

# **RADIOACTIVE WASTE GUIDE**

Waste that is radioactive must never be treated like ordinary trash. The handling and disposal of radioactive waste is regulated by the State of Utah and the Federal Government. Regulations apply to generating, handling, storage, transportation and final disposal. Despite the fact that rules and regulations are sometimes difficult to understand, we must still comply with them. This guide is provided to help all radioactive material users stay safe and compliant with rules, regulations and University policy.

There are three basic steps that must be followed when preparing radioactive waste for pickup: SEGREGATION, PACKAGING and COMMUNICATION. A description of how to complete each of these steps follows, along with answers to frequently asked questions. Additionally, a description of how radioactive waste is processed after pick up is given. This will help you understand why each of these steps is necessary.

## **SEGREGATION**

Segregation is performed according to two characteristics; radionuclide "half-life", and the type of material or "material category".

### **HALF-LIFE**

Segregate radionuclides with a half-life of less than 120 days (short lived) from those with a longer half-life (long lived). You must know the half-life of all the radionuclides you are working with. A list of commonly used radionuclides, with their half-life and other information, can be found in Radiation Procedures and Records (RPR) 10. For data on radionuclides not listed in RPR10, please contact the Radiological Health Department (RHD) at 801-581-6141.

As an example, P-32 has a half-life of about 14 days, which is much less than 120 days, while C-14 has a half-life of about 5730 years, which is much more than 120 days. A lab that uses both P-32 (short-lived) and C-14 (long-lived) must segregate the generated waste. If a protocol involves mixing short-lived and long-lived radionuclides together, then all the waste generated from that protocol is placed into the long-lived category.

### **MATERIAL CATEGORY**

Each package of radioactive waste must include only one material category. Segregate your radioactive waste into one of the categories stated below. The material categories do not refer to isotopes or activity, but to the physical or chemical form of the waste. Each material category is handled and disposed of in a different manner; therefore, it is essential that you do not mix different categories of waste in a single package. Be sure to completely describe the waste material in the available area on the radioactive waste tag. If you are unsure how to categorize a particular waste, contact the RHD at 801-581-6141.

<u>Category</u>	<u>Type</u>	<u>Description</u>
<u>A</u>	<u>Sharps</u>	Because of potential injury, proper handling and packaging of sharps is a very serious issue. Needles must be placed into a special plastic "sharps" container, which is a red polyethylene jug. Sharps also include glassware, glass or plastic pipette tips (which can puncture a plastic bag even if not broken), razor blades, scalpel blades, etc. All sharps must be packaged separately from dry compactable solid waste. All sharps must be placed either into a "sharps" container or into a heavy cardboard corrugated box. The cardboard box must be securely taped shut. Fasten the radioactive waste tag to the top of the box with clear tape. Do not include sharps with dry waste.
<u>B</u>	<u>Dry Solids</u>	This category includes plastic, paper, rubber gloves, empty plastic centrifuge tubes, etc. NO SHARP OBJECTS, such as pipette tips, needles, scalpel blades or anything that can readily cut or puncture the bag; NO GLASS, glass breaks easily and becomes a sharp object; NO ANIMALS OR ANIMAL PARTS; NO LIQUID SCINTILLATION VIALS; NO LIQUID (except for the small residue that may remain when a container is emptied); NO HAZARDOUS CHEMICALS such as acids, bases, oxidizer (like nitrate), reactive (like sulfide), poison, flammable or toxic solvent; and NO LEAD (lead is an EPA-regulated hazardous waste).
<u>C</u>	<u>Animal/Biological</u>	This category includes animal carcasses, animal parts, blood, excreta, etc. Place in heavy plastic bags and cardboard boxes. Do not include other waste with the biological waste. Be especially aware of the possible presence of used scalpel blades or needles, which should be disposed in the "Sharps" category. Animal packages must

		<p>be kept frozen until they are picked up. No more than 10 kilograms (~22 pounds) of biological waste shall be in any single package. If you have a single animal carcass that weighs more than this please divide it into 10 kg (~22 lb) sections.</p> <p><b>Important Note:</b> If you are using H-3 and / or C-14 on animals, disposal criteria mandates the separation of animals from any other materials including bedding, waste, etc... If you fit into these circumstances, be sure to create a disposal tag for animals only and a disposal tag for contaminated material related to animal housing, and keep these materials separate at the time of disposal. The RHD will make a particular effort to contact and work closely with research labs involving animals and the radionuclides H-3 and C-14.</p>
<p><b><u>D</u></b></p>	<p><b><u>NHNT (Non-Hazardous, Non-Toxic) Liquids</u></b></p>	<p>This category includes Liquid Scintillation Counting (LSC) vials, or bulk scintillation fluid which only contains NHNT LSC cocktails; sometimes referred to as non-flammable / biodegradable (i.e. Optifluor). It must be collected in a plastic bottle which will be provided by the RHD. Be sure the bottle is appropriately labeled and avoid mixing it with non-radioactive hazardous substances that could create a "mixed waste" hazard.</p> <p>Whenever possible, LSC vials should be placed back into their cardboard trays, and then placed into the original cardboard box. You may also place LSC vial trays, or loose LSC vials into a clear strong plastic bag. Be sure the vial caps are snug, and do not mix paper, gloves or other trash with the vials.</p>

