

Radiation Safety Laboratory User Manual



Reviewed 12/2022



**Case Western Reserve University (CWRU) Department of Environmental
Health & Safety (EHS) Radiation Safety Office (RSOF)**

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GENERAL LABORATORY PROCEDURES Training

Policy

The Radiation Safety Office (RSOF) provides Radiation Safety Training for individuals who work with or around radioactive materials (RAM), Radiation Generating Equipment (RGE), Irradiators, Lasers, or UV equipment. Authorized Users (AUs) and workers using RAM must have initial training before using radioactive materials (RAM). Ancillary Radiation Laboratory Workers who have only minor contact with radioactive material (RAM) must attend either the New Radiation Laboratory Worker training or the Hazard Communication (Right-to-Know) training within 30 days of beginning work. All employees that work for an Authorized User of radioactive materials are required to attend one of these two radiation safety trainings. Those who work with radioactive materials are required to complete radiation safety training annually. Those who do not work with radioactive materials are required to complete ancillary radiation safety training annually. If a worker is more than 60 days overdue for annual retraining as stated in the RSOF Training Enforcement Policy, he or she must repeat the New Radiation Laboratory Worker training. The Training Enforcement Policy can be accessed on the EHS website <https://www.case.edu/ehs/> under the heading "Radiation Safety."



Regulatory References

OAC 3701:1-38-10 - Notices, instructions, and reports to workers

Worker Categories and Training Requirements

Authorized Users (AUs)

A Principal Investigator (aka Authorized User) who wishes to use radioactive materials (RAM) must have a faculty appointment. AUs are directly responsible for compliance with all regulations governing radiation safety in the laboratory. AUs must attend the New Radiation Laboratory Worker training prior to applying for AU status and are subject to the same retraining requirements as radiation workers.

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Radiation Workers

These individuals work in a radiation laboratory. They must initially train by attending the New Radiation Laboratory Worker training before starting work in the laboratory. The annual retraining requirement can be fulfilled on your Canvas dashboard (canvas.case.edu).

Ancillary Radiation Laboratory Workers

These are personnel are listed under an AU. They work in laboratories that use radioactive materials, but have only minor, incidental contact with radioactive material (RAM). They include dishwashers, workers with data only management functions and other workers who do not handle radioactive materials. Initial training can be the three-hour New Radiation Laboratory Worker training or the Hazard Communication (Right-to-Know) training. These ancillary personnel are subject to the same retraining requirements as active Radiation workers.

Non-Radiation Laboratory Workers

These workers are personnel who are associated with laboratories or administration but have no direct contact with radioactive material (RAM). These personnel must attend the Hazard Communication (Right-to-Know) training. Annual retraining is required.

What if a worker leaves or wants to change their status?

It is the responsibility of the AU to inform the RSOF, either by written memo or email, of the category of each person working in their laboratory. It is also the responsibility of the AU to inform the RSOF as to a change in personnel status, which includes a change in the category of worker type or an individual departing the laboratory as well as departure from Case Western Reserve University (CWRU).

Procedure for New Radiation Laboratory Worker Training

All new radiation workers should review the following before attending the New Radiation Laboratory Worker training:

- The Radiation Safety Manual
- The Radiation Safety Training Manual
- The AU's RAM-use protocols

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Copies of these manuals are available at the RSOF and on the EHS website <https://www.case.edu/ehs/> under the Radiation Safety link. The New Radiation Laboratory Worker training consists of sections on the fundamentals of radiation, radiation and biological risk, a twelve-minute video on laboratory safety practices while using ionizing radiation, and on laboratory and control procedures specific to CWRU. Each AU is responsible for training workers under his/her supervision on radiation safety procedures and practices specific to their particular laboratory.

Procedure for Annual Retraining

You can visit <https://www.case.edu/ehs/> and use **check your training** button to view your training information. Every radiation laboratory worker will be informed of the expiration of his/her training occurs via email by the RSOF and the consequences of its expiration at least 30 days before expiration of the past years training. The retraining requirement can be most easily fulfilled on the Canvas system (canvas.case.edu). The retraining course provides updates in RSOF policies, as well as general topics of interest that are relevant to those working around radioactive material (RAM). You will need your CWRU User ID and password. After viewing the presentation, you will click on the handout and have the option to view/print it. You will then be allowed to take the quiz. The EHS database will be updated automatically within two working days if a passing grade is achieved.

When and where are the classes scheduled, and how to sign up?

New Radiation Laboratory Worker training and Hazard Communication (Right-to-Know) training can be found on the EHS website <https://www.case.edu/ehs/> under Training. Special classes for large groups may be given, as needed, if prior arrangements are made. Call the RSOF at (216) 368-2906 to sign up for the New Radiation Laboratory Worker training or sign up online at <https://www.case.edu/ehs/training/radiation-safety>. Hazard Communication (Right-to-Know) trainings are held every Tuesday from 10:30 a.m.-12:00 p.m. at EHS. Please call 216-368-2907 or sign up online at <https://www.case.edu/ehs/training/hazard-communication>.

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**What training is needed if I'm only using Radiation Generating
Equipment (RGE)?**

Individuals that are only using RGE (X-ray diffraction units, fluorescents/spectrometers, industrial radiography equipment, X-ray machines in the Animal Resource Center (ARC), and PET scanners) should refer to the RGE Manual found on the EHS website <https://www.case.edu/ehs> regarding training requirements.

What if I'm using RAM and RGE?

You must register for both the New Radiation Laboratory Worker training and the X-ray training. The individual in charge of the equipment performs site-specific training on the RGE.

**What if I'm using irradiator, laser, and/or ultra violet (UV)
equipment?**

Contact the Radiation Safety Office (RSOF) at (216) 368-2906 regarding training requirements for using an Irradiator, Laser, and/or Ultra Violet (UV).

Posting and Labeling

Policy

All rooms and areas where regulated quantities of radioactive material (RAM) are used or stored must be posted with appropriate signs and labels to inform personnel and visitors to use caution upon entering the area. An Ohio Department of Health (ODH) Notice to Employees information sheet must be posted so that all employees can observe and have the opportunity to read the notice on their way to or from these work areas. If the room contains an irradiator, emergency procedures for possible radiation exposure from the irradiator are also posted.



Regulatory References

OAC 3701:1-38-10 - Notices, instructions, and reports to workers
OAC 3701:1-38-18 - Posting, labeling, and receipt of packages
ODH Broad Scope License

Where do I obtain needed labels?

All radiation labels, Emergency Contact Information sheets, and ODH notices can be obtained from the RSOF.

How, what, and where do I label?

Laboratory Areas

A “Caution Radioactive Materials” label should be placed on the Emergency Contact Information sheet and must be visibly posted at the entrance or on the door for each area or room where licensed quantities of radioactive materials (RAM) are stored or used. The name of the AU, as well as the name of an alternate contact, along with their after-hours telephone numbers should be clearly printed on the Emergency Contact Information sheet. It is the responsibility of the laboratory to keep this information current. The alternate contact needs to have completed Radiation Safety Training.

An ODH Notice to Employees information sheet must be posted in an area in the main laboratory that is readily visible to all employees. It does not need to be posted in every room under an AU.

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Refrigerators and Freezers

Refrigerators and freezers that are used to store radioactive material (RAM) stock solutions and sample preparations should be prominently labeled with a "Caution: Radioactive Material" sign or sticker. Refrigerators and freezers used for radioactive material (RAM) storage not in a lockable laboratory need to be posted with an Emergency Contact Information sheet containing a radiation label along with the name of the AU and an alternate contact in the event of an emergency. They also must be locked, unless a secured Rad-Lock Box is contained within the refrigerator. If a secured, internal Rad-Lock Box is used, a radiation label must be placed on the outside of the Rad-Lock Box. If any sample preparations are stored inside, the isotope, total activity, and the date should be posted somewhere on the outside of the Rad-Lock Box. A "Caution: Secured Radioactive Material Stored Inside" label must be posted on the outside door of the refrigerator or freezer in addition to the Emergency Contact Information sheet. Please contact the RSOF to obtain the "Caution: Secured Radioactive Material Stored Inside" label.

Sinks and Waste Containers

All sinks used for radioactive material (RAM) disposal must be labeled with "Radioactive Material" tape. A sewer disposal log for each AU, indicating isotope, activity, date, and the chemical form of each isotope disposed, must be posted so that it is readily visible from the sink. These log sheets can be found on the EHS website.

All radioactive waste containers must be labeled with a "Caution Radioactive Material" label. The trefoil labels must be large enough and clearly visible from all sides of the waste container. A radioactive waste accumulation log indicating the isotope, activity, and the disposal date should be posted on or near the container. If the log sheet is not directly on the waste container, the isotope, waste type, and maximum activity in the waste container should be written somewhere on the container. Each container of radioactive liquid waste must be doubly contained.

Small Laboratory Equipment

All trays, containers, racks, tools, etc. that are used for radioactive material (RAM) experiments must be labeled with "Radioactive Material" tape.

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Hallway Equipment

Equipment in hallways used with radioactive material (RAM) (other than refrigerators or freezers mentioned above) must be labeled "Caution Radioactive Materials." In addition, these items must be posted with an Emergency Contact Information Sheet listing the AU's name and emergency contact, after-hours telephone number.

Stock Solutions and Sample Preparations

All trays, containers, and racks that contain stock solutions of radioactive material (RAM) must be labeled with "Radioactive Material" tape indicating isotope, estimated activity, and reference date if it is stored in a refrigerator or freezer. While it is not reasonable to expect that each tube or vial is labeled, each tray or rack that holds radioactive material (RAM) must be labeled.

What is considered "special labeling"?

Radiation Area refers to any area accessible to personnel in which the radiation levels are such that a major portion of the body could receive a dose of 5 mRem or more in one hour at 30 cm from the source, or 100 mRem in any five consecutive days.

High Radiation Area refers to any area accessible to personnel in which the radiation levels are such that a major portion of the body could receive a dose of 100 mRem or more in one hour at 30 cm from the source. Ropes or fences should be used in addition to the warning signs to clearly mark restricted areas. A locked door must be used to control access when unattended.

Please contact the RSOF if you feel you have any laboratory areas that fall under these categories.

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What are the exemptions from posting and labeling?

Areas or rooms containing radioactive material (RAM) for periods of less than eight hours are exempt from posting requirements if one of the following conditions is met:

- containers are attended by an individual who takes the precautions necessary to prevent the exposure of other people (less than 2 mRem) in an hour at a distance of one foot) from the source and does not involve the manipulation of open radioactive material (RAM); or
- containers are in transport and are packaged and labeled in accordance with the U.S. Department of Transportation (USDOT) regulations.



