

---

## **RADIOACTIVE WASTE MANAGEMENT AND DISPOSAL**

---

### 1.0 **PURPOSE**

To describe the handling, storage, and disposal of radioactive waste and the documentation requirements of these activities.

### 2.0 **SCOPE**

This procedure applies to all radioactive waste generated at the Georgia Institute of Technology (Georgia Tech) from the use of radioactive sources, as well as radioactive sources to be disposed. The procedure covers the requirements of waste storage, waste management and inventory, and waste disposal for all physical forms of waste and waste containing short or long half life isotopes.

### 3.0 **RESPONSIBILITIES**

- 3.1 The Authorized User (AU) shall ensure that waste produced is properly stored until removed from the lab by the Office of Radiological Safety, and that all forms are completed accurately. The AU shall keep records of waste disposal and maintain inventory information up-to-date. The AU shall ensure that waste volume is minimized to the extent possible.
- 3.2 The Office of Radiological Safety (ORS) shall be responsible for the collection, storage, inventory, and disposal of all radioactive waste and sources from Georgia Tech as specified in this procedure.
- 3.3 The radioactive waste broker utilized by Georgia Tech shall be appropriately licensed to accept radioactive waste in the form and quantity required. They shall label all containers and create the required manifests. The radioactive waste broker shall ensure that waste from Georgia Tech is transferred to an appropriately licensed facility for permanent disposal.

### 4.0 **REFERENCES/REQUIREMENTS**

- 4.1 Requirements and Specifications
- 4.1.1 OCGA 391-3-17-.03(13)
- 4.1.2 10 CFR 20, Appendix B, Table III
- 4.1.3 40 CFR 260, 266
- 4.2 Related Procedures

---

**RADIOACTIVE WASTE MANAGEMENT AND DISPOSAL**

---

- 4.2.1 Procedure 9510, Radioactive Material Shipment
- 4.3 Required Forms
  - 4.3.1 RS-019e, "Radioactive Material Inventory Record Form" (Form E)
  - 4.3.2 RS-019g, "Radioactive Waste Disposal Form" (Form G)
  - 4.3.3 RS-150, "Decay In Storage Disposal Cover Sheet"
  - 4.3.4 RS-159, "ORS Hot Sink Disposal Log"
- 4.4 Other
  - 4.4.1 Method 71, Analysis of DIS Waste Prior to Disposal
- 5.0 **PROCEDURAL STEPS**
- 5.1 STORAGE IN THE LAB
  - 5.1.1 Waste shall be separated by physical form and isotope to the extent possible.
  - 5.1.2 Waste shall be secured in the same manner as radioactive sources, such as in a locked lab or in a locked cabinet in a neighborhood lab.
  - 5.1.3 Mixed waste must be approved by the Radiation Safety Committee before generation. It refers to waste that is both radioactive and hazardous, to include:
    - 5.1.3.1 RCRA listed wastes (e.g., "F", "K", "P", and "U" lists)
    - 5.1.3.2 RCRA wastes showing the characteristic of ignitability, corrosivity, reactivity and/or toxicity (these are "D" wastes)
    - 5.1.3.3 Biological, pathogenic, infectious
  - 5.1.4 Waste Storage Containers
    - 5.1.4.1 All radioactive waste storage containers shall be provided by the ORS and labeled with a "Caution Radioactive Material" label.

