

14. RADIOACTIVE WASTE STORAGE AND DISPOSAL

14.1 STORAGE OF RADIOACTIVE WASTE

All **temporarily** stored radioactive waste material must be kept in appropriate containers that are properly labeled. The required waste containers used for transfer are provided by Radiation Safety.

14.2 TRANSFER OF RADIOACTIVE WASTE

The disposal of all radioactive waste must be carried out with the approval and cooperation of the Radiation Safety Office. All radioactive waste material, except for specifically authorized drain discharges of low level liquid waste or other exceptions as specifically approved by Radiation Safety, must be transferred to Radiation Safety for proper disposal. In addition to other requirements listed below, all radioactive waste materials must be treated to reduce the hazard from any biological agents.

14.3 DRY WASTE

14.3.1 Short-lived waste

All dry waste containing radionuclides with half-lives of less than 120 days **should be segregated from radionuclides with half-lives of >120 days..** In addition, it is necessary to place all broken glass, syringe needles and other sharp objects in an unbreakable and puncture-proof container before placing it with other dry waste. Two sizes of dry waste containers (1.1 cubic feet and 0.6 cubic feet capacities) are provided by Radiation Safety. They are lined with **yellow bags** for easy identification by housekeeping and, in addition, each container is lined with a secondary clear plastic liner that allows inspection of the contents by Radiation Safety personnel. All short-lived dry waste must be delivered for transportation in one of the appropriately lined containers.

14.3.2 Long-lived waste

All dry waste containing radionuclides with half-lives greater than or equal to 120 days should be segregated from short-lived waste. It is absolutely necessary to separate **long-lived incinerable** materials from non-incinerable materials in order to avoid astronomical waste fees (Incinerable long-lived radioactive waste can be shipped out-of-state for incineration. The substantial volume reduction results in a significant savings versus shipping the initial waste volume for burial). The following materials, if contaminated with long-lived radionuclides, are not acceptable for incineration and therefore must be segregated: sharps, metal, glass, PVC (polyvinyl chloride), asbestos, listed RCRA hazardous wastes, explosives and pyrophorics. Due to activity concentration limits on incinerable materials, it is requested that unused portions of

stock supplies of radionuclides be restricted from incinerable wastes. The incinerable long-lived materials must be maintained in waste containers that are appropriately labeled and plastic lined. The containers, labels and plastic liners are provided by Radiation Safety. Two sizes of dry waste containers (1.1 cubic feet and 0.6 cubic feet capacities) are provided by Radiation Safety. They are lined with **yellow bags** for easy identification by housekeeping and, in addition, each container is lined with a secondary clear plastic liner that allows inspection of the contents by Radiation Safety personnel. All dry waste must be delivered for transportation in one of the appropriately lined containers.

14.4 LIQUID WASTE

Aqueous based bulk liquid waste should be segregated from organic based bulk liquids. In addition, all liquid waste containing radionuclides with half-lives of less than 120 days **should be segregated.** Two sizes of liquid waste containers (5 gallon and gallon capacities) are available from Radiation Safety. All liquid waste must be delivered for transportation in one of these containers. All aqueous based liquid waste transferred to Radiation Safety must have a pH value between 4 and 10, inclusive.

A special category of liquid waste is so-called mixed **hazardous waste**, radioactive waste that also contains a material identified by the EPA as hazardous. You should be aware that it is very expensive to dispose of mixed hazardous waste, even if the radionuclide is relatively short-lived, e.g., ^{32}P . The current waste broker fee for mixed hazardous waste is of the order of several hundred dollars per gallon, on the average. Researchers are advised not to generate mixed hazardous waste unless it is absolutely necessary.

Another special category of liquid waste is **bulk scintillation fluid**. Since the disposal fee for bulk scintillation fluid is substantially less than that for **mixed hazardous waste**, the two categories of liquid waste should not be combined.

Radiation Safety personnel (314-362-3476) should be contacted if you have any inquiries about mixed hazardous waste or bulk scintillation fluid waste.

14.5 ANIMAL WASTE

Animal waste must be segregated into three categories:

- Deregulated — Animals containing only ^3H and/or ^{14}C in concentrations less than 0.05 $\mu\text{Ci/gm}$ when averaged over the whole carcass.
- Animals containing radionuclides with half-lives of less than 120 days.
- Animals containing radionuclides with half-lives of greater than or equal 120 days, excluding those containing only ^3H and/or ^{14}C in average concentrations less than 0.05 $\mu\text{Ci/gm}$ (see Deregulated above).

