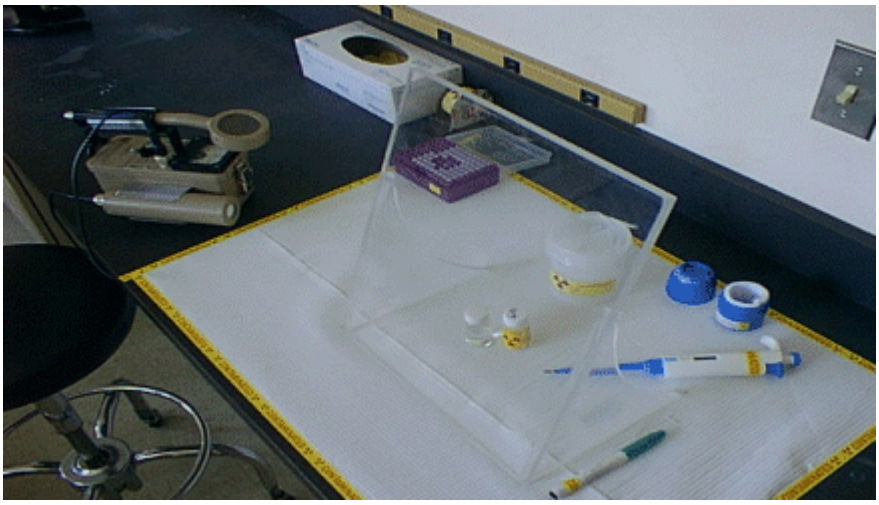
HARVARD
Campus Services
ENVIRONMENTAL HEALTH & SAFETY

Radioactive Materials Safe Work Practices

ALARA is a basic principle of working safely with radioactive materials. ALARA is As Low As Reasonably Achievable. This principle refers to keeping doses and releases as low as we can achieve. Therefore, the goal is to keep any exposures as far below the limits as possible.

Before working with radioactive material

- Develop a detailed experimental plan. Practice with a dry run to rehearse the experiment. With planning and practice you will improve dexterity, minimize the potential for a spill, decrease the time you spend working with radioactive materials, and improve shielding.
- Arrange your workplace and minimize the amount of unnecessary equipment.



- Clearly label containers, equipment, and areas for the handling of radioisotopes with radioactive labeling tape. Dedicate equipment such as pipettes and glassware to radioactivity work to help avoid cross contamination.

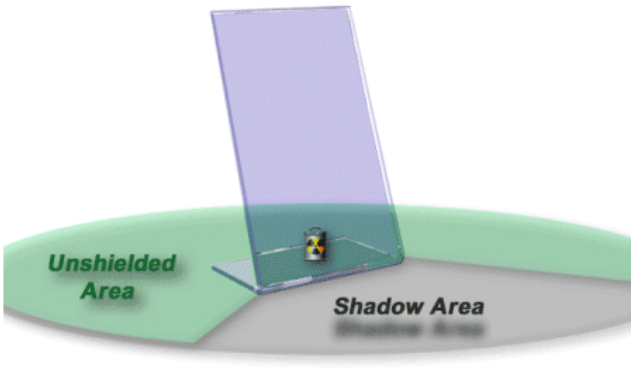
- Use absorbent material (benchcoat) and trays that help to confine spills and reduce the spread of potential contamination.
- Traps to collect radioactivity may be necessary (as required under some permits) (e.g., vacuum line traps). If a trap is not available, contact the Radiation Protection Office (RPO).
- Plan your experiment so that mixed waste (i.e., hazardous chemical or biologically active material combined with radioactivity) is not generated. If this cannot be avoided contact the RPO prior to generating the waste for further assistance.
- Ensure that you have a calibrated, operational survey meter with a pancake probe or, for work with low-energy gamma or x-ray emitters, a scintillation probe. For work with low-energy beta emitters, such as ^{3}H, ensure that you have access to a liquid scintillation counter.

