

The University conducts an annual audit of the entire Radiation Safety Program, consistent with Title 17 CCR and 10 CFR requirements.
The audit evaluates compliance with the Radiation Safety Manual, University policies, and license conditions, including training, records, dosimetry, waste management, sealed source accountability, and RSC oversight.
The audit must be conducted by a qualified individual who is not responsible for the day-to-day management of the Radiation Safety Program. Acceptable reviewers include:

- The Director of Environmental Health & Safety or a designated senior EH&S official
- A peer RSO from another CSU campus
- A third-party consultant experienced in academic radiation safety programs

The RSO may coordinate the audit but should not serve as the primary reviewer.

Annual RGE Surveys

For applicable radiation-generating equipment (RGE), the RSO conducts exposure rate surveys at least annually to verify shielding integrity, detect potential leakage, and confirm proper function of safety features.
Any faults or abnormal readings are reported immediately to the Authorized User and corrected before the equipment is returned to service.
Records of all RGE surveys are maintained by the RSO and made available for review by the Radiation Safety Committee and regulatory inspectors.

Follow-up

Deficiencies identified during quarterly, annual, or RGE surveys must be corrected promptly.
Corrective actions will be documented and reported to the Radiation Safety Committee at the next scheduled meeting.

USE AREA CLEARANCE FOR UNRESTRICTED USAGE

The Radiation Safety Committee retains authority to approve new areas for the use of dispersible RAM and to release existing use areas for unrestricted use once RAM activities have ceased. Clearance applies to University property and buildings previously under radiological control.

Clearance Process

1. The Authorized User notifies the RSO that RAM work has ended and all licensed material has been removed from the use area.
2. The RSO reviews historical records of radionuclide use and contamination surveys.
3. The RSO, or designee, prepares a written plan describing the final survey, based on the history of use and applicable clearance criteria.
4. The RSO, or designee, conducts the final survey according to the plan, with adjustments made as needed to reflect field conditions.
5. Results are documented in a written final status report, which is submitted to the RSC for review and approval.
6. Once the RSC approves release, the RSO notifies Facilities Planning and Management and other relevant departments so the room may be reassigned.
7. The historical review, survey plan, and final status report are retained for regulatory review.

Clearance Criteria

A use area may only be released for unrestricted use if contamination levels are below the more restrictive of the following:

- ANSI/HPS N13.12-2013 (or most recent edition), *Surface and Volume Radioactivity Standards for Clearance*; or
- Nuclide-specific Derived Concentration Guideline Levels (DCGLs), scaled to a dose of 1 mrem/year to the maximally exposed individual.

Documentation and Records

- Clearance records, including the historical review, survey plan, survey results, and final status report, will be retained as part of the permanent radiation safety program file.
- Records must be available for review by the Radiation Safety Committee, CDPH-RHB inspectors, and other regulatory authorities during inspections or license renewal.
- Facilities Planning and Management is provided a copy of the clearance documentation for their records.

APPENDIX A: EMERGENCY CONTACTS

This appendix provides comprehensive contact information for key safety personnel and emergency services at and around Cal Poly Pomona.

Radiation Safety Committee (RSC):

- Contact through the Radiation Safety Officer

Radiation Safety Officer (RSO):

- Lance Coey
- Email: lwcoey@cpp.edu
- Phone: (909) 869-5054

Environmental Health & Safety Office:

- General inquiries: ehs@cpp.edu
- Phone: (909) 869-4697

Campus Security/Emergency Services:

- CPP University Police
- Email: police@cpp.edu
- Phone: Emergency Dial 9-1-1
- If using a cell phone in an emergency, dial (909) 869-3070

Local Hospital/Emergency Room:

- Pomona Valley Hospital Medical Center
- Address: 1798 N. Garey Avenue, Pomona, CA 91767
- Phone: (909) 865-9500

Poison Control Center:

- National Capital Poison Center
- Online Help: https://triage.webpoisoncontrol.org/#!/exclusions
- Phone: 1-800-222-1222

Public Health Department:

- Los Angeles County Department of Public Health
- Email: publichealth@ph.lacounty.gov
- Phone: (213) 240-8144

APPENDIX B: FORMS AND TEMPLATES

The following forms and resources support the University's Radiation Safety Program. Current versions are available on the Environmental Health & Safety (EH&S) Radiation Safety website or through the RSO.