<b><u>E</u></b>	<b><u>Flammable, Hazardous, or Toxic Liquids</u></b>	These liquids include any flammable or toxic solvents (toluene, xylene, hexane, chloroform etc.) and are classified as mixed wastes if they also contain radioactive materials. Note that many commercial LSC cocktails, such as Ready Value, Liquiscint, Aquasol, and Econofluor, contain toluene, xylene or pseudocumene. If you are not sure, check the Material Safety Data Sheet, or call the Occupational and Environmental Health and Safety (OEHS) Department at 801-581-6590. These cocktails are rarely used. Be sure to keep them segregated from the NHNT LSC vials.
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**NOTE ABOUT MIXED WASTES**

*It is essential to plan ahead when generating hazardous liquid mixed wastes. Please avoid doing so whenever possible. Mixed waste requires compliance with a number of NRC and EPA regulations and is expensive to dispose. Contact the RHD at 801-581-6141 if you are preparing to perform research which will generate mixed waste. We can provide plastic liquid waste containers with appropriate labels and can arrange for proper pick up and disposal. Be certain that only one category of liquid waste is placed in an individual bottle.*

**PACKAGING**

The RHD provides clear, heavy-duty, polyethylene bags for dry waste, and heavy duty plastic containers for liquids.

Place dry, compactable, solid waste into the clear, unmarked, heavy-duty, polyethylene bag. Never place radioactive waste in non-clear bags. Clear bags are essential since every bag collected is visually inspected.

Liquid waste should be collected in the provided plastic containers. Be sure to place the liquid container into a secondary plastic "capture" container in case the original container breaks during use. At the time of pick up, an empty container will be provided. LSC vials can be kept and placed back into their original cardboard boxes. Remember to never mix full or partially full LSC vials with dry radioactive waste.

Sharp objects such as needles, razor blades, pipettes, glass, etc. should be placed in a "sharps" container or a heavy duty cardboard box.

**When packaging short-lived waste, do not forget to completely obliterate all radioactive material labels, stickers and markings. This waste is eventually disposed of in the ordinary**

**trash. If radioactive labels, stickers or markings are found, it may not be accepted by the landfill.**

Always keep lead pigs separated from all other waste material. Often the lead is a liner inside of a plastic container. Treat these as lead pigs and dispose of the lead and plastic together. Never throw lead into the ordinary trash.

It is expected that proper segregation and packaging will take place in your lab before the waste is picked up. Radioactive waste that is not properly segregated and packaged, or has an improperly completed radioactive waste tag, will not be picked up. If the waste is found to be improperly categorized or packaged, the lab will be notified and the waste package will be returned for proper characterization.

## **COMMUNICATION**

The radioactive waste tag is used to communicate the contents of the waste package to those individuals who retrieve, process and dispose of the package. An example of a blank radioactive waste tag is included at the end of this guide for reference. Be sure to completely and accurately fill out the tag. Select one category per package to be picked up. Follow the guidelines under "SEGREGATION" to select the appropriate category. If your waste contains liquid contents, complete the information in the area indicating vial or container size. Note that there is a blank for both bulk liquid container size and actual volume contained in that container. An approximate estimate of the volume of liquid in the container is sufficient (i.e. 20%, 50%, etc.).

In the "Describe Material" box, write in the name of the LSC cocktail or the chemical name(s) of the bulk liquids. Include the names of ALL chemicals and fluors. If the waste includes hazardous material, you shall also complete and attach a hazardous waste tag. These tags are available from the campus OEHS Department (801-581-6590).

Include the symbol of each radionuclide, such as H-3 or P-32, and the corresponding activity. Circle the corresponding activity units and check the applicable radionuclide category. A "best" estimate of the amount of activity contained in the waste package is fine, but please do not write "less than" (<) or "more than" (>) a certain activity. You will select either the "Long-Lived" or "Short-Lived" box and you will also select either the "Beta-Gamma Emitter" box or the "Alpha Emitter" box. If you are disposing of uranyl acetate or uranyl nitrate write "Nat-U", not U-238. If you are disposing of thorium nitrates write "Nat-Th", not Th-232.