Working with radioactive material

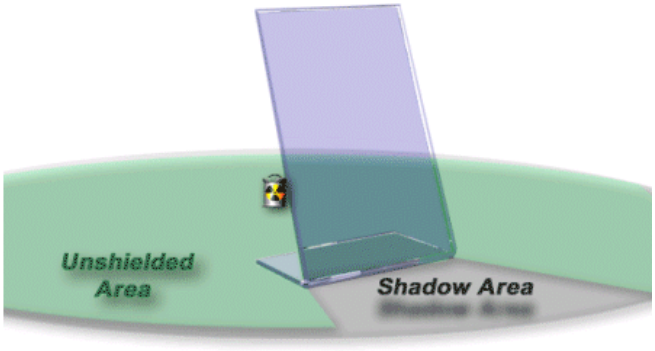
- Minimize the time spent near radioactive materials.
- Keep as much distance between yourself and the radiation source(s) as possible.
- Wear personal protective equipment. The minimum requirements include a laboratory coat, gloves, safety glasses and close-toed shoes. Wear whole-body dosimeters (e.g. Luxel dosimeter) when handling radioactive material and extremity dosimeters (e.g. finger ring), if one is provided by the RPO. Wear either a single or double pair of gloves, depending on the radionuclide you are working with. Choose gloves that are appropriate for the chemical and other hazards in your experiment. If you are unsure about the type of protective glove to use call the RPO at 496-3797.

- Change your gloves often. Assume gloves are contaminated until proven otherwise. Do not leave the laboratory or touch things outside of the work space. Remove gloves carefully from the inside out. Ensure that gloves are disposed of properly and wash hands immediately.
- Use remote handling devices (forceps or tongs) to handle stock vials, sources, or potentially contaminated items.
- Do not eat, drink, smoke, chew gum, or touch exposed areas of skin while working in a room where radioisotopes are handled. Be careful not to rub your eyes, scratch exposed areas of skin, or touch your hair.

- Use an appropriate survey meter and probe. Monitor work surfaces and gloves regularly to maintain control over contamination and exposure.
- Use automatic or remote pipetting devices. **NEVER** pipette by mouth.
- Allow sufficient time for frozen stock solutions to thaw before attempting to withdraw an aliquot. If you are working with ^{35}S-methionine, cysteine, and Translabel® refer to the related worksheet for ^{35}S volatility.
- Handle volatile compounds, which have the potential for vapor or gas release (such as Na^{125}I or ^{35}S-Methionine or Cysteine) in a functioning hood.
- Handle and dispose of spin (centrifuge) columns with care. Place used columns in a sealed container (capped tube or Ziploc® bag) prior to discarding into the radioactive waste.
- Use shielding appropriate for the radionuclide. An effective shield should provide protection in all directions. Place the radioactive material close to the shield to maximize the "shadow area" (area where radiation is blocked out by the shield) cast by the shield. Survey to ensure proper shield placement.



Moving the material back from the shield shrinks the shielded area (the shadow) and thus decreases shielding effectiveness.



- Never shield high-energy beta radiation (e.g. ^{32}P) in high atomic number materials such as lead, as secondary radiation (Bremsstrahlung) may be produced and is more penetrating than the beta radiation that produced it. Therefore, use light weight materials such a plastics (e.g. Lucite, Plexiglas) to shield beta emitters.

After working with radioactive materials

- Lock-up and secure your radioactive stock solutions immediately after use.
- Survey yourself (e.g. hands, hair, eyeglasses, clothing, shoes, etc.) and work area for contamination with an appropriate survey meter. Decontaminate if necessary. Remove protective clothing and wash hands immediately and thoroughly with warm water and soap.
- Note the results of your survey on your personal survey record. Personal and area surveys must always be performed after each use of radioactivity, but documentation on this form is only required if you are working with 1 mCi or greater.
- Promptly segregate and package in appropriate waste containers all radioactive waste items. Record the activity on the waste log. Store waste containing gamma/x-ray emitters or high energy beta emitters (e.g. ^{32}P) behind sufficient shielding.

- For ^{3}H, wipe test the work and adjoining areas for removable contamination and count in a liquid scintillation counter. Areas of concern would be such things as equipment handles, doorknobs, telephones, sinks, floor areas, and other points of frequent contact.
- Clean all the glassware and equipment used in an authorized radioactive material disposal sink.
- Sink disposal must be done according to the approved guidelines. Do not exceed the posted daily limit for the radionuclide, unless otherwise authorized by the Radiation Safety Committee (RSC) in the permit. Record the activity disposed, either directly or while washing, down the radioactive sink, on the sink disposal log.
- Participate in the bioassay program as requested by the RPO.

Contact the RPO at 617-496-3797 or **radiation_protection@harvard.edu** with questions or concerns.