Inactive AU Status, Absence from Laboratory

Policy

The RSOF has two AU classifications for laboratories not currently using radioactive materials. The Storage Mode classification is for AUs that wish to retain their license but have no immediate plans (within the next 6 months) to use radiation. AUs in Storage Mode are relieved from monthly survey requirements, but are still required to maintain their training, meter calibrations, and are still subject to Compliance Reviews. AUs that wish to terminate their radiation license are classified as Radiation Inactive. The Inactive classification requires a complete radiation decommissioning of the AUs lab space and disposal or transfer of all radioactive material in their possession. Inactive labs are not required to maintain their radiation training and will no longer undergo Radiation Compliance Reviews.

Regulatory References

None

What do I need to do to change status to inactive mode?

Inactive Status, The Radiation Safety Office (RSOF) has a classification of Inactive for laboratories that do not need to possess or use radioactive material in the foreseeable future. If you wish to become inactive the following procedures must be completed:

1. Send a letter of intent to the RSOF. This can be either a fax or an email.
2. You will be contacted by the RSOF indicating the steps that must be taken to make your laboratory inactive.
3. Follow the guidelines as stated in the Laboratory Decommissioning/Laboratory Relocation section of this manual.
4. Return all personnel dosimeters to the RSOF.

What if I want to become active again?

1. Send a letter to the RSOF requesting reactivation. This can be either a fax (216-368-2236) or an email (arso@case.edu) to the Assistant RSO.
2. Send updated room maps with survey locations, as well as an updated application and protocol to the RSOF.
3. Verify that survey meters are within annual calibration.
4. Verify that radiation workers, ancillary radiation workers, and the AU were

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retrained within the past year.

5. Obtain required personnel dosimeters for all radiation workers, ancillary radiation workers, and the AU.
6. After the steps outlined above have been completed and, the RSOF will activate your rooms for radioactive material use.

What do I need to do to change status to Storage Mode?

Storage mode is for an Authorized User (AU) who wishes to remain active with or without radioactive material inventory for a period greater than 6 months.

Storage Mode means that the AU has chosen to maintain their laboratory in immediate readiness for isotope usage, even if they have no active inventory (short-lived isotope users). Therefore, survey meters must be kept in calibration, training for all involved personnel must be kept up to date, and protocols need to be reviewed & updated every 5 years. The RSOF will continue surveying the laboratory.

The laboratory will no longer need to perform surveys while in storage mode. You can drop the use of dosimetry until use starts again (unless you use equipment that requires it). Turn in your badges to the RSOF with a note to discontinue use.

At 6-month intervals, AUs must also send a notification to the RSOF that states:

1. No isotope use has occurred in the laboratory.
2. The AU has checked all isotope stocks to ensure that no loss of radioactive material has occurred.

If you wish to place your laboratory into this status, send an email to the Assistant RSO (arso@case.edu) stating that you wish to go into Storage mode. Resumption of isotope use shall not occur until and unless an email requesting active status is sent to the Assistant RSO (arso@case.edu). Stop by EHS to obtain new badges if you are required to do so by your protocol. The laboratory will then be required to perform contamination surveys as outlined in their protocol.

Please Note!!!! Laboratories are welcome to go into storage mode if they are sure they will not use radioactive material for 6 months or more.

Such laboratories must be thoroughly surveyed by the AU before entering and after leaving storage mode (Pre-Storage Mode Survey and Post-Storage Mode Survey) regardless of whether there are isotopes in the laboratory.

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The Post-Storage Mode Survey ensures a clean baseline that demonstrates no unauthorized RAM use has occurred in your posted area.

What if I do not have isotopes in my laboratory, but still want to retain active AU status?

The AU should survey the laboratory monthly or decommission the laboratory for radioactive material (RAM) use. If the AU decides to use radioactive materials (RAM), contact the RSOF so the room can be posted with the appropriate signage and labels.

What if I'm going to be absent from my laboratory?

If you are going to be absent from your laboratory for greater than five working days, designate another AU (not a technician) to assume responsibility for all radiation safety issues. Please contact the Assistant RSO indicating the date you are leaving, when you will be returning, as well as the AU that will be assuming responsibility for all radiation safety issues in your absence.

What if I am going on sabbatical?

If you are going on sabbatical, an individual must be designated to assume responsibility for all radiation safety issues in your absence. This individual must be another AU (not a technician) preferably within the same department. Please contact the Assistant RSO indicating the date you are going on sabbatical, when you will be returning, as well as the AU that will be assuming responsibility for all radiation safety issues in your absence.

Personal Protective Equipment/ Personal Safety

Policy

To ensure the health and safety of all members of the CWRU research community.

Regulatory References

OAC 3701:1-38-11 - Radiation protection standards, general provisions 29
CFR 1450 Appendix A - National Research Council Recommendations
Concerning Chemical Hygiene in Laboratories (Non-Mandatory) 29
CFR 1910.1030 - Bloodborne pathogens
ODH Broad Scope License

What is PPE and why is it so important?

In general, the use of Personal Protective Equipment (PPE) is meant to prevent direct skin contamination and minimize the risk of internal contamination. Laboratory coats, appropriate gloves, and eye protection are the primary form of PPE recommended to protect you from contamination with radioactive material. The Authorized User must provide all necessary equipment for workers in each laboratory.

PPE – When, Where and How

Eye Protection

Eye protection is required if there is risk of splash or splatter in the laboratory and where radioactive material (RAM) is stored and handled. Wearing contact lenses is prohibited while working in the laboratory unless non-vented goggles are worn. Where there is danger of splashing or flying particles, safety goggles are mandatory and are the minimum protection required. If extra safety protection is necessary, combine safety goggles with a face shield. Information about eye protection can be found on the EHS website, <https://www.case.edu/ehs/laboratory-safety/personal-protective-equipment>.

Laboratory Coats



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Laboratory coats and other PPE shall be worn at all times while handling radioactive material (RAM). Laboratory coats should be fastened completely to provide complete protection. Information about laboratory coats can be found on the EHS website <https://www.case.edu/ehs> under the Personal Protective Equipment link on the Laboratory Safety page.

OSHA regulations prohibit employees from taking laboratory coats home to be laundered. Laboratory coats **must not** be laundered at community laundromats.

To facilitate laundering of laboratory clothing, arrangements have been made with Merchants Linen Services for the laundering of laboratory coats. Before using the service, you must contact the Merchants Linen representative for CWRU to set up an account at (216) 961-3310. Laboratory coats should be taken to the Merchants Linen drop off area in a clear plastic bag (Service Building dock or the Wolstein Research Building dock).

All laboratory coats must be checked for radioactive contamination and decontaminated before they are dropped off. If a laboratory coat cannot be decontaminated, bring it to the RSOF for proper handling. **DO NOT wear laboratory coats in public areas.**

Gloves

Selection of proper glove materials is important. Disposable gloves are required while handling unsealed radioactive material (RAM). Contaminated gloves cannot be reused and must be disposed of as radioactive waste. Potentially contaminated gloves cannot be worn when handling uncontaminated materials.

Please consult the glove compatibility charts found on the EHS website <https://www.case.edu/ehs/laboratory-safety> under the Personal Protective Equipment link, to identify the safest gloves to wear, since one glove material cannot protect you from all chemicals.

Remove and change your gloves if they are torn, ripped, or punctured. Contaminated gloves must not be reused. **DO NOT wear gloves outside the laboratory.** Gloves must be changed frequently, and hands must be washed at each change.

It is the policy of the CWRU EHS that all laboratory materials be transported using double containment. The material to be transported must be in a leak-proof container that is then placed into an outer container. The surface of the secondary container must be sufficiently free of materials to be handled without the use of PPE.

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General safety tips that you need to follow

Food, beverages, cosmetics, medications

Federal and state laws **prohibit** storing or eating food and drink, chewing gum, smoking, applying cosmetics, and taking medications in **all** CWRU laboratory areas. This includes standard laboratory areas, cold rooms, warm rooms, equipment rooms, common use and other laboratory-related areas. Any food, drink, and their containers found in laboratory areas will be confiscated and disposed of as bio-hazardous waste. All food or drink used for research purposes must be labeled “NOT FOR HUMAN CONSUMPTION.”

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Certain hand lotions are permitted. According to 29 CFR 1910.1030 - Bloodborne Pathogens, hand lotion is not considered a cosmetic and is permitted. However, after this rule went into effect, it was brought to the attention of OSHA that petroleum-based hand lotions affect the integrity of latex gloves. Hand lotions that are NOT petroleum based are, therefore, recommended if you are using latex gloves in the laboratory. Examples of satisfactory hand lotions are:

- Johnson and Johnson Baby Lotion
- Cetaphil
- Jason Natural Cosmetics
- Nexcare
- Keri Lotion

Clothing

Shorts, ties, pants with holes, or other loose clothing is not satisfactory while conducting experiments in the laboratory. Open-toed shoes or sandals (including crocs) are not permitted in the laboratory.

Dosimetry

Policy

Each individual likely to receive a measurable radiation dose must wear a personal radiation dosimeter. This includes all laboratory workers, visitors to the laboratory, and maintenance workers or contractors working in the laboratory. Other personnel may request dosimeters that will be provided at the discretion of the RSOF.



Regulatory References

OAC 3701:1-38-10 - Notices, instructions, and reports to workers
OAC 3701:1-38-12 - Occupational dose limits
OAC 3701:1-38-14 - Survey and monitoring requirements
ODH Broad Scope License

When do I need to wear a badge?

Whole body Luxel dosimeters will be issued for users of all isotopes EXCEPT for ^3H , ^{35}S , and ^{14}C . Finger badges are required for all personnel working with more than 0.5 mCi of ^{32}P , ^{86}Rb , or ^{22}Na , particularly if aliquoting radioactive samples from high activity stock vials. Whole body badges are also issued for individuals using irradiators.

Do I need a special badge if I'm working with a neutron source?

Yes. For experiments and procedures involving the use of neutron sources, personal monitors sensitive to neutron radiation must be worn. These can be obtained by contacting the RSOF.

Do I need a badge if I'm working with X-ray machines, X-ray diffraction units, or electron microscopes?

For users of X-ray equipment, see the RGE Manual for badge requirements. The RGE Manual is available on the EHS website <https://www.case.edu/ehs> under the Radiation Safety link.

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What if I'm pregnant or think I might be?

Any radiation worker who is pregnant or thinks they might be pregnant may declare themselves a pregnant worker by completing a Declaration of Pregnancy form and sending it to the RSOF. Declaration of pregnancy is voluntary. Counseling will be provided, and an additional dosimeter will be issued which is read every month. This additional fetal badge is worn such that any dose to the developing baby is conservatively measured. The Declaration of Pregnancy form can be found on the EHS website <https://www.case.edu/ehs> under the Radiation Safety link.

Where can I get a badge?

Badges can be obtained through the RSOF by completing the Radiation Worker Dose History Sheet. This can be done either during the New Radiation Laboratory Worker training or at the time you come to the RSOF to pick up your badge. The badges are provided. No work can start, however, until the proper training requirement has been fulfilled.