Indicate if the package contains any non-obliterated radioactive material labels, stickers or markings. If only short lived radionuclides are included in the waste package, then it is essential to obliterate all indications that the waste contained radioactive material. A requirement for disposing of short-lived radioactive waste as ordinary trash is that there are no visible radioactive labels, stickers or markings in the package. The radioactive waste tag itself is fine, as it is removed

before disposal. Radioactive labels can remain on long-lived radionuclides because those wastes are not disposed of in ordinary trash.

Print the name of the Responsible User on the indicated line. If you are unsure who the Responsible User is, call the RHD at 801-581-6141. Sign your name on the indicated line and enter the date from the online request.

When your waste package is picked up, the technician will enter the acceptance date, sign the form and leave you with the "Generator's" copy. Keep that copy in a safe place in case your package is returned or if there are any questions.

**Common radioactive waste tag issues:**

- Selecting more than one category – Remember, only one category per package.
- Selecting a liquid category but not filling out the "FOR LIQUIDS" area.
- Selecting a non-liquid category and filling out the "FOR LIQUIDS" area.
- Not using the correct activity unit - Remember, micro-curies ( $\mu\text{Ci}$ ) are  $\times 10^{-6}$  and milli-curies (mCi) are  $\times 10^{-3}$ .
- Confusion between the name of the "Responsible User" and the "Prepared By" name.

## **FREQUENTLY ASKED QUESTIONS**

**Should I segregate my short half-life radionuclides from each other?** Yes. All short half-life waste will eventually be disposed of as ordinary trash; however, if several short half-life radionuclides are mixed in the same waste package, we must hold that package for ten half-lives of the longest-lived radionuclide. This affects the number and volume of waste packages being stored. To insure efficient storage of short lived waste, if possible, segregate short half-life radionuclides into separate packages.

**How do I handle sharp objects or glass?** Be sure they are placed into a "sharps" container or in a heavy duty cardboard container and classify them as Sharps (Needles, Pipettes, Etc.) under the "Material Category" section of the radioactive waste tag.

**How do I handle animals or animal tissue?** Keep frozen until pick up. Do not exceed 10 kg (~22lb) per waste container; it may be necessary to divide animal tissues to ensure the weight limits are not exceeded.

**How do I handle liquid scintillation vials?** Keep the original cardboard box with the cardboard dividers. Place the used vials back into the original container for pick up. Alternatively, you can pour used liquid into a provided plastic bulk liquid container and place the empty vials into dry waste.

**How do I handle liquids?** Place liquid into provided plastic bulk liquid containers. Be sure each container is placed into a secondary, tray like container that can capture all the liquid in case the container breaks. Arrange for a pickup well before a bottle is filled to capacity. To prevent spills and contamination, avoid over filling bottles.

**How do I handle hazardous chemicals?** If these chemicals are mixed with radioactive material then this constitutes a mixed waste. Please contact the RHD at 801-581-6141 for handling instructions.

**How do I handle lead pigs?** The RHD picks up both lead pigs that are contaminated and those that are not contaminated. We can pick up non-contaminated lead pigs at the same time as a radioactive waste pick up. Contaminated lead pigs constitute mixed waste and you should contact the RHD at 801-581-6141 for handling instructions.

## **HOW IS RADIOACTIVE WASTE HANDLED?**

All radioactive waste collected is taken to the Regulated Waste Management Facility. All packages are separated into solid and liquid waste. Each package is visually inspected to ensure that it does not contain any inappropriate items. Clear bags are necessary to cleanly perform this inspection. Each package is checked with a metal detector to locate stray lead containers. Long lived dry wastes are then placed into a steel 55-gallon drum. Using a 20,000 pound hydraulic compactor, the waste is crushed into the drum to get as much waste as possible into each drum.

Radioactive waste with a short half life is stored for a period of time equal to at least 10 times the half life of the radionuclide being stored. This is called holding for decay. Once the radioactivity has decayed, the material is disposed of as ordinary trash if there are no other hazards in the material. For example, P-32 has a half-life of 14 days. Waste containing P-32 is held for about 5 months of storage (140 days) before being disposed of as ordinary trash. Each package being held for decay is thoroughly surveyed before disposal to ensure no unknown or residual radioactivity is present. Materials containing non-radiological hazards are transferred to the appropriate campus entity for disposal.

To comply with regulatory requirements, storing radioactive waste for physical decay occurs only after the material is picked up by the RHD. Dispose of material to the waste process as soon as you are able. Do not hold material for decay in your laboratories, unless you have been specifically permitted to do so.