---

## **RADIOACTIVE WASTE MANAGEMENT AND DISPOSAL**

---

- 5.1.4.2 Liquid waste shall be stored in plastic 1-gallon containers or an appropriate container if the liquid is not compatible with plastic. When waste is not being added, the cap shall be secured.
- 5.1.4.3 Solid waste shall be stored in black plastic 5-gallon buckets with plastic bag liners placed inside. When waste is not being added, the plastic lid shall be in place.
- 5.1.4.4 Liquid scintillation vials shall be stored in vial flats inside plastic storage tubs. Vials may be stored in plastic bag-lined black plastic 5-gallon buckets with plastic lids with approval of the RSO. When waste is not being added, the lid shall be in place.
- 5.1.4.5 Sharps shall be stored in red puncture-proof plastic containers.
- 5.1.5 Documentation
- 5.1.5.1 A Form G shall be completed for each waste container.
- 5.1.5.2 The Form G shall contain the following: date, source number, radionuclide, non-decayed activity disposed, description of waste disposed into the container, initials of the individual adding the waste to the container, physical form, and AU signature and date.
- 5.1.5.3 If a source or waste generated from a source is being disposed and the source is not currently listed on the inventory, the source number field of the Form G may be blank.
- 5.1.5.4 A Form E shall be completed for each source.
- 5.1.5.5 The Form E shall contain the following: date, initial assay (non decay corrected) activity, non decay corrected activity removed, type of waste that was generated, final non decay corrected activity after each disposal, initials of the individual making the entry, and AU signature and date.
- 5.1.5.6 No radioactive waste shall be removed from the generating lab until the appropriate paperwork is completed.
- 5.2 **ENTRY INTO DATABASE AND WASTE STORAGE FACILITY**
- 5.2.1 The waste container shall be given a unique identification number (the waste number) by ORS based on the year the waste is picked up and the AU number. The number is comprised of a "W", the 4-digit year, the AU's number, and a sequential number indicating the order of container receipt for that year.

Examples: W2014-240-12, W2013-167-01

---

## RADIOACTIVE WASTE MANAGEMENT AND DISPOSAL

---

- 5.2.2 The waste number shall be entered into the “Package ID Number” field on the Form G by the ORS employee picking up the waste. This person shall also sign the “Received By” field and date the Form G
- 5.2.3 Information from the Form G shall be entered into the waste inventory in the database with one entry per source number (the sum of all entries for that source number on the Form G).
- 5.2.4 The waste container shall be placed in the appropriate location of the waste storage facility.
- 5.2.5 The Form G shall be filed pending final disposal.
- 5.3 DISPOSAL OPTIONS
- 5.3.1 Any isotope with a half life of 120 days or less is considered a short half life isotope. Any other isotope is considered a long half life isotope.
- 5.3.2 Any waste container only containing a short half life isotope may be stored for 10 half lives to decay or may be shipped off in the same manner as waste containers containing long half life isotopes.
- 5.3.3 **Decay In Storage (DIS)**
- 5.3.3.1 DIS is the process by which short half life waste is held for decay until its radiation level is no longer distinguishable from background.
- 5.3.3.2 Distinguishable from background means that the detectable concentration of a radionuclide is statistically different from the background concentration of that radionuclide in the vicinity of the site or, in the case of structures, in similar materials using adequate measurement technology, survey, and statistical techniques.
- 5.3.3.3 A sample shall be considered distinguishable from background if the net count rate of the sample exceeds the critical level ( $L_C$ ) determined for the instrument used. Refer to ORS Method 71 for a discussion of the critical level and guidance on applicable DIS waste survey methods.
- 5.3.3.4 After confirmation that waste is not distinguishable from background:
- 5.3.3.4.1 Attach the RS-150 and any sample printouts to the waste tag and Form G to document disposal.

---

**RADIOACTIVE WASTE MANAGEMENT AND DISPOSAL**

---

- 5.3.3.4.2 Update the database to indicate the means and date of disposal of the waste container.
- 5.3.3.5 Solid Waste DIS
  - 5.3.3.5.1 Solid waste shall be checked thoroughly with an appropriate survey meter.
  - 5.3.3.5.2 At least one smear shall be taken of the contents of each waste container and counted using an LSC.
  - 5.3.3.5.3 Solid waste is considered non-radioactive if the survey meter readings are below the Georgia Tech contamination levels and the smear results are not distinguishable from background.
  - 5.3.3.5.4 Non-radioactive solid waste may be discarded as regular trash after all labels and markings indicating the presence of radioactive materials have been removed or defaced.
- 5.3.3.6 Liquid Scintillation Vial Waste DIS
  - 5.3.3.6.1 LSC vials shall be counted on an LSC. If they have liquid on the exterior, they shall be washed before being counted.
  - 5.3.3.6.2 LSC vials are considered non-radioactive if the results are not distinguishable from background.
  - 5.3.3.6.3 Non-radioactive LSC vials may be transferred to EH&S for disposal.
- 5.3.3.7 Liquid Waste DIS
  - 5.3.3.7.1 A 1 mL sample of the liquid waste shall be combined with 10 mL of liquid scintillation cocktail and counted using a liquid scintillation counter (LSC).
  - 5.3.3.7.2 Liquid is considered non-radioactive if the sample result is not distinguishable from background.
  - 5.3.3.7.3 Before pouring non-radioactive liquid waste down the drain, verify the following:
    - 5.3.3.7.3.1 Chemical and other properties are suitable for sewer disposal as verified by Georgia Tech Environmental Health & Safety (EH&S)
    - 5.3.3.7.3.2 Any material is readily soluble in water or is readily dispersible biological material.