Required Postings and Notices: Documents that must be displayed in radiation use areas to inform workers of their rights and responsibilities.

- Radiation Notice to Employees
- Radiation Emergency Contact Posting

Reporting and Compliance Tools: Resources for documenting incidents, inspections, and program audits.

- Manager's Report of Injury/Illness Form
- Accident Injury and Illness Investigation Form - Employees
- Accident Injury and Illness Investigation Form - Students
- Report a Safety Concern Online Form

Radiation Use Authorization (RUA) Forms: Required for requesting approval to use RAM or RGE.

- Radiation Use Authorization Form
- Radiation Training and Experience Form (RHB 2050A)
- User Acknowledgement Form

Dosimetry: Forms used to request and manage personnel radiation monitoring badges.

- Dosimetry Badge Request Form

Training Record Form:

- Safety Training Documentation Form

Other Forms and Templates:

- Universal Safe Work Practices and Hazard Assessment Template
- Safety Training Documentation Form

APPENDIX C: REVISION HISTORY

Revision Date	Reviewer	Summary of Changes
September 29, 2017	M. DeSalvio	Changes to use authorization procedures.
July 10, 2018	M. DeSalvio	New plan template, policy changes, updated pregnant worker program, exposure limits, dosimetry program, and updated references.
November 2, 2018	M. DeSalvio	Amended RAM receipt and transfer procedures in alignment with license requirements.
February 25, 2019	M. DeSalvio	Updated RSC meeting procedures.
May 14, 2019	M. DeSalvio	Updated introduction and procedural changes in support of license amendment; added training links and notation to radiation application (electronic submission process); added dosimeter wear instructions.
October 1, 2019	M. DeSalvio	Formatting—justified text and updated training links.
June 24, 2024	L. Coey	Updated links and contact information.
July 24, 2025	L. Coey	Comprehensive revision of manual structure, updated roles and responsibilities, clarified audits, emergency procedures, and training requirements.

REFERENCES

The practices and procedures outlined in this manual are based on federal and state regulations, as well as guidance from professional organizations and standards-setting bodies. This section provides the key references that inform the University's Radiation Safety Program.

Relevant Federal and State Regulations

- Title 10, Code of Federal Regulations (10 CFR): U.S. Nuclear Regulatory Commission (NRC) standards for radiation protection, including Parts 19, 20, 30, 31, 33, and 35.
- Title 17, California Code of Regulations (17 CCR): California Department of Public Health – Radiologic Health Branch regulations governing radiation protection, licensing, and use of RAM and RGE.
- California Department of Public Health – Radiologic Health Branch (RHB): Licensing requirements for broad scope research and development licenses, including oversight of RAM and RGE.
- Title 49, Code of Federal Regulations (49 CFR): U.S. Department of Transportation regulations for the packaging and transportation of radioactive materials.
- California State University (CSU) Executive Order 1039: Establishes systemwide policy for radiation safety programs within CSU campuses.

Guidelines and Standards

- National Council on Radiation Protection and Measurements (NCRP): Reports and recommendations on radiation protection principles, monitoring, and dose limits.
- American National Standards Institute / Health Physics Society (ANSI/HPS): Standards such as N13.12, *Surface and Volume Radioactivity Standards for Clearance*.
- Health Physics Society (HPS): Professional guidance on radiation safety practices, ALARA implementation, and emerging issues.
- International Commission on Radiological Protection (ICRP): Recommendations on dose limits, radiation risk assessment, and principles of protection.
- Radiation Emergency Assistance Center/Training Site (REAC/TS): U.S. Department of Energy/NNSA resource for medical management of radiation incidents.

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