

WASTE: RADIOACTIVE & MIXED

1. INTRODUCTION

This Chapter will address the general requirements for handling waste in a radioactive materials laboratory. There are three different types of radioactive waste created in a radiation laboratory: 1) purely radioactive, 2) mixed (radioactive and chemical), and 3) radioactive and biological. Proper handling of wastes is critical for appropriate transportation and disposal. Numerous Federal, State, and local regulations impact waste; the Colorado Department of Public Health and Environment (CDPHE), the Department of Transportation (DOT), the Environmental Protection Agency (EPA) through the Resource Conservation and Recovery Act (RCRA), the University's Radioactive Materials License, and the City of Boulder. Mixed waste must comply with both radioactive and chemical regulations.

Radioactive wastes are separated by waste type (solid, liquid, and scintillation vial) and by half-life. See section 2 of this chapter. Health Physics provides containers for all radioactive waste. When the containers are full, the laboratory submits a *Radioactive Waste Pick-up Request Form* to Health Physics. Health Physics then schedules a waste pick-up. See section 5 of this chapter.

Mixed waste is separated by waste type and half-life in the same way as purely radioactive waste. Generation of mixed (hazardous and radioactive) wastes should be avoided whenever possible. Disposal of this type of waste is very difficult and costly. Laboratories should actively seek ways to reduce the amount of mixed waste generated. One example of a way to decrease a laboratory's mixed waste production is switching to biodegradable scintillation cocktail from flammable scintillation cocktail. Cost for mixed waste disposal may be re-charged to the laboratory.

Mixed waste generators must complete Hazardous Waste Generator Training as well as Radiation Safety Training. Please refer to the Training chapter for more information regarding Radiation Safety Training. More information on Hazardous Waste Generator Training is available at <http://www.colorado.edu/ehs> or the *EH&S Generator's Guide to Hazardous Material/Waste* booklet.

Mixing biological wastes and radioactive material should be avoided whenever possible. Any biological material must be rendered non-infectious using bleach or other disinfecting agent prior to disposal with Health Physics. **When radioactive material is involved, use of an autoclave is NOT permitted.** Once rendered non-infectious, this waste should be segregated from all other radioactive wastes. **Do not use biohazard bags for radioactive materials.** If this type of waste is expected to be produced in the laboratory, contact Health Physics at (303) 492-6523 for further guidance.

2. WASTE CONTAINERS

Radioactive waste is separated into three types: solid, liquid, and scintillation vials. Each type has specifically designated waste containers. Solid waste containers are available in two sizes, a twenty-gallon size which looks like a trash can, and a five-gallon size which looks like a covered metal bucket.

Liquid radioactive waste containers are available in two sizes, a five-gallon, round plastic carboy not to be confused with the cube-like carboys used for chemical wastes, and a one-gallon, round plastic bottle. Smaller containers are available upon request for small amounts of liquid waste. Secondary containment tubs are available from Health Physics and are strongly recommended for liquid waste containers.

Scintillation vials have only one size of waste container, a five (5) gallon covered metal bucket. This container looks the same as the small solid waste container. Care must be taken to avoid confusion between these containers. See section 4 of this chapter.

Containers are also provided for sharps, lead pigs, and any other unusual wastes. Empty lead pigs are stored separately and collected upon request by Health Physics for possible recycling. Unlike lead pigs, plastic pigs may be disposed in the appropriate solid waste container. Call Health Physics at (303) 492-6523 for special containers.

Radioactive waste is also segregated by half-life. There are three half-life categories designated by color. The half-life categories are as follows:

Yellow: P-32, P-33, Rb-86 and other radionuclides with half-lives < 60 days
Orange: S-35, I-125 and other radionuclides with half-lives > 60 days but < 90 days
Green: H-3 and C-14 and other radionuclides with half-lives > 90 days

The yellow and orange categories are held for decay by Health Physics. Half-life categories are very important for waste minimization and decreasing disposal costs for the University. Waste should be **segregated by half-life** category whenever possible and placed in the appropriately colored waste container. If waste is created containing two or more isotopes from different half-life categories, the waste should be disposed in the container for the longest lived isotope in the waste. For example, waste containing S-35 and C-14 should be placed in a C-14 waste container.