How often are badges exchanged?

All badges (with the exception of fetal badges) are exchanged quarterly (January, April, July, and October) at the RSOF. Fetal badges are exchanged monthly. Each laboratory is notified via email of the badge exchange date. Badges are to be returned promptly at the end of each cycle to assure the RSOF can take timely action consistent with implementation of ALARA (As Low as Reasonably Achievable), in the event any significant dose is measured.

What if my badge is lost or damaged?

Report lost or damaged badges (crushed, broken, melted, washed, accidentally exposed, contaminated, heated in any way, etc.) to the RSOF as soon as you are aware of the situation so that a new badge can be issued. If the badge has been lost, the individual will also be required to complete a Lost Dosimetry (Ring or Badge) form. This form can be found on the EHS website <https://www.case.edu/ehs> under the Radiation Safety link.

How should I properly use and care for my dosimeters?

- The whole body badge is worn between the neck and waist. However, since one area of the body may be more likely to be exposed under some experimental conditions, the badge should be worn in that area.
- The front of the badge must be exposed toward the source of radiation with no obstruction such that it correctly samples the actual exposure of the radiation worker.
- The badge shall be worn outside of any PPE.
- Extremity badges (ring badges) should be worn under *any* protective gloves on the hand most likely to receive the greatest exposure. The front of the ring badge should face toward the radiation source.
- Badges are issued to a single user and cannot be shared.
- Store the badge in a radiation-free area, such as a desk drawer, when not in use. Do not take the dosimeter home.

Bioassays

Policy

Bioassays are required for employees who may receive an internal, measurable radiation dose. Bioassay procedures include, but are not limited to, thyroid screening and urinalysis.

Regulatory References

NRC Regulatory Guide 8.20 - Applications of Bioassay for ^{125}I and ^{131}I
NRC Regulatory Guide 8.32 - Criteria for Establishing a Tritium Bioassay OAC
3701:1-38-12 - Occupational dose limits
ODH Broad Scope License

When is a bioassay required?

A bioassay is required any time more than 1 mCi of radioactive iodine is used, or if more than 10 mCi of ^3H is used. Use, by definition, includes opening a stock vial containing more than 1 mCi of radioactive iodine or 10 mCi of ^3H .

Radioactive iodine bioassay – what do I need to do?

Call the RSOF before handling more than 1 mCi of radioactive iodine. If bioassays are performed, a baseline bioassay must be recorded for anyone involved in the procedure that does not have a baseline bioassay on file.

Also arrange for the RSOF to monitor effluent releases to the atmosphere during the iodination in order to measure any release of radioactive iodine to the environment. Please call at least 24 hours in advance to allow the RSOF to set up monitoring equipment in the chemical hood.

Anyone performing an iodination should also use a special glove box containing an activated charcoal filter inside the chemical hood. These boxes are provided free of charge to any AU that is performing this type of procedure. Please contact the RSOF at (216) 368-2906 if you need one of these glove boxes.



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After the iodination, the RSOF must be contacted to remove the monitoring equipment. Record the date of the procedure, the room number where the procedure took place, the length of time the monitoring equipment was running, and the amount, in mCi, of radioactive iodine that was used. Each individual performing an iodination requiring bioassay must come to the RSOF on the next business day following the procedure to obtain a five-minute thyroid scan.

Tritium bioassay – What do I need to do?

Call the RSOF before handling more than 10 mCi of ^3H . If bioassays are required, a baseline bioassay must be done for anyone involved in the procedure that does not have a baseline bioassay on file.

The required schedules for Urine bioassays for tritium users are shown below:

- Less than 100 mCi: Bioassays are performed at the discretion of the RSOF, or when requested by the AU.
- Greater than 100 mCi but less than 10 Ci: Bioassays are performed weekly until results are in the normal range.
- Greater than 10 Ci: Bioassays are performed daily until results are in the normal range.

Can I perform my own bioassay for tritium?

Yes. Following approval from the RSOF, tritium users may perform their own bioassays and submit the results to the RSOF. The bioassay procedure can be obtained from the RSOF.

Are there any exceptions?

Yes. If you use tritium sources in sealed metallic foils, you are exempt from bioassay requirements.

Record Keeping

Policy

Record retention must conform to all applicable Federal and State regulations. Records must be kept up-to-date and be readily available for inspection by University administration, federal, and state regulatory authorities. It must be possible from the documentation to establish that all conditions for the safe use of radioactive material (RAM) have been met.



Regulatory References

OAC 3701:1-38-20 - Records

What records do I need to keep?

- Receipts of radioactive material (RAM) in your possession
- Waste disposals (RSOF and sewer)
- Transfer and storage, including relevant radiation survey results
- Incident reports
- Surveys of rooms and equipment
- Package receipt surveys
- Meter calibration record (current)

Why do I need to keep these records?

Records must be kept up-to-date and be readily available for inspection by the University administration, Federal, and State regulatory authorities, as well as the RSOF.

How long do I need to keep these records?

Records of the above items must be maintained until the appropriate federal and state regulatory agencies terminate the University's radioactive material (RAM) license.

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What if the AU leaves the university?

All radiation records should be given to the RSOF.

Does the RSOF provide any forms?

The RSOF provides generic isotope inventory sheets which allow you to record information on each isotope shipment, radioactive waste accumulation forms for your waste containers, and laboratory sewer disposal logs. All of these forms can be found on the EHS website <https://www.case.edu/ehs> under the Radiation Safety link.

What is an RSOF Compliance Review?

A Compliance Review by the RSOF is performed for each AU three times per year and consists of two parts: a survey of all rooms that are surveyed by that AU and an audit of all laboratory records. This includes contamination surveys, package receipts, waste disposal records, isotope inventories, survey meter calibration, personnel status and training, and inventory of sealed sources. A copy of the Compliance Review is then mailed to the AU. The RSOF follows a General Enforcement Policy approved by the Radiation Safety Committee (RSC), which outlines a system of consequences for violations of mandated procedures for the safe use of radioactive material (RAM).

What is an Environmental Release Summary?

As required by the Northeast Ohio Regional Sewer District, an environmental release summary must be submitted by the university. Each laboratory must keep records of how much radioactivity they are disposing via the sanitary sewer system, as well as any chemical hood releases. The RSOF sends a reminder to each AU one week prior to the due date of this report. The form can be completed online in both January and July. The Environmental Release Summary is available on the EHS website <https://www.case.edu/ehs> under the Radiation Safety link.

Survey Meter Maintenance and Calibration

Policy

AUs are responsible for the annual calibration, maintenance, and repair of their survey meters. Count rate survey meter calibrations are provided by the RSOF as a free service.

Regulatory References

OAC 3701:1-38-14 - Survey and monitoring requirements
ODH Broad Scope License

What type of calibration can the RSOF do and how long does it take?

The RSOF has the ability to perform count rate calibrations for survey meters that are used for contamination surveys. This calibration is performed free of charge. When a meter is brought to the RSOF for calibration, the RSOF checks the electronic linearity of the meter and determines meter efficiencies for the isotopes used in the laboratory. This procedure generally takes two to five working days. Also, the meter must have properly charged batteries. The RSOF will call or email the laboratory when the meter has been calibrated and is ready for pick up. It is the responsibility of the laboratory to pick up the meter as well as to ensure that the batteries are fully charged. Meters can be loaned to laboratories on a short-term basis while laboratory meters are being calibrated or repaired. Please inform the RSOF if you need to borrow a meter.

What if the meter requires dose rate calibration?

Meters requiring dose rate calibration cannot be calibrated by the RSOF. Meters requiring dose calibration must be sent to an outside vendor by the AU. If there are any doubts about where to have the meter calibrated, contact the RSOF to obtain this information.



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When do I need to bring the meter for calibration?

Meters can be brought to the RSOF one or two weeks before their expiration date for calibration. Make sure that the survey meter's batteries are in good working order and that the meter and probe are free from contamination. If the probe is protected with paraffin or plastic caps, these must be removed prior to bringing the meter to the RSOF.

What if the meter is not working?

If the meter is not functioning properly, bring the meter to the RSOF to be checked. Minor repairs such as loose connections or dirty battery connections that can be fixed quickly are carried out by the RSOF. However, AUs must send any meter that needs major repairs to an outside vendor. The AU is responsible for all charges incurred for repair by a commercial vendor and for commercial calibration of meters. The AU is also responsible for having a meter available in their laboratory for survey purposes if their meter is being repaired or calibrated. Under certain circumstances, the RSOF does loan meters to individual laboratories.

If an outside vendor has calibrated the meter, does it still need to be brought to the RSOF?

After an outside vendor has calibrated the meter, bring the meter AND a copy of its calibration certificates to the RSOF for determination of isotope efficiencies since the vendor only checks the electronic linearity of the meter.

If a new meter is purchased, what needs to be done?

If a new meter is purchased, bring it to the RSOF for determination of isotope efficiencies, along with a copy of the calibration certificate from the vendor.

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What precautions should be taken for the survey meter?

Many laboratories protect the probe of the survey meter with paraffin or plastic caps. This practice is appropriate when using the meter to detect possible contamination occurring during the experiment. However, when carrying out contamination surveys, an *unshielded* probe is used.

Protect the probe from contamination by avoiding contact with surfaces that may be contaminated.

Batteries in the survey meter should be checked every time the meter is used. This is generally done by turning a switch to the BATT position or by pressing the button labeled "Battery Check." If the needle does not reach the "Battery OK" range, the batteries must be replaced immediately to ensure that the meter functions properly. If unsure about any aspect of the survey meter's operation, call the RSOF (216) 368-2906.

For inactive survey meters, remove the batteries from the meter to prevent damage from corrosion.

Protect the meter from bumps and drops. The crystals in a gamma detector shatter on impact, and GM probe windows can easily become damaged, releasing the gas necessary for the meter to function. Also, the electronics in the meter box can develop loose connections.

USE OF RADIOACTIVE MATERIAL

Purchase of Radioactive Material (RAM)

Policy

Radioactive material (RAM) may be purchased only by an AU or a designee listed in the AU's application to use isotopes. The instructions to obtain AU status are provided in the Application for Use of Radioactive Materials (RAM) for Non-Human Use, available on the EHS website. The Laboratory Personnel List contained in the Application designates individuals who are approved to sign requisitions for isotope purchases. If there are any changes to this list, please fax an updated list to the RSOF at (216) 368-2236. All radioactive material (RAM) purchases must be approved by the RSOF before the order is processed through the purchasing department.

The AU must be approved to possess the isotope and activity ordered. The activity, when added to the current isotope inventory, cannot exceed the AU's approved possession limit for that isotope.

All acquisitions of radioactive material (RAM) from a vendor must follow the same procedures as if they were purchased. This includes replacement shipments, trial kits, and free samples.