---

## **RADIOACTIVE WASTE MANAGEMENT AND DISPOSAL**

---

- 5.3.3.7.4 If all of the above criteria are not met, the liquid waste will be transferred to EH&S for disposal.
- 5.3.4 **Sewer Disposal of Radioactive Liquids**
- 5.3.4.1 Sewer disposal of radioactive liquids shall only be performed when specific conditions are met. This disposal shall be done only by ORS using its designated hot sink.
- 5.3.4.2 The conditions that must be verified prior to ORS pouring radioactive liquids in the hot sink are:
- 5.3.4.2.1 Concentration limits from Table III of Appendix B of 10 CFR 20 will not be exceeded. If multiple isotopes are released, the sum of the fractions will not exceed 1.
- 5.3.4.2.2 Annual limits of 5 Ci of H-3, 1 Ci C-14, and 1 Ci all other isotopes will not be exceeded
- 5.3.4.2.3 Chemical and other properties are suitable for sewer disposal as verified by EH&S
- 5.3.4.2.4 Any material is readily soluble in water or is readily dispersible biological material
- 5.3.4.2.5 Document sewer disposal on RS-159, waste tag, and Form G.
- 5.3.4.2.6 Update the database to indicate the means and date of disposal of the waste container.
- 5.3.5 **Shipment to Permanent Waste Facility**
- 5.3.5.1 General Instructions
- 5.3.5.1.1 Waste shall be packaged in appropriate containers.
- 5.3.5.1.2 Waste shall be packaged as described in OCGA 391-3-17-.03(13)(g)1.
- 5.3.5.1.3 Determine class of waste (A/B/C/GTCC) based on OCGA 391-3-17-.03(13)(f) and label container as such.
- 5.3.5.2 Additional Instructions by Physical Form
- 5.3.5.2.1 Any LSC vial with counts that are not distinguishable from background may be considered non-radioactive.
- 5.3.5.2.2 LSC vials containing H-3, C-14, or I-125 are considered non-radioactive if the activity of does not exceed 0.05  $\mu\text{Ci}/\text{gram}$  of liquid scintillation counting media.

---

**RADIOACTIVE WASTE MANAGEMENT AND DISPOSAL**

---

- 5.3.5.2.3 A Uniform Hazardous Waste Manifest shall be completed for shipments of LSC vials or mixed waste, and a copy sent to EH&S.
- 5.3.5.2.4 Animal carcasses are considered not radioactive if the activity of H-3, C-14, and I-125 does not exceed 0.05  $\mu\text{Ci}/\text{gram}$  averaged over the weight of the entire animal.
- 5.3.5.3 Documentation for Shipment
  - 5.3.5.3.1 Each waste container to be shipped shall be given a unique identification number comprised of the type of waste (D – dry solid, A – aqueous liquid, V – scintillation vials, R – resin, etc.), the year it was packed, and the sequential number of that type of container for that year.
  - 5.3.5.3.2 NRC Forms 540 and 541 (and 542 if applicable) shall be completed according to OCGA 391-3-17-.03(13)(g)2.(i).
  - 5.3.5.3.3 Procedure 9510 for a DOT regulated ground shipment shall be followed.
  - 5.3.5.3.4 Update the database to indicate the means and date of disposal of the waste container.
- 5.3.6 Return to Vendor or Transfer to Other Licensee
  - 5.3.6.1 Ship the source according to Procedure 9510 to the vendor or other licensee.
  - 5.3.6.2 Update the database to indicate the means and date of disposal of the waste container.

6.0 **RECORDS**

All records generated by the implementation of this procedure shall be maintained as permanent records of Georgia Tech.