Waste containers should be kept closed at all times, unless waste is actively being added.

3. RESTRICTED MATERIALS

Keep in mind the following restrictions when disposing of radioactive waste:

- **Sharps** (glass pipettes, needles, scalpels, razor blades) must be placed in sharps containers designated for radioactive sharps and not in any other type of waste container. Sharps do not require segregation by half-life.
- **Lead pigs** should be collected in lead pig boxes available from Health Physics.
- **No more than 10 ml of liquid total** should be placed in a solid waste container.

- **Scintillation vials** (even if empty and “clean”) have their own waste container. Solids other than scintillation vials and/or liquids other than liquid scintillation cocktail should not be placed in the scintillation vial container.
- **Mixed wastes** of different types should be segregated and minimized as much as possible to facilitate disposal. Smaller waste containers are available from Health Physics upon request.
- Contact Health Physics with questions concerning items not specifically addressed in this list.

4. CONTAINER CONTENTS SHEETS

Container Contents Sheets are provided with each container from Health Physics and are color coded to correspond with the decay categories used to separate waste by half-life. The color coding was implemented to facilitate identification with a given container in laboratories having multiple decay categories. If you need additional *Container Contents Sheets*, copies are acceptable and the color coding is not required. Once waste is added to a container, all contents must be recorded on the *Container Contents Sheet*. Additional copies are available from Health Physics as well as in Appendix H.

The *Container Contents Sheet* is designed so that an entry can be made on the sheet **each time** that waste is placed into the container, and the contents can be easily totaled for disposal. The entries should detail the amount added, constituents, radionuclide and activity, and the initials of the waste generator. Full chemical names, in English, should be used for each constituent. Do not use abbreviations.

When the container is full, the individual entries from the waste generators should be totaled and the separate total section of the *Container Contents Sheet* should be completed by an appropriately trained waste generator. Prior to pick-up by Health Physics, the waste generator must survey the exterior of each container for contamination using a wipe smear and liquid scintillation counter analysis. The result of the wipe smear survey is then recorded on the *Container Contents Sheet*. Each sheet must be signed by the generator. The Generator Certification is required by regulation and includes confirmation that the generator has completed appropriate Radiation Safety training. Please refer to the Training Chapter.

5. RADIOACTIVE WASTE PICK-UP REQUESTS

When some or all of the waste containers in a laboratory are full, a pick-up may be requested from Health Physics. To request a pick-up, the generator or laboratory representative completes a *Radioactive Waste Pick-up Request Form*. Requests must be submitted to Health Physics any time before noon on the day preceding the next scheduled pick-up. The pick-up request forms may be submitted on-line at <http://www.colorado.edu/radsafety>, by Fax, Campus Mail, U.S. Mail, or in person. Refer to Appendix I for a blank form. Contact Health Physics at (303) 492-6523 for a current waste pick-up schedule. The *Radioactive Waste Pick-up Request Form* summarizes all of the information for the containers that need to be collected including

the total volume of the container, radionuclide, total activity, constituents and total percentages of each constituent (which must total 100%), and pH for liquids. Indicator paper is acceptable for determining the pH value. Unless otherwise requested, each container collected will be replaced with an empty container of the same type and size.

Congruent with submittal of the *Radioactive Waste Pick-up Request Form*, each *Container Contents Sheet* must be completed, signed by the generator, and the contamination survey performed and noted on the sheet. Health Physics cannot collect waste containers without properly completed container contents sheets.

6. SEALED SOURCE DISPOSAL

Sealed sources require special provisions for disposal. Some sources may be returned to the manufacturer for reuse/recycling rather than disposed. A completed *Container Contents Sheet* and *Radioactive Waste Pick-up Request Form* will be required as mentioned in sections 4 and 5 of this chapter. Contact Health Physics at (303) 492-6523 to dispose of sealed sources or facilitate return to manufacturer.