# Radioactive Waste Disposal Guide

The University Of Iowa
Environmental Health & Safety
122 Grand Avenue Court
Iowa City, IA 52242-1000
Phone: 319-335-8501
Date Revised/Reviewed: 3/25/2019

# Contents

# 1.0 Introduction

The University of Iowa generates radioactive wastes as a result of its teaching, research, and patient care activities. The University's Environmental Health & Safety (EHS) manages radioactive isotope use through its Radiation Protection Program, and radioactive waste disposal through its Radiation Waste Management Program. EHS provides technical assistance for generators to comply with regulations and policies.

Radioactive waste disposal is regulated by the Iowa Department of Public Health (IDPH), the Nuclear Regulatory Commission (NRC), and the Environmental Protection Agency (EPA). EPA regulations apply to "mixed waste," i.e., waste that is both radioactive and hazardous chemical.

# 2.0 Training

The following training course is available:

Radioactive Waste Management - W086RD

- Recommended as a refresher course after Basic Radiation Safety Training is completed.
- Audience: Persons generating radioactive waste in labs.

# 3.0 Radioactive Waste Defined

You are required to dispose of all waste that contains or is contaminated with radioactive material as radioactive waste. This means that if a hazardous chemical or biohazardous waste contains or is contaminated with radioactive material, it must be disposed of as radioactive waste.

# 4.0 EHS Responsibilities

## 4.1 Containers

EHS supplies the following waste container types:

- Dry waste (>90 day half-life)
- Dry waste (<90 day half-life)
- Liquid bottles (1-1/2 gallon)
- LSC Vials
- Bags

## 4.2 Waste Collection

Radioactive waste is collected in the area where it is generated.

## 4.3 Waste Transportation

Radioactive waste is transported by EHS on a specially designed truck. A waste inventory is created as waste is collected and manifested for transportation to storage facilities on the UI Research Campus.

## 4.4 Waste Management and Record Keeping

Each waste item collected by EHS is assigned a serial number, tagged, and tracked in a database. This allows EHS to follow the course of each item through collection, storage, management, and disposal. Waste management methods depend on the waste type and length of the half-life of the radioisotope. Records required by IDPH and EPA are maintained by EHS.

# 5.0 Generator Responsibilities

## 5.1 General Requirements

The radioactivity in radioactive waste is licensed material, and as such, remains subject to all regulatory requirements. Observe the following guidelines:

- Keep volumes small; do not let radioactive waste accumulate.
- Place only radioactive waste in radioactive waste containers. Mixing non-radioactive and radioactive waste creates unnecessary hazards and significantly increases disposal cost.
- Label all radioactive waste containers.
- Do not leave radioactive waste in unattended areas. Secure all radioactive wastes from unauthorized removal.
- Radioactive waste containing biological, pathogenic, or infectious material must be treated to the maximum extent practicable to reduce potential hazards (disinfect with biocide).
- Keep a record of isotope and activity each time waste is placed in waste containers. This will facilitate completing the radioactive waste tag.
- Obtain training – training programs are available through the EHS Web site.

## 5.2 Containers

Collect radioactive waste in the proper containers. Obtain dry waste, LSC vial, and liquid waste containers from EHS. There is no charge for containers supplied by EHS. Sharps containers may be obtained from Biochem Stores and General Stores.

- Keep radioactive waste containers closed unless adding items or materials.
- Radioactive waste must be stored securely at all times to prevent unauthorized removal.

## 5.3 Tagging

Each time you place radioactive waste in its container, enter the radionuclide and activity (in uCi) on the radioactive waste tag provided by EHS. Keep the waste tag attached to the container at all times.

# 6.0 Segregating Radioactive Waste

Segregate radioactive waste by waste type and radioactive half-life. Segregation is the responsibility of the generator, and takes place in the work area where the waste is produced.

## 6.1 Segregate by Half-Life

Radioactive waste is separated into two categories based on half-life.

- Short Half-Life = less than 90 days, e.g., $I^{125}$, $P^{32}$, $P^{33}$, $S^{35}$
- Long Half-Life = greater than 90 days, e.g., C14, $Cl^{36}$, $Fe^{55}$, $H^{3}$

## 6.2 Segregate by Waste Type

There are nine general types of radioactive waste generated at The University of Iowa:

- Aqueous liquid waste
- Animal carcasses
- Dry Waste
- Liquid scintillation vials
- Mixed waste
- Radioactive sharps
- Source vials
- Sealed sources
- Lead shielding

## 6.3 Aqueous and Mixed Waste

When organic solvents or other hazardous chemical wastes are contaminated with radioactive material it is known as mixed waste. Mixed waste must always be segregated from aqueous liquid waste.

- Secondary containment is required.
- Segregate by half-life and, if possible, by radionuclide.
- Keep waste containers closed at all times unless adding or removing waste.
- Do not mix solvents or other chemically hazardous liquid waste with water.
- Do not put solid material in liquid waste containers.
- Avoid overfilling radioactive waste containers – leave at least 3 inches of headspace.

- Do not mark liquid waste containers supplied by EHS. If labeling is necessary, use tape.
- Prior to pick up by EHS, tightly secure container cap, affix a radioactive label to the container, and place the radioactive waste tag under the bottle handle.