Regulatory References

ODH Broad Scope License

How do I purchase radioactive materials (RAM)?

The RSOF has established the following procedures when ordering radioactive material (RAM).

The RSOF requires that the old CWRU requisition with the signature of the AU or the AU's approved designee be faxed to the RSOF at (216)368-2236 and must have the PeopleSoft requisition number referenced in the body of the requisition. Only the AU's or formally approved designee's signature will be accepted. For clarity, print the name of the AU or designee below the signature. This information can be written on the main body of the requisition. The RSOF maintains a list of individuals authorized to sign isotope orders. If you want to add or delete anyone's name, fax an updated form to the RSOF.



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In addition to the paper requisition, orders must be submitted through the PeopleSoft system. Include all replacement orders and no-charge samples. The following items must appear on the PeopleSoft requisition:

- the vendor's name and address under Suggested Vendor. Be sure to choose the *radioactive* category and not *glassware* or *chemicals*.
- the number of stock vials to order should be placed under Quantity.
- the activity to order should be placed under Unit. Activity is expressed in units of millicuries (mCi) or microcuries (μ Ci), not Becquerels (Bq).
- the catalog number is entered under Catalog Number.
- the isotope and chemical form is written under Description.

Once all of the above steps are completed, the requisition will automatically appear in the RSOF approval work list for final approval.

There is a 2:00 p.m. cut-off time in the RSOF for processing radioactive material (RAM) requisitions that are due the following business day. Requisitions received after 2:00 p.m. are not guaranteed for next day delivery.

Radioactive materials (RAM) cannot be purchased with a University P-Card.

NOTE: Purchase requisitions for radioactive material (RAM) to be ordered or delivered to MetroHealth Medical Center or the VA Medical Center do not require the approval of the CWRU RSOF. Contact the RSOF at those locations for instructions.

All purchase requisitions are entered into the EHS database. Two copies of the Case RAM Package Receipt Form are generated. The upper portion will display the PI name, number, laboratory location, vendor, catalog number, isotope, activity, requisition number, and date ordered.

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What do I do with the Purchase Requisition once it's completed?

The order must be faxed (216) 368-2236, emailed, or attached as a pdf to the order in People Soft. DO NOT fax your order to Purchasing. The RSOF approves many orders for radioactive material (RAM) each day. Therefore, place the order as early in the day as possible to ensure same-day processing.

What if I cancel an order?

Call the RSOF at (216) 368-2906, as well as Purchasing at (216) 368-2560, to cancel the requisition through PeopleSoft. Otherwise, the activity will be assigned to your inventory automatically.

What if I need to order an isotope but the activity of the isotope exceeds the AU possession limit for that isotope?

Waste counts as inventory and a waste pick-up can be scheduled to reduce inventory. If approval to increase the AU possession limit for an isotope is needed, call the RSOF (216) 368-2906 for further information.

What if I want to purchase an isotope, but it is not on my license?

If a required isotope is not on your AU license, an Application Form for Use of the isotope must be requested using the application form that can be found among the Radioactive Materials (RAM) for Non-Human Use forms that are available on the EHS website <https://www.case.edu/ehs>, See Radiation Safety link. The completed form must then be sent to the RSOF where it will be reviewed by the ARSO and placed on the agenda for the next scheduled Radiation Safety Committee (RSC) meeting. Please be certain that you send your forms to the RSOF two weeks prior to the next scheduled Committee meeting. It is also possible to order the isotope under an AU that is authorized for that isotope and to then work under that AU until the committee approves the application.

What if I want to purchase a Sealed Source?

If you plan to purchase a sealed source, follow the same procedure used for ordering radioactive materials (RAM). Sealed sources include disc sources used for meter calibration, rod sources used as external standards for gamma counters, as well as sources contained in anti-static devices and liquid scintillation counters.

What if I want to purchase a Liquid Scintillation Counter (LSC)?

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Liquid scintillation counters contain an internal radiation source and, therefore, must be processed like all other sealed source-containing radiation packages. Please refer to the “How do I purchase radioactive materials (RAM)” section of this manual.

What if I want to purchase a Gamma Counter?

Gamma counters are shipped with an external calibration radiation source and this source must be processed like all other radiation packages. Please refer to the “How do I purchase radioactive materials (RAM)” section of this manual.

Receipt of Radioactive Material (RAM)

Policy

The AU or designee shall survey all radioactive material (RAM) packages and contents upon receipt for contamination and evidence of damage or breakage.

Regulatory References

OAC 3701:1-38-18 - Posting, labeling, and receipt of packages

OAC 3701:1-50-17 - Routine determinations

49 CFR 172 – Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, Training Requirements, and Security Plans

49 CFR 173 – Shippers, General Requirements for Shipments and Packaging

Package Receipt and Check-In

When a package of radioactive material (RAM) is received by CWRU Shipping & Receiving, the RSOF is notified. The packing slip, as well as the CWRU RAM Package Receipt Form will be attached to the package when it is delivered to the laboratory. A dated inspection label is also attached to the package indicating that it was inspected by the RSOF. If this sticker or the CWRU RAM Package Receipt Form is missing, inform the RSOF immediately. If your laboratory orders >1 mCi of radioiodine (I125) or > 10 mCi of Tritium (H3), a label informing you of bioassay requirements will also be attached.

The CWRU RAM Package Receipt Form

RSOF Package Screening Results

A specialist from the RSOF will check all received packages for any surface contamination on the outside of the box, as well as measure dose rates on the surface and at three feet (one meter). If surface contamination exceeds 220 dpm/100cm², or greater than 0.5 mSv/hr (200mR/hr) at the surface, the package will be held by the RSOF and the laboratory will be contacted. The packing slip attached to the package will also be checked to ensure that the correct isotope and activity has been ordered. A signature and the time and date that the package was checked should be noted on the package along with the purchase order number and the package receipt date.



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Laboratory Responsibilities for Package Survey Results

The individual receiving the package in the laboratory must complete the laboratory receipt part of the form. ***The laboratory MUST survey the package on the same day that the package is received.*** Probe readings, as well as wipe tests, must be performed on the exterior of the box and on the inside of the Styrofoam container containing the stock vial. Please be certain you do not take probe readings if the vial is in the box. If your shipment contains ^3H , only a wipe test is performed. Perform a wipe test on the outside of the stock vial in order to ensure the vial is not leaking. Determine the activity of the wipe with an appropriate counting device. Wipes from a package containing ^{32}P can be checked using a survey meter. Wipes from packages containing any other isotopes must be checked using the LSC. Record the activity in units of $\text{dpm}/100\text{cm}^2$. Please include all survey meter information on the form. Sign your name; record the date that the package was surveyed, and place this form in a notebook for future RSOF Compliance Reviews.

Transfer of Radioactive Materials (RAM), LSCs, and Sealed Sources



Policy

The RSOF reviews all procedures for transfer of radioactive materials (RAM), LSCs, and sealed sources to or from an AU, either on campus (internal transfer) or off campus (external transfer). Radioactive materials (RAM) (stock solutions, samples, gels), LSCs, and sealed sources may not be transferred to another AU or location until this review process has been completed.

Transport of radioactive material (RAM) between Case AUs follow ALARA procedures. Those approved for the isotope transfer must proceed in a manner that minimizes exposures and risks from accidental release of radioactive material (RAM).

Transport of radioactive material (RAM) off campus must conform to all applicable State and Federal regulations. It is essential to obtain approval from the RSOF before shipment. **Individuals shipping radioactive material off campus must attend a DOT Hazardous Materials Shipment Training is offered by the Department of Environmental Health & Safety (EHS). Call (216) 368-2907 for more information.**

Regulatory References

- OAC 3701:1-50-05 - Transportation of licensed material
- OAC 3701:1-50-07 - General license: NRC-approved package
- OAC 3701:1-50-17 - Routine determinations
- OAC 3701:1-50-25 - Determination of A1 and A2 values for radionuclides
- ODH Broad Scope License

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What if I want to transfer radioactive material (RAM) to another AU at CWRU?

Before initiating an Internal Transfer of radioactive materials (RAM), verify that the receiving AU is authorized to possess the isotope. An Internal Transfer Form must be signed by both the sending and receiving AUs, as well as by the RSOF, **before** the transfer may proceed. A copy of the form will be returned to both AUs. If the internal transfer will involve the use of a motor vehicle, a Bill of Lading must also be completed. Please call Safety Services at (216) 368-2907 for further instructions. The Internal Transfer Form can be found on the EHS website <https://www.case.edu/ehs> under the Radiation Safety link.

What if I want to transfer radioactive material (RAM) to someone at another institution, within or outside of the United States?

Before initiating an External Transfer of Radioactive Material (RAM), an External Transfer Form must be completed and sent to the RSOF. Information provided must include the isotope, activity, and chemical form. A contact telephone and fax number of the receiving institution will help expedite the RSOF process for obtaining approval for the shipment. The shipping address of the receiving institution must also be written on the form. A copy of the form, signed by the RSOF, will be returned to both AUs. **Do not** proceed with the transfer until this form approved by the RSOF is returned to the AU. The External Transfer Form can be found on the EHS website <https://www.case.edu/ehs> under the Radiation Safety link.

What if I'm transferring an LSC to another AU at CWRU, or an AU outside of CWRU?

Call the RSOF at (216) 368-2906. The RSOF will ask you where the counter is going to be located, as well as the name of the AU to whom the counter is being transferred. If the LSC is being transferred to an AU outside Case, see the section on Safety Clearances for the paperwork that is required. The Safety Clearance Form can be found on the EHS website <https://www.case.edu/ehs> on the main page. Also, further documentation may be necessary from the receiving institution.

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What if I'm transferring a sealed source to another AU at CWRU, or an AU outside of CWRU?

Call the RSOF at (216) 368-2906. The RSOF will ask you where the sealed source is going to be located, as well as the name of the AU to whom the sealed source is being transferred. If the sealed source is being transferred to an AU outside Case, further documentation may be necessary from the receiving institution.

How do I prepare radioactive material (RAM) for shipment?

Call Safety Services at (216) 368-2907 regarding packaging and labeling requirements. Perform radiation and contamination surveys of the package prior to shipment. Radiation and contamination levels shall not exceed the following:

- 220 dpm/ 100 cm² (40 Bq/100 cm²) removable contamination,
- 0.5 mRem/hr (0.005 mSv/hr) at any point on the external surface of the package.

Although these limits apply, procedures consistent with ALARA (As Low As Reasonably Achievable), which advocate that no removable contamination exists on package exteriors should be followed. If the dose rate of the package exceeds 0.5 mRem/hr, call the RSOF for additional labeling information.

What are the safety precautions when checking in packages?

RAM packages cannot be delivered to non-rad rooms. If a package is delivered to a room that is NOT authorized to use radioactive material (RAM), it must be moved to an authorized RAM area prior to opening the package.