All animal waste must be delivered for transportation frozen and neatly packaged in double plastic bags in a strong, tight container.

14.6 SCINTILLATION VIALS

Scintillation vials should be segregated into several categories:

Scintillation Media

1. Segregate flammable liquid scintillation cocktails from non-flammable cocktails. We strongly encourage using non-flammable cocktails.
2. Segregate by half-life according to the following table:
 - a) Deregulated-³H and/or ¹⁴C with concentration less than 0.05 µCi/ml
 - b) Isotopes with half-life less than 30 days
 - c) Isotopes with half-life greater than 30 days but less than 109 days
 - d) Isotopes with half-life greater than 109 days

Liquid scintillation media is shipped out-of-state for incineration. The list of acceptable radionuclides for incineration changes from time to time. Call Radiation Safety personnel at 314-362-3476 for updates concerning radionuclides acceptable for incineration.

Scintillation vials with contents should be delivered in the original trays or in boxes lined with two plastic bags.

14.7 RADIOACTIVE WASTE TRANSFER DOCUMENTATION

Each container of radioactive waste that is delivered for transportation must be accompanied by a completed **radioactive waste transfer form**. Specific usage and packaging instructions are printed on the back of each transfer form.

Provide all the requested information. If the transfer forms are incomplete or if the waste is discovered to be packaged incorrectly the waste must be returned to the laboratory. Radiation Safety personnel at 314-362-3476 will provide guidance for safety questions concerning scintillation media and radioactive waste.

14.8 RADIOACTIVE WASTE TRANSFER SCHEDULE

Radiation Safety personnel are available at scheduled locations to accept properly packaged radioactive waste. In the event that Radiation Safety cannot make one of its scheduled pickups, the laboratory will be notified as early as possible by telephone and/or by signs posted near

elevators and at the loading dock. The [radwaste pickup schedule](#) is given on the Radiation Safety website.

14.9 LABORATORY DRAIN DISPOSAL OF LOW-LEVEL LIQUID WASTE

Drain disposal of significant amounts of radioactive material by a research group is prohibited by the Radiation Safety Committee. However, a laboratory may request approval for the disposal of aqueous-based liquid radioactive waste of low concentration via the drain. The activity released per quarter must not exceed the limits given in [Table 14-1](#):

To request authorization, use the [Drain Disposal Request](#) form. (The form is also available on our forms webpage at <https://radsafety.wustl.edu/An1Pages/An1-Forms.htm>)

Upon approval, the specific sink to be used will be posted by Radiation Safety staff and you will begin keeping a record of all disposals, indicating the date and activity discharged for each radionuclide. At the end of each quarter, you will sum and report the total activity of each radionuclide disposed of. The disposals are logged using the Quarterly Drain Disposal Log Sheet and Summary form. The form is sent by Radiation Safety by email at the end of each calendar quarter to each group that has one or more approved drains. Quarterly totals must be promptly reported to Radiation Safety (within 15 days of the end of the quarter) through the Radiation Safety website so that reporting requirements of the Metropolitan St. Louis Sewer District can be fulfilled.

Table 14–1. Radionuclide Drain Discharge Limits

Radionuclide	Maximum Activity to be Released per Quarter (microcuries)
³ H	750
¹⁴ C	150
³² P	150
³³ P	150
³⁵ S	150
⁵¹ Cr	150
¹²⁵ I	150
¹³¹ I	150
Any other radionuclide, unless approved by the RSC	75

14.10 GASEOUS RELEASES TO THE ATMOSPHERE

Radioactive gases are released via fume hoods to the atmosphere. Federal agencies require that the radioactivity concentrations at the release sites do not exceed certain limits. The WU Radiation Safety Office has developed a program to evaluate and control the effluent concentrations released to the atmosphere. The Radiation Safety staff evaluates the prospective airborne concentration at the release point and limits the laboratory use of the potentially volatile radioactive material to an amount that will result in a calculated average release concentration that is 10% or less of the federal limit. In addition, retrospective computations of average concentrations are performed to insure that the average release concentrations are 10% or less of the limits, i.e., that we achieve ALARA.