## 6.4 Animal Carcass Waste

Animal carcasses also include animal body parts, excreta, and bedding.

- Double-bag using strong polyethylene bags.
- Package in as small a volume as possible.
- Add coagulants or absorbents to reduce liquids.
- Bags should not be punctured and outer bag must be free from blood.
- Securely close and seal bags with tape. Complete the radioactive waste tag prior to pick up by EHS.
- Larger animals may need to be cut into smaller parts.

## 6.5 Dry Waste

Only paper, plastic, and unbroken glass should be placed in dry waste containers. Do not place liquids, lead, needles, razors, broken glass, or other sharps in dry waste containers.

- EHS supplies containers.
- Segregate by half-life. Orange label = <90 days half-life. Red label = >90 days half-life.
- Do not overfill containers. Lid must fit snugly to the top of container.
- Deface/obliterate all radioactive symbols and wording on any items placed into a dry waste container.
- Do not put liquids, lead, or sharps into dry waste containers.
- Do not place items in black or colored bags prior to placing inside a dry waste container.

Prior to pickup by EHS, secure the liner and seal with tape. Complete the radioactive waste tag and affix it to the lid of the radioactive waste container.

## 6.6 Liquid Scintillation Vials Waste

Only LSC vials may be placed in liquid scintillation vial waste containers. Do not place source vials in liquid scintillation vial waste containers.

- Segregate $C^{14}$ and $H^{3}$LSC vials in one container and place all other radionuclide LSC vials in another.
- Use biodegradable liquid scintillation cocktail, such as Econosafe or Ready Safe, whenever possible.
- Avoid overfilling liquid scintillation vial waste containers. Lid must fit snugly on the top of the container.

Prior to pick up by EHS, complete the radioactive waste tag and affix it to the lid of the waste container.

## 6.7 Radioactive Sharps Waste

Radioactive sharps must be placed only into sharps containers – not dry waste containers.

- Collect only in containers designed to hold sharps. These are available from Biochem Stores or General Stores.
- Affix a radioactive warning label to any sharps container used to dispose of radioactive waste.
- Do not overfill containers.
- Segregate radioactive sharps by half-life.

Prior to pickup by EHS, tape the lid securely to container, and complete the radioactive waste tag and affix to the sharps container.

Refer to the Sharps Management Chart for more information on sharps disposal.

## 6.8 Source Vials

- Vials containing liquid are not to be placed in radioactive waste containers. Attach a tag directly to the source vial and shield, prior to pickup by EHS.
- Empty vials must have the label and markings obliterated, and must be removed from lead shielding. Dispose of empty vials in the radioactive dry waste.

## 6.9 Sealed Sources

Do not dispose of licensed or generally licensed sealed sources in any EHS radioactive waste container. Sealed sources do not require further packaging if they are not leaking. If a sealed source is leaking, contact the Radiation Protection Section of EHS for assistance.

## 6.10 Lead Shielding

Do not place lead shielding in radioactive waste containers. To prepare shielding for pickup by EHS:

- Remove from outer plastic containers, if applicable.
- Perform a contamination survey.
- Complete and attach a radioactive waste tag.

**Do not accumulate large quantities of lead in your lab.**

# 7.0 Requirements for Waste Pickup

EHS will not remove radioactive waste until you have performed the following:

- Checked the outer surface of the waste container for contamination.
- Completed a radioactive waste tag for each container or sealed source.
- Sealed all containers appropriately.
- Completed an online radioactive waste pickup request.

## 7.1 Check for Contamination

- Perform a wipe test of the entire surface of the external container.
- Count the wipe in a scintillation counter or gamma counter.
- If the result is >22 dpm/$cm^2$, decontaminate, re-wipe and count.
- If the result is <22 dpm/$cm^2$ check the "yes" box found on the radioactive waste tag.

## 7.2 Completing a Radioactive Waste Tag

- EHS provides tags for identifying the contents of radioactive waste. You will need to know the identity of all radionuclides and their activity in order to complete the waste tag.
- Dry waste activities are estimated by the user and may be based on the general rule that about 10-20% of the activity used in an experiment ends up as solid waste.
- Liquid waste activities should be determined by counting a sample of the waste in a scintillation counter or gamma counter.

The waste tag must be completed in full and in pencil.

It is usually only necessary to complete the back of the radioactive waste tag if the waste is a liquid. It may also be necessary to provide information on the tag back for items such as source vials, sealed sources and chemical solids.

- Identify each chemical component and its percentage – this must equal 100%.
- Do not abbreviate chemical names.
- Indicate pH if waste is aqueous.
- If waste is a liquid scintillation cocktail – identify the brand name.

## 7.3 Radioactive Waste Pickup Request

The waste generator must request a waste pickup from EHS. Waste pickup requests are now taken online. Visit the EHS Web site to complete an online radioactive waste pickup request.

## 7.4 What if Your Waste is Not Removed?

If a pickup cannot be completed, EHS will leave a note explaining the reasons. Deficiencies must be corrected and another pickup scheduled.

# 8.0 Waste Minimization

- Avoid ordering and storing more radioactive material than is actually needed.
- Do not place items that are not radioactive or contaminated in radioactive waste containers.
- Replace xylene and toluene based liquid scintillation cocktail with ones that are biodegradable.