Wear proper protective clothing. Examples include a buttoned laboratory coat, latex, vinyl, butyl, or nitrile gloves, safety goggles, and a body and ring badge, as needed.

Check for evidence of potential contamination, such as packages that are crushed, wet, or damaged. If there is any evidence of leakage or contamination, contact the RSOF immediately.

Open all packages containing volatile radioactive material (RAM) (S35 and radioiodine (I-125)) in an approved chemical hood.

If there is no evidence of isotope contamination, remove and/or completely deface the trefoil warning labels before disposing of the items as non-radioactive trash.

Radioactive Material (RAM) Incident Response/Reporting

Policy

All laboratories should have an “Emergency Response Plan” appropriate for their laboratory. Each AU is responsible for making certain that *the RSOF*, (216) 368-2906 during office hours (8:30 a.m. – 5:00 p.m.), or Security, (216) 368-3333 after hours, weekends, and holidays is called immediately in the event of:

- A major spill, theft, or loss of radioactive material (RAM);
- Personnel contamination;
- Contamination outside a restricted area;
- Accidental ingestion of radioactive material (RAM); or
- Accidental disposal of radioactive material (RAM) to the normal trash.

Regulatory References

OAC 3701:1-38-21 - Reports
ODH Broad Scope License

Are incident response procedures included in the AU application?

Yes. The AU is required to implement incident response procedures as part of the radioactive material (RAM) use application process. These procedures are included in the application packet that is given to an individual who is applying to use radioactive material (RAM). These procedures are divided into three parts: 1) spill, 2) decontamination, and 3) emergency procedures. All three are included together since they are all used in responding to incidents involving radioactive material (RAM) that are most likely to occur in a laboratory. Response procedures for other laboratory hazards that may be present (i.e. chemical hazards and biological pathogens) are not listed.



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When do I need to call the RSOF?

Each AU is responsible for making certain that *the RSOF, (216) 368-2906 during office hours (8:30 a.m. – 5:00 p.m.), or Security, (216) 368-3333* after hours, weekends, and holidays is called immediately in the event of:

- A major spill, theft or loss of radioactive material (RAM);
- Personnel contamination;
- Contamination outside a restricted area;
- Accidental ingestion of radioactive material (RAM); or
- Accidental disposal of radioactive material (RAM) to the normal trash.

The incidents listed **MUST** be reported to the RSOF. An Incident Report Form must be completed by the AU and sent to the RSOF as soon as possible after the incident. An Incident Report Form can be found on the EHS website <https://www.case.edu/ehs> under the Radiation Safety link.

The first part of the form includes basic information such as the name of the AU, the date and time of the incident, the date and time it was reported, the location of the incident, and the isotope and activity involved.

The second part of the form consists of a written description that includes how the incident occurred, what caused the incident, the area, personnel, and/or equipment that were contaminated, if any, the current status, and any procedural changes required to prevent a recurrence of the incident.

If the incident involved contamination of an area, personnel, or equipment, a copy of the contamination survey should be attached. This survey should include a diagram of the affected area or equipment and the results of meter and wipe tests indicating contamination levels in “dpm” or “mCi.” The original survey should be placed in the AU’s file with laboratory survey records. The “Incident Report Form” can be found on the EHS website <https://www.case.edu/ehs> under the “Radiation Safety” link.

How do I know if it is a major or minor spill and how do I make this determination?

Spill assessment considerations:

- Isotope emission characteristics
- Radioactive material (RAM) volatility
- Quantity of radioactive material (RAM) involved
- Size of contaminated area

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- Potential for spreading contamination
- Potential dose – external and internal

Minor Spill

A spill that remains contained that can easily and effectively be cleaned up without assistance from the RSOF, and does not involve personnel contamination.

Major Spill

A spill that involves contamination of personnel or results in contamination outside of the intended work area that cannot be promptly cleaned up.

What if I determine that it is a minor spill?

1. Survey clothing, hands, and shoes for potential personnel contamination.
2. Notify others in the area of a minor radiological spill.
3. Remove contaminated bench paper and/or gloves, and dispose of as radioactive waste.
4. Decontaminate the work area and survey to verify all contamination has been removed.
5. Document incident, attach decontamination results, and place report in the laboratory's radiation record-keeping binder for future RSOF Compliance Reviews.

What if I determine that it is a major spill?

1. Survey clothing, hands, and shoes for potential personnel contamination.
2. Notify others in the area of a major radiological spill.
3. During business hours (weekdays 8:30 a.m. - 5:00 p.m.) call the RSOF at (216) 368-2906.
4. After hours (weekdays 5:00 p.m. - 8:30 a.m., weekends, and holidays) call Security at (216) 368-3333 and indicate there is a radiation spill.
5. Give Safety or Security your name, the AU's name, location, and telephone number.
6. Establish a secure boundary to prevent spreading of contamination.
7. Do not leave the area (unless in immediate danger) until initial investigations by Safety have been completed.

What if there is a fire or a medical emergency or personal injury?

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In the case of a fire

Evacuate the area and immediately call Security at (216) 368-3333. Give them your name, your AU's name, and the location of the fire. Security will activate the fire alarm, contact the fire department, and evacuate the building.

In the case of a medical emergency

Immediately call Security at (216) 368-3333. If radioactive material (RAM) is involved, call the RSOF at (216) 368-2906 **AFTER** Security has been contacted. Give Security and Safety your name, the AU's name, location, telephone number, and type of medical emergency. Do not leave the area (unless in immediate danger) until initial investigations by Safety have been completed.

In the case of personal injury

Immediately call your Supervisor then call Security at (216) 368-3333. If RAM is involved, call the RSOF at (216) 368-2906 once Security has been called. It is imperative that a medical evaluation be done since the injury would be considered an occupational injury. Go to Health Services, between the hours of 8 a.m. and 4 p.m., to be checked out. If after hours, go to the Emergency Room to be evaluated. Complete the Occupational Injury Report and send it to the RSOF. The Occupational Injury Report can be found on the EHS website <https://www.case.edu/ehs> on the main page.

Security of Radioactive Materials (RAM)

Policy

Radioactive material (RAM) shall be secured against unauthorized access.

Regulatory References

OAC 3701:1-38-17 - Storage and control of a licensed or registered source of radiation
ODH Broad Scope License



When does radioactive material (RAM) need to be secured?

If you or someone from your laboratory authorized to use radioactive material (RAM) is not present. Even if you are in another part of the laboratory, the radioactive material must be in your line of sight. If it is not, it is not considered secured. If you have a stock vial on the bench and are leaving your laboratory even for a few minutes and there is no one else present, the laboratory must be locked or the radioactive material must be placed in a locked refrigerator or in a lockbox that is secured inside the refrigerator. Just placing the container in the refrigerator does not provide adequate security.

What type of radioactive material (RAM) needs to be secured?

Stock vials or stock solutions must be secured when not in use.

Does radioactive waste need to be secured?

No. Common and accepted practice is not to secure waste to the same degree as other radioactive material (RAM). However, waste is to be kept in the waste area of the laboratory and its activity sensibly minimized.

What equipment needs to be secured?

Equipment containing radioactive material (RAM) (i.e., cabinets, refrigerators, freezers) that are located in hallways must be locked or contain a secured Rad-

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Lock Box within. A refrigerator containing a secured Rad-Lock Box should also have a special label posting on the outside of the refrigerator (see section on Posting and Labeling in this manual).

What if the equipment does not contain radioactive material (RAM)?

If the labeled equipment (i.e., cabinets, refrigerators, freezers) is not being used for radioactive material (RAM), then the equipment should be decommissioned. For equipment that is used occasionally for radioactive material (RAM) storage, the equipment must be locked even if no radioactive material (RAM) is currently present. An unsecured refrigerator or freezer labeled as radioactive, but which contains no radioactive material (RAM), is considered a security violation as per RSC guidelines. Researchers shall not keep empty stock vial containers labeled radioactive on their laboratory benches. These containers are still considered as unsecured radioactive material unless the label has been defaced.

Where can I purchase secure lock boxes?

Locking acrylic shielding containers with Container Restrainers are available from Research Products International (800.323.9814). If you have one of these containers, please contact the Radiation Safety Office at 368-2906 to obtain a label for your refrigerator indicating that there is a secured locked-box inside.

Does the RSOF conduct security checks?

Yes. Security checks by the RSOF are frequently conducted before and/or after normal working hours to ensure that areas where radioactive material (RAM) is present are properly secured. Normal work hours are between the hours 8:30 a.m. and 5 p.m.

Uranyl Acetate

Policy

Uranyl Acetate is not regulated as radioactive material (RAM) under the ODH, but must be disposed as waste by the RSOF.

Regulatory References

40 CFR 261.31 - Hazardous wastes from non-specific sources
40 CFR 261.32 - Hazardous wastes from specific sources

Description of Uranyl Acetate

Uranyl Acetate is a naturally-occurring radioactive material (NORM) that emits alpha (α), beta (β) and gamma (γ) radiation. It is used as a stain for electron microscopy viewing enhancement. Although the radiation associated with the material is far less hazardous than its chemical toxicity, it should be treated as a radioactive hazard.

What about external dose?

One hundred grams of Uranyl Acetate powder has a maximum unshielded dose rate of 0.6 mRem/hr.

Assume you are at 10 cm from this source and working with 25 grams. The maximum dose would be 150 μ Rem/hr. At 1 meter, the dose rate would be 1.5 μ Rem/hr. Background radiation is about 1000 μ Rem/day, or 42 μ Rem/hr. Therefore, distance exposure at 1 meter from 25 grams results in 4% of natural background.

What about skin dose?

Uranyl Acetate will give a skin dose rate of 6.7 mRem/hr per μ Ci/cm². The activity of 1 gram of Uranyl Acetate is 2 μ Ci/g. If one gram were spread over 100 square centimeters, the contact dose rate would be 134 μ Rem/hr. This is a very low dose rate. Wearing laboratory gloves will provide adequate protection.

What is the external radiological hazard from Uranyl Acetate?



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The gamma dose at 10 cm from 25 grams is less than or equal to (\leq) 150 μ Rem/hr. So you would have to stay in this radiation field for 667 hours before reaching the public exposure limit of 100 mRem in a year. Skin/finger dose is also low. Assume 1/50 of the allowed extremity occupational exposure value of 50,000 mRem. You would have to have your fingers touching the material for 75 hours to obtain this 1000 mRem dose limit.

What is the internal radiological hazard from Uranyl Acetate?

The stochastic annual limit of intake is 10 μ Ci. Do not inhale or ingest it. Use it in a chemical hood. Chemical safety procedures will suffice. Follow the safety procedures from the Material Safety Data Sheet (MSDS) for Uranyl Acetate. MSDS" are available on the EHS website <https://www.case.edu/ehs> under the "MSDS" link.