Radioactive waste with a long half life cannot be held for physical decay. All radionuclides with half-lives of 120 days or more are packaged into steel drums. The drums are compacted and sent to a waste processing company. If inappropriate material is found, the drum is sent back, a fee is assessed and expensive remediation is performed before the drum is sent back to the processor. The processing company further compresses the waste using a 400,000 pound

compactor. The waste is then packed into a compressed mass and shipped to Richland, Washington for final disposal by burial.

## **RADIOACTIVE WASTE TAG VARIATIONS**

New tags will be distributed over time, which incorporate updates and revisions. The radioactive waste tag format from old tags to new tags may vary slightly. If you find yourself using a radioactive waste tag that does not contain blanks for all relevant information as discussed in this guide, please be sure to add it in. An example of a radioactive waste tag is found on the next page.

**CAUTION - RADIOACTIVE WASTE****ONLY ONE MATERIAL CATEGORY ALLOWED PER PACKAGE!****KEEP LEAD CONTAINERS SEPARATE FROM WASTES!**

- DRY, COMPACTIBLE, SOLID WASTE  
 SHARPS (NEEDLES, PIPETS, ETC.)  
 ANIMAL OR OTHER BIOLOGICAL WASTE  
 NON-HAZARDOUS, NON-TOXIC AQUEOUS LIQUID  
 FLAMMABLE, HAZARDOUS OR TOXIC LIQUID  
 TOXIC OR HAZARDOUS, NON-FLAMMABLE LIQUID  
 OTHER MATERIALS (DESCRIBE BELOW)

**FOR LIQUIDS:**

Vials - circle size:

**Mini Standard**

Bulk container size: \_\_\_\_\_ Gallons

Volume of contents: \_\_\_\_\_ Gallons

**DESCRIBE MATERIAL - give names of ALL chemicals and fluors:**

\_\_\_\_\_

\_\_\_\_\_

If any constituent is a "HAZARDOUS MATERIAL" as defined by the EPS, complete and ATTACH a HAZARDOUS WASTE DESCRIPTION

<u>NUCLIDES</u>	<u>ACTIVITY</u>	<u>Circle Units</u>	<u>CHECK ALL APPLICABLE CATEGORIES:</u>
_____	_____	μCi mCi	<input type="checkbox"/> Long-lived, half-life > 120 days
_____	_____	μCi mCi	<input type="checkbox"/> Short-lived, half-life < 120 days
_____	_____	μCi mCi	<input type="checkbox"/> BETA-GAMMA Emitters
_____	_____	μCi mCi	<input type="checkbox"/> ALPHA Emitters or Mass>204

**DOES THIS PACKAGE CONTAIN ANY "RADIOACTIVE MATERIAL" LABELS?**

Circle one: Yes No

I certify under penalty of law that to the best of my knowledge this information is accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility for fine and imprisonment.

Name of Responsible User (print): \_\_\_\_\_

Prepared by: \_\_\_\_\_ Ready/Online Request Date: \_\_\_\_\_

**RADIOLOGICAL HEALTH USE ONLY:**

Acceptance Date: \_\_\_\_\_ By: \_\_\_\_\_

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> <b>C</b> ompacted                   | <input type="checkbox"/> <b>S</b> tored in bin     | <input type="checkbox"/> <b>E</b> mptied into bulk jug  |
| <input type="checkbox"/> <b>B</b> iostabilized               | <input type="checkbox"/> <b>S</b> tored in freezer | <input type="checkbox"/> <b>A</b> bsorbed or Solidified |
| <input type="checkbox"/> <b>C</b> rushed vials               | <input type="checkbox"/> <b>S</b> tored on shelf   | <input type="checkbox"/> <b>O</b> ther _____            |
| <input type="checkbox"/> <b>S</b> ealed source Inv#(s) _____ |  |   |

Weight of bag: \_\_\_\_\_ kg

Container #: \_\_\_\_\_

Process Date: \_\_\_\_\_ By: \_\_\_\_\_

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> Shipped drum               | <input type="checkbox"/> Released to EH&S | <input type="checkbox"/> Released to CMC |
| <input type="checkbox"/> Released liquid _____ mCi  | <input type="checkbox"/> PH level         |  |
| <input type="checkbox"/> Released solid short-lived | <input type="checkbox"/> _____ μCi/gm     |  |

Maximum Exposure Rate at Contact: \_\_\_\_\_ mR/hr

Survey Instrument ID: \_\_\_\_\_ Calibration Date: \_\_\_\_\_

Disposal Date: \_\_\_\_\_ By: \_\_\_\_\_

RPR 13E (12/10)

**Generator Copy**