Isotope and Shielding Requirements

The following chart is meant as a general guide only. Please call the RSOF at (216) 368-2906 or consult the information sheet that comes with the isotope should you require further information on the specific thickness of the shielding that is required.



Isotope	Energy	Shielding
⁴⁵ Ca	0.257 MeV beta	None
⁵¹ Cr	0.320 MeV gamma	Lead
¹⁴ C	0.156 MeV beta	None
³⁶ Cl	0.710 MeV beta	Lucite
¹²⁵ I	0.035 MeV gamma/X-ray	Lead
³² P	1.71 MeV beta	Lucite
³³ P	0.249 MeV beta	None
²² Na	1.275 MeV gamma 0.546 MeV position	Lead
Tc-99m	0.141 MeV gamma	Lead
³ H	0.019 MeV beta	None
³⁵ S	0.167 MeV beta	None
⁸⁶ Rb	1.77 MeV beta 1.077 MeV gamma	Lucite first, then Lead

CLOSING A RADIATION LABORATORY

Laboratory Decommissioning

Policy

AUs are responsible for a final laboratory radiation survey following the last use or storage of radioactive material (RAM) anywhere under their supervision. These areas must be thoroughly checked for removal of radioactive material (RAM) and contamination prior to being returned to general laboratory use. Once a thorough survey has been completed by the laboratory and confirmed by the RSOF, the room is considered decommissioned and released from radiological control with no further use of radioactive material (RAM). An email from the AU initiates this decommissioning process. The Clearance Request Form and the other forms for laboratory relocation and termination are found on the EHS website, <https://www.case.edu/ehs> under the Laboratory Safety link. Follow the guidelines noted in the Laboratory Decommission Packet that covers both Chemical and Radiological Decommissioning procedures.



Regulatory References

Reg. Guide 8.23, Table 2.1 – Recommended Action Levels for Removable Surface Contamination in Medical Institutions
OAC 3701:1-38-02 - Fees for inspection, application, amendment, and renewal of radioactive material sources of radiation
OAC 3701:1-38-22 - Decommissioning
See all “Multi-Agency Radiation Survey and Site Investigation Manual” (MARSSIM via NRC NUREG-1575, EPA 402-R-97-016)
ODH Broad Scope License

Radioactive Waste Disposal

Policy

The AU shall implement an effective radioactive waste management program that includes proper labeling, shielding, minimization, and assurances that disposed materials go into the correct radioactive waste stream.

Regulatory References

OAC 3701:1-38-12 Appendix C – Annual Limits on Intake (ALI) and Derived Air Concentrations (DAC) of Radionuclides for Occupational Exposure, Effluent Concentrations, Concentrations for Release to Sanitary Sewerage

OAC 3701:1-38-19 - Waste disposal

40 CFR Part 261 - ID listing of hazardous waste under RCRA

40 CFR Part 302 - Designation, reportable quantities and notification under CERCLA

29 CFR Part 1910.1200 - Hazard Communication Standard

What does the AU need to do?

The AU is responsible for obtaining all containers and shielding required for their waste management program, as well as for maintaining written inventory records of the activity of all waste in storage and those wastes removed from the laboratory. Waste bags for dry solids and vials, tags, and waste disposal forms can be obtained from the RSOF at no charge.

General waste handling procedures

Radioactive waste should be separated by type – dry solids, vials, SHARPS, beta plates, liquids, and animals – and by isotope. Dual-label experiments are the only exception. **DO NOT**, under any circumstances, place radioactive waste in the hallways where housekeeping personnel might pick it up.

Liquid radioactive waste should be doubly contained so that leakage from a breach in the primary container is fully contained by the secondary vessel. If you have contaminated waste that is bio-hazardous, contact the RSOF for disposal guidelines.

Radioactive waste placed in biohazard bags will not be accepted for pickup by the RSOF.



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Dose rates from any radioactive waste container should not significantly exceed background radiation levels. Any container used to store radioactive waste should be prominently labeled with a radiation trefoil sign. This will alert housekeeping personnel that it is a radioactive waste container and not an ordinary trash container.

How do I schedule a waste pickup?

Before waste can be picked up from the laboratory, a Radioactive Waste Disposal Form with decay-corrected activities must be completed and faxed, emailed or hand delivered to the RSOF. Also, if you have liquid or vial waste, a Disposal Listing for Liquid Waste form must also be completed for *each* bottle of liquid waste and each bag of vials. The liquid and vial waste should be listed on the Radioactive Waste Disposal form as well and faxed to the RSOF at (216) 368-2236. The waste sheet will be reviewed before arranging a pickup date to verify that the activity disposed of is reasonable based on the existing (decay-corrected) inventory for the laboratory.

Disposal activity in mCi should be expressed in decimals and not exponents (i.e. if you have 1.0 μ Ci of waste, it should be written as 0.001 mCi, and not 1×10^{-3} mCi).

During the waste pickup, an EHS specialist will bring a copy of the RAM Inventory for laboratory personnel to update and return to the RSOF. This will allow the laboratory to update its inventory by eliminating those items that were disposed.

If the laboratory needs waste bags, tags, or forms, list them on the Radioactive Waste Disposal form and the EHS specialist will bring these items to the laboratory during the waste pickup.

EHS personnel are careful to protect the campus community while waste is transported from laboratories to our waste facility. Our personnel try to use service elevators whenever possible.

When EHS must use public elevators, we will notify elevator users that may enter that there is waste in the cart. If the elevator already has passengers, we will more than likely just wait for the next car, unless we are invited into the elevator.

We will push the cart without wearing laboratory coats or gloves because waste is doubly contained within the cart, just as any laboratory samples are, when transported.

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Types of Radioactive Waste

Dry Waste

This category of waste consists of anything that has come into contact with radioactive material (RAM) such as disposable laboratory ware, gloves, stock vials with a total volume of < 2.0 mL, bench paper and polyacrylamide gels.

Dry waste should be placed in yellow Radiation labeled trash bags. These bags can be obtained free of charge from the RSOF. Any temporary waste containers (bench bags) should be emptied into the appropriate permanent waste container at the end of each working day. The date of disposal, the isotope, and activity of the waste should be entered on a log sheet that posted on or near the waste container.

Radioactive waste placed in biohazard bags will *not* be accepted for pickup by the RSOF.

SHARPS

SHARPS include discarded hypodermic needles, syringes, scalpel blades; cannulas, coverslips, microscope slides, all pipettes (glass or plastic) and pipette tips, test tubes, glass Petri dishes, and other materials designed for use in biological, etiological, bacteriological or tissue culture work capable of causing puncture wounds or cuts; broken glass or any other item capable of causing puncture wounds or cuts.

Radioactive waste classified as SHARPS **MUST NOT** be mixed with dry solid materials, but must be contained in puncture-proof/rigid containers.

All contaminated SHARPS, needles, syringes and scalpel blades; and all materials designed for use in biological, etiological, bacteriological or tissue culture work capable of causing puncture wounds or cuts must be placed in red rigid SHARPS containers and marked with the isotope, activity, date of closure, and AU name. ***All contaminated radiological SHARPS must be soaked in a 20% bleach solution for 24 hours and then drained prior to pickup.*** The bleach can be drained into a Radiation sink (following the activity restriction guidelines for liquids) with the activity and isotope written on the Sewer Disposal Log (available on the EHS website <https://www.case.edu/ehs> under the Radiation Safety link).

All other SHARPS (such as broken glassware) which **are not** biologically contaminated may be discarded in red SHARPS containers OR in puncture-proof

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containers labeled “SHARPS” and marked with the isotope, activity, date of closure, and AU name.

Liquid Scintillation Vials

These are vials containing or formerly contained scintillation fluids, as well as background vials. The type and amount of scintillation fluid used should be written on the liquid waste sheet.

Glass or plastic liquid scintillation vials should be double bagged in solid yellow plastic bags, provided by the RSOF free of charge. Vials placed in larger bags will not be accepted for waste pickup. Vial waste should be double bagged due to the added weight of the scintillation fluid and inner bag leakage. The RSOF does not accept bulk liquid scintillation fluid.

Do not mix dry waste with scintillation vials. Vial waste should be composed of scintillation vials ONLY. Sterilized Bactec vials and sterilized blood-containing vials, or vials containing other aqueous non-scintillation fluids should be placed in a separate container and appropriately labeled.

Bactec Vials

Bactec vials are ampules containing ^{14}C used in clinical applications. Collect and dispose of Bactec vials in the same fashion as liquid scintillation vials. Indicate that they are Bactec vials on the Radioactive Waste Disposal form. Bactec vials must be autoclaved prior to pick-up by the Radiation Safety Office (RSOF). A certificate indicating that the vials have been autoclaved should be attached to the waste pickup form.

Beta Plate Mats

Beta plate mats should be double bagged in solid yellow bags. Do not mix beta plate mats with scintillation vials.

Liquid Waste

No liquid radioactive waste may be disposed into the sanitary sewer system unless it meets all federal, state, local, and university regulations governing disposal of chemicals into the sanitary sewer system. The activity restrictions for each AU are as follows:

- 20 μCi per day for ^3H
- 20 μCi per day for ^{14}C , and

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- 7 μCi total per day for all other isotopes combined. (“Total” means these isotopic limit values are additive. For example, 2 μCi of ^{32}P and 5 μCi of ^{35}S is the limit, not 7 μCi of each.)

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Liquid disposed into laboratory sinks enters the sanitary system and must meet EPA/RCRA requirements for disposal to groundwater. Therefore, it must be water soluble or readily dispersible in water, the pH must be between 5 and 10, and it cannot contain any regulated chemicals. Consult the Laboratory Safety Manual or contact the RSOF with any questions about regulated chemicals in buffer solutions.

The AU is responsible for maintaining a record of all quantities of radioactive liquids disposed into the sewer system. The isotope, activity, chemical form, and date of disposal must be specified on the sewer disposal form (available on the EHS website <https://www.case.edu/ehs> under the Radiation Safety link), which should be posted at or near the sink where the waste is being disposed. (See the section on Record Keeping). Any change in the disposal protocol must be approved by the RSOF.

Liquid waste not disposed of via laboratory sinks is given to the RSOF for disposal. For each bottle of liquid waste, a separate Disposal Listing for Liquid Radioactive Waste form must be completed. This form provides information regarding the isotope, activity, date, chemical constituents, pH, and chemical form. This applies to all liquids whether or not they contain regulated chemicals.

Perform a wipe survey on the outside of the liquid waste container to make certain it is not contaminated and that the container's lid has been tightened. Liquid waste should be placed in recyclable containers that can be returned to the laboratory by the RSOF. These containers should be made of heavy gauge plastic with not more than a 20-liter capacity. Judgment should be used in the selection of plastics since organic chemicals dissolve many. Some containers that are relatively inert and have good chemical resistance to toluene, other phenyls, esters, ketones, and alcohols are unmodified polypropylene, polytetrafluoroethylene (Teflon), and polytrifluorochloroethylene.

The RSOF will not accept liquid waste that has been placed in glass containers. Contact the RSOF if you have any questions about the type of container to use for your liquid radioactive waste or if your liquid waste contains any regulated chemicals.

Lead Pigs and Bricks

Lead is a regulated material and cannot be disposed of as normal trash. It must be surveyed and free of contamination before it can be picked up by the RSOF. The inner lead lining of a lead pig must first be removed from the plastic container and surveyed prior to RSOF pickup. Any radiation label must be completely defaced before the plastic container is disposed as regular trash. If

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your laboratory has lead to pick up, indicate this on the Radioactive Waste Disposal form.

Uranyl Compounds

NORM (Naturally-Occurring Radioactive Material) Uranyl compounds are treated as chemical waste. All uranium-containing compounds are picked up and disposed of by Chemical Safety. This includes liquid, dry/solid waste, and Uranyl Acetate/nitrate in powder form.

Fill out the Hazardous Waste Disposal form and turn it to EHS Chemical Safety. Bag and tag as you would for dry/solid or liquid hazardous waste (white tag).

Sealed Sources

If you want to dispose of a sealed source, contact the RSOF at (216) 368-2906.

Radioactive Animal Waste

Radioactive animal waste can include carcasses, bedding and excreta, animal blood, animal SHARPS, as well as animal waste containing etiologic agents.

Carcasses (including tissue and viscera)

Research personnel are to place all carcasses in the -20°C freezer of the Animal Resource Center (ARC). They are to be double-bagged in yellow Radiation waste bags. Each bag is to be tagged with the standard radioactive waste tag. An item number is to be written on the tag that corresponds to the item number assigned on the log sheet that is posted on the door to the freezer. All isotopes contained in a carcass within a bag must be identified as well as their maximum activities. Carcasses containing single but different isotopes should be bagged separately. If more than one isotope has been administered to an animal, the longest-lived isotope will usually dictate the final disposal method. Activities of each isotope will be clearly stated. If the carcass contains ^3H or ^{14}C , the maximum specific activity of any carcass, averaged over the entire carcass, in units of $\mu\text{Ci/gm}$, is to be entered on the log sheet and tag. Inform the RSOF regarding disposal so that the activity can be accounted for on the EHS database.

Bedding and Excreta

Handle animal bedding and excreta in the same manner as carcasses, with one exception: there is no need to determine the specific activity of ^3H or ^{14}C content. (The specific activity rule pertaining to disposal applies only to carcasses, not bedding or excreta). Animal bedding and excreta is double-bagged in yellow

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Radiation waste bags, labeled, and identified on the entry log sheet with isotope, activity, and date, and placed in the -20°C freezer in the ARC. Inform the RSOF regarding disposal so that the activity can be accounted for on the EHS database.

Animal Blood

Animal blood can be disposed of in the laboratory Radiation labeled sink after sterilization by adjusting to 20% with bleach solution. The criteria for radioisotope drain disposal are the same as for a laboratory sewer disposal. If these daily activity disposal limits are exceeded, the blood is to be neutralized and held for pickup by the RSOF in a single container. Tubes or vials that contained blood are to be rinsed with a 20% bleach solution and disposed of as dry radioactive waste.

Animal SHARPS

All contaminated radiological SHARPS must be placed in a red rigid SHARPS container and held for pickup by the RSOF.

Radioactive Waste Containing Infectious Material

Infectious material is defined as any materials containing animal or human bacteria, viruses, and parasites.

Investigators generating radioactive waste containing infectious material will be required to store this waste in yellow bags that are marked with biohazard waste labels until this waste is properly decontaminated to avoid the possibility of accidental submittal of infectious and radioactive waste for disposal. All potential generators of radioactive waste containing infectious material will be warned that radioactive and infectious waste cannot be submitted for disposal. For mixed waste that is infectious and radioactive, the purple bag must be used for waste storage. If this procedure is necessary, specific training will be supplied by the Department of Environmental Health & Safety (EHS) on how to handle this type of waste.

Laboratory Contamination Surveys/ Decontamination Guidelines

Policy

AUs shall perform contamination surveys and document the results in appropriate units for all areas where radioactive material (RAM) is used or stored under their supervision. The RSOF will conduct periodic surveys and Compliance Reviews to assure proper use of all radioactive material (RAM), as well as assist laboratory personnel on how to perform decontamination procedures.



Regulatory References

OAC 3701:1-38-11 - Radiation protection standards, general provisions
OAC 3701:1-38-20 - Records
NRC Regulatory Guide 8.23 – Radiation Safety Surveys at Medical Institutions
ODH Broad Scope License

When do I need to perform laboratory surveys?

Any laboratory containing radioactive material (RAM) is required to perform and document a contamination survey monthly. However, when more than 200 μCi are used regularly, then documented full laboratory surveys are required weekly. If more than 200 μCi are used only occasionally, a documented post- experimental survey of the work area will suffice in lieu of a weekly full-laboratory survey.

What if I have isotopes in storage but do not actively use them?

Inactive

The Radiation Safety Office (RSOF) has an *Inactive* classification for laboratories that do not need to possess or use radioactive material in the foreseeable future. If you wish to become inactive the following procedure must be completed: Send a letter of intent to the RSOF. This can be either a fax or an email. You will be contacted by the RSOF indicating the steps that must be taken to make your laboratory inactive.

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If you wish to reactivate the laboratory for radioactive use, the following steps must be followed: Send a letter to the RSOF requesting reactivation. This can be either a fax (216-368-2236) or an email (arso@case.edu) to the Assistant RSO.

Send updated room maps with survey locations, as well as an updated application and protocol. Verify that survey meters are within annual calibration. Verify that radiation workers, ancillary radiation workers, and the AU were retrained within the past year. Obtain required personnel dosimeter for all radiation workers.

After the steps outlined above have been completed and reviewed by the Radiation Safety Committee, the RSOF will activate your rooms for radioactive material use.

Storage Mode

Storage Mode is for an Authorized User (AU) who wishes to remain active with or without radioactive material inventory for a period greater than 6 calendar months. Storage mode means that the AU has chosen to maintain their laboratory in immediate readiness for isotope usage, even if they have no active inventory (short lived isotope users). Therefore, survey meters must be kept in calibration, training for all involved personnel must be kept up to date, and protocols need to be reviewed and updated every 5 years. The RSOF will continue surveying the laboratory.

AUs must also, at 6 month intervals, send a notification to the RSOF that states: No isotope use has occurred in the laboratory, and the AU has checked all isotope stocks to ensure that no loss of radioactive material has occurred. This notification is collected during Compliance Reviews.

If you wish to place your laboratory into this status, send an email to the Assistant RSO (arso@case.edu) stating that you wish to go into Storage Mode. Resumption of isotope use shall not occur until and unless an email requesting active status is sent to the RSOF. The laboratory will then be required to perform contamination surveys as outlined in their protocol.

PLEASE NOTE!

Laboratories are welcome to go into Storage Mode if they are sure they will not use radioactive material for 6 months or more. Such laboratories must be thoroughly surveyed by the AU before entering and after leaving storage mode (Pre-storage Mode Survey and Post-Storage Mode Survey) regardless of whether there are isotopes in the laboratory.

What if my laboratory does not currently have RAM, but I still want to keep the room as a RAM-active room?

The room must be posted and surveyed monthly even if the laboratory does not have RAM. If the AU decides to use radioactive material (RAM), contact the RSOF so the room can be posted with the appropriate signage and labels.

What documentation do I need?

Survey documentation shall include meter efficiencies and confirm that limits for removable contamination or restricted area exposure rates are not exceeded (see the Posting and Labeling section of this manual for definitions of restricted areas). All records require both count rate measurements with an appropriate, calibrated survey meter and wipe tests performed to identify removable contamination. If your laboratory uses only ^3H , only a wipe test needs to be performed. Attach the wipe test results to the room survey map.

What items do I need before I perform a contamination survey?

These procedures are intended as a guideline for performing a standard laboratory survey, and may vary from laboratory to laboratory.

Gather all necessary items, including:

- maps of the survey area for marking locations of probe readings and wipe locations.
- an appropriately calibrated meter. Check the batteries every time the meter is used.
- material for performing the wipe test, such as cotton swabs, tissue, or filter paper.
- vials in which to place the wipes.
- tweezers to allow handling of the wipes without cross-contaminating the samples.
- liquid Scintillation Counter (LSC) to analyze the wipes.

Should I perform a meter survey, a wipe test, or both?

The following chart was created to assist you in selecting the best method and instrument for performing contamination surveys:

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Nuclide	Radiation Emitter	Energy, keV	Contamination Survey Technique*
¹⁴ C	β (Beta)	156	WL + SG
³⁶ Cl	β	714	WG + SG
⁵¹ Cr	γ (Gamma)	320	WL + SN
³ H	β	18.6	WL
¹²⁵ I	γ	35	WL + SN
²² Na	β/γ/γ	545/1275/511	WG + SG
³² P	β	1710	WG + SG
³³ P	β	248	WL + SG
⁸⁶ Rb	β/γ	1780/1078	WG + SG
³⁵ S	β	167	WL + SG

* See key below

W = WIPE to check for removable contamination

S = SURVEY with meter (Geiger-Mueller (GM) or Sodium Iodide (NaI)) for fixed contamination L = run on LSC

G = use GM or "sandwich" probe N

= use NaI or "sandwich" probe

Example: WL + SG means to perform a smear to *wipe* the surface and count the smear with a *liquid scintillation counter*, plus perform a meter *survey* for fixed contamination using a *GM probe*.

When checking for removable contamination, you should always perform a wipe. When checking for fixed contamination, the total radiation from the surface is measured with a hand-held instrument then the removable component is subtracted from this, if appropriate.

The sandwich probe (beta-gamma sandwich detector) combines a plastic scintillator to detect beta with a Sodium Iodide crystal to detect gamma. The Ludlum Model 44-21 is the common model used at the university.

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How do I perform a meter survey?

When surveying a laboratory with a survey meter, concentrate on regions where radioactive material (RAM) has been used. Do not overlook areas where radiation users may have inadvertently walked or items that they may have touched. Hold the meter as close to the surface as possible without touching it to avoid contaminating the meter. Move the meter slowly and deliberately along laboratory benches, near selected floor regions, radioactive material (RAM) work areas, all small equipment, sinks, refrigerators and freezers, telephones, light switches and doorknobs. Also pay close attention to laboratory coats, waste areas, and containers for both radioactive and normal trash.

All meter surveys should be performed with an unshielded probe. Meter surveys performed with a probe covered with parafilm, saran wrap, or a meter cap will not be valid. Probe efficiencies are calculated by the RSOF using an unshielded probe.

What do I need to write down?

Record the make, model, serial number, and calibration date of the survey meter on your survey sheet. Record the count rates in counts per minute (cpm) for all locations on the survey data sheet. Convert all count rates from cpm to disintegrations per minute (dpm). The cpm to dpm calculation, as well as the isotope efficiencies, can be found on the tag that is attached to your meter. Identify those areas that show count rates greater than (>) 220 dpm after background subtraction. Record the isotope that caused the contamination next to the count rate, decontaminate the radioactive area, re-wipe the area to ensure it is no longer contaminated, and attach all results to the original survey.

How do I perform a wipe test?

Perform a wipe test of the laboratory, including the areas indicated previously. Also, take wipes of regions where high counts were found with the survey meter. Wipes may be wetted with alcohol or distilled water to increase their lifting ability. Typical wipe tests should be performed over a 100 cm² area.

What do I need to write down?

Record on the room map the locations of the wipe tests and the area wiped. Take wipes of broad areas initially but remember that for determination of contamination, wipes of small should be taken as well. Load wipes in the appropriate radioactivity counter (Liquid Scintillation Counter for beta emitters and a Gamma counter for gamma emitters). All results must be converted to

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units of dpm per 100 cm² or in $\mu\text{Ci}/100\text{ cm}^2$. It is understood that this represents net dpm (i.e. after background has been subtracted). If your radioactivity counter is not programmed to convert cpm to dpm, refer to the manual that is provided with the counter for the isotope efficiencies, and record them on your survey sheet.

A blank consisting of a clean wipe along with the same volume of scintillation fluid used for your sample wipes should be run along with your wipe samples.

If the results verify there is contamination (greater than (>) 220 dpm), record the isotope that caused the contamination, decontaminate that area, re-wipe, and attach the results to the original survey.

Can I use my survey meter to run my wipes instead of an LSC?

If your laboratory uses only ³²P, ²²Na, ³⁶Cl, or ⁸⁶Rb, a survey meter may be used to count your wipes. However, if you use ³²P, ²²Na, ³⁶Cl, or ⁸⁶Rb in addition to other isotopes, you must use the LSC. If you use a portable survey meter, record the Make, Model, Serial Number, and the meters calibration date on the survey sheet. Record the count rates in cpm for all locations on the survey data sheet. Convert cpm to dpm. The cpm to dpm calculation, as well as the isotope efficiencies, can be found on the tag that is attached to your meter. Identify those areas that show count rates greater than (>) 220 dpm after background subtraction. Also record next to the count rate the isotope that caused the contamination, and the results of new wipes after decontamination of that area. Attach all results to the original survey.

What is fixed contamination and how do I know?

Fixed, or non-removable, contamination can result when radioactive material (RAM) has been absorbed into a material and can only be detected by a survey meter and is not found on wipes. The area should be labeled with isotope, activity, and the date. Shield the area if possible until isotope decays. If has a short half-life, resurvey the non-removable contamination and update label until the isotope has completely decayed.

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Decontamination Procedures: How do I do it?

Please refer to the definitions of a minor spill and a major spill in this manual.

Floor Decontamination

- Put on appropriate PPE (double gloves, booties, laboratory coat, goggles) before entering areas where there may be contamination.
- Define the outer boundary of the contaminated area and mark off with tape.
- Clean from the outer edge of the contamination and work inward.
- Use a spray solution and wipe up with paper towels or other absorbent material to remove as much removable contamination as possible.
- Using soap and water can clean up low activity spills not containing hazardous materials. After aliquoting the wastewater, it may be disposed down the sanitary sewer, provided the activity does not exceed daily sewer disposal limits. Be sure to log the isotope and activity on the sewer disposal log.
- For large activity spills, shielding may be required to reduce radiation exposures. The use of tongs will minimize hand exposure.
- While cleaning towards the center area, check newly cleaned areas for loose contamination before walking or kneeling in these areas. Bench paper may be placed over these areas to prevent spread of the contamination to new areas of the laboratory.
- Tape off and shield any areas where the contamination cannot be easily removed by further decontamination efforts.
- Re-survey area.
- Wash until removable contamination is gone if possible.
- When wipe tests confirm only fixed contamination remains, appropriately shield the contaminated area and label with isotope, activity and date.
- Document that the area has been decontaminated and place the results in the laboratory notebook along with the initial survey.

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Equipment Decontamination

- Use a spray solution and wipe up with paper towels or other absorbent material to remove as much removable contamination as possible. Be cautious not to flood the area with cleanser since it will wash the contamination into cracks, which will be difficult to decontaminate.
- Using soap and water can clean up low activity spills not containing hazardous materials. After aliquoting the wastewater, it may be disposed down the sanitary sewer provided the activity does not exceed daily sewer disposal limits. Be sure to log the isotope and activity on the sewer disposal log.
- Wash until removable contamination is gone.
- Re-survey the equipment.
- Wash until removable contamination is gone.
- When wipe tests confirm only fixed contamination remains, appropriately shield the contaminated area and label with isotope, activity and date.
- Document that the area has been decontaminated and place in the laboratory notebook along with the initial survey.

Chemical Hood Decontamination

- Ensure that the chemical hood is running.
- Remove items from the hood and place them on clean bench paper outside of the hood, segregating contaminated items.
- **Volatile isotopes should be placed into bags and sealed before removing them from the hood.**
- Cut out and remove contaminated bench paper from the hood and remove the remaining bench paper. Place contaminated paper with dry radiation waste.
- Check floor area for contamination from transporting contaminated items.
- Using soap and water can clean up low activity spills not containing hazardous materials. After aliquoting the wastewater, it may be disposed down the sanitary sewer, provided the activity does not exceed daily sewer disposal limits limit (found in this manual). Be sure to log the isotope and activity on the sewer disposal log.
- Re-survey the chemical hood. Check the backside of the hood sash as well as the walls of the hood for additional contamination.
- Wash until removable contamination is gone.
- When wipe tests confirm only fixed contamination remains, appropriately shield the contaminated area and label with isotope, activity and date. Short-lived isotopes may be left for decay; long-lived isotopes may require destructive removal and replacement by the RSOF.
- Document that the area has been decontaminated and place in the

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laboratory notebook along with the initial survey.

Clothing Decontamination

- Remove all contaminated clothing carefully to avoid or minimize contaminating your skin.
- Check your skin for possible contamination. Decontaminate the skin as indicated below before continuing with clothing decontamination.
- Determine approximate activity on the clothing.
- If clothing contamination is less than the daily sewer disposal limit, wash the clothing with soap and water in the sink, recording the sewer disposal activity.
- Re-survey the clothing.
- If the clothing contamination is more than the daily sewer disposal limit and cannot be easily cleaned, the clothing will have to be held for decay or disposed as radioactive waste.
- Complete an Incident Report and place it in the laboratory's records for future RSOF compliance reviews. The Incident Report can be found on the EHS website <https://www.case.edu/ehs> under the Radiation Safety link.

Skin Decontamination

- Contact the RSOF (216) 368-2906.
- Wash contaminated area with mild soap and rinse with running tepid water (or wetted towels).
- Do not abrade or scrub the skin.
- Survey after each washing and drying for cleaning efficiency.
- When washing with soap and water no longer reduces the contamination, record the remaining activity on the skin and apply lotion to keep the skin moist and help loosen the contamination. Apply a bandage over the area to sweat out contamination. Monitor the area each day until the contamination is gone. Survey the bandage and dispose of it as RAM waste, if necessary.
- Complete an Incident Report and place it in the laboratory's records for future RSOF compliance reviews. The Incident Report can be found on the EHS website <https://www.case.edu/ehs> under the Radiation Safety link.

Clearance Requests for Radiation Equipment or Rooms

Policy

AUs or laboratory personnel needing to have equipment or laboratory areas cleared for maintenance or disposal must submit a Clearance Request form prior to the equipment leaving the laboratory or any maintenance work on laboratory areas. The RSOF, as well as Safety Services, will respond to this request to ensure no potential radiological or biological/ pathogenic contamination exists on the equipment or in the specified laboratory area. The Safety Clearance Form can be found on the EHS website <https://www.case.edu/ehs> on the main page.

Regulatory References

Regulatory Guide 8.23 - Radiation Safety Surveys at Medical Institutions
OAC 3701:1-38-22 - Decommissioning

How do I dispose of equipment that was used for radioactive material (RAM)?

If the equipment has a CWRU tag on it, call Equipment Accounting at (216) 368-4281. They will complete a disposal form and send it to the Facility Operations/ Customer Services Department, which will then complete and submit a Clearance Request form to EHS. If the equipment does not have a CWRU tag on it, submit a Clearance Request Form to EHS.

A member from the RSOF as well as Safety Services will inspect the equipment prior to release. The laboratory may be given specific instructions on cleaning of the equipment for radiological, as well as biological/chemical contamination. If you are disposing of a Liquid Scintillation Counter (LSC), the manufacturer should be contacted to arrange for removal and disposal of the sealed source. Please contact the RSOF prior to disposing of an LSC.



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What do I do if equipment that is used for radioactive material (RAM) breaks and I need to have it repaired?

This applies to equipment being returned to a manufacturer for repair, as well as equipment that will be serviced in the laboratory. A Clearance Request Form must be completed and faxed to EHS at (216) 368-2236. Ensure all information on this form is correct so EHS can contact the laboratory for information pertaining to the equipment. A member from the RSOF as well as Safety Services must inspect the equipment. Any radiation label on the equipment will be removed by the RSOF once it has been surveyed and the survey verifies the equipment is free of contamination. If the equipment is found to be contaminated, the laboratory will be responsible for decontaminating it. Fixed contamination will be dealt with as deemed appropriate by the RSOF, as well as the manufacturer's requirements.

What if a piece of equipment or a laboratory is no longer used for radioactive material (RAM), or you want to move a piece of Radiation equipment into a non-Radiation laboratory?

The RSOF will ask the laboratory to perform a contamination survey on the equipment and to fax them the results at (216) 368-2236 and a Clearance Form. If there is contamination, the laboratory is required to decontaminate the equipment, resurvey, and fax the results to the RSOF. The RSOF will follow up and perform its own survey. Only the RSOF will remove RAM labels.

What do I do if I need to have maintenance work performed in a Radiation laboratory area, cold room, or chemical hood?

In order to have any maintenance work performed in your Radiation laboratory, cold room, or chemical hood, you must notify the Facility Operations/ Customer Services Department (216) 368-8602. Give them your name, your laboratory location, your telephone number, and the area requiring maintenance work. They will complete and submit a Clearance Request form to EHS. A member from the RSOF as well as Safety Services must inspect the area. The laboratory may then be given specific instructions on cleaning of the area for radiological, as well as biological/ pathogenic contamination.