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EHS-201 REGULATED WASTE GUIDELINES

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1.0 Introduction

1.1 Purpose

Emory operations generate waste that is regulated by federal and state agencies, including the United States Environmental Protection Agency (EPA), Georgia Environmental Protection Department (GA EPD), and the Nuclear Regulatory Commission (NRC). The Environmental Health and Safety Office (EHSO) has developed this guideline for proper management of regulated waste and to ensure compliance with applicable regulations. Please visit the EHSO website at www.esho.emory.edu or contact us at 404-712-6622 or by email at chemwaste@emory.edu for more information about management of regulated waste.

Once a material has no further use it may become regulated as a chemical waste.

Discharging waste to the sanitary sewer or regular trash is strictly prohibited.

Contact EHSO prior to disposing of any chemicals.

1.2 Scope

These guidelines apply to all Emory operations.

1.3 Definitions

Hazardous Waste. A solid, liquid or gas that can harm the health of the public or the environment. Hazardous waste is defined by the EPA as materials that are specifically listed by EPA or that exhibit characteristic traits of: ignitability, corrosivity, reactivity, and toxicity.

Characteristic Hazardous Waste. Waste that exhibits any of the following characteristics:

Ignitability. 1. Liquids with a flashpoint below 140°F or 60°C; 2. Oxidizers; 3. Ignitable Compressed Gases; 4. Non-liquids that cause fire through friction, absorption of moisture or spontaneous chemical combustion, and burn vigorously and persistently when ignited.

Corrosivity. 1. Aqueous solutions with a pH less than 2 or greater than or equal to 12.5; 2. Liquid that corrode steel at a rate of greater than 6.35 mm per year at 130°F or 55°C.

Reactivity. 1. Material that is normally unstable and undergoes violent change without detonating; 2. Material that reacts violently with water, produces toxic gases when mixed with water, and/or potentially forms explosive mixtures with water; 3. Material capable of detonation if struck or heated; 4. Cyanide or Sulfide containing material that releases toxic gases under a specified pH range.

Toxicity. A waste that contains one of the constituents in concentrations equal to or greater than the values found in the EPA's Toxicity Characteristic table.

Listed Hazardous Waste. Materials that are specifically listed by the EPA as hazardous waste. These materials are broken up into four separate lists: F, K, P, and U.

F-Listed Hazardous Waste. Hazardous waste from non-specific sources. At Emory this mostly includes spent solvents.

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K-Listed Hazardous Waste. Hazardous waste from specific industrial sources. These do not apply to Emory.

P-Listed Hazardous Waste. Acutely hazardous waste that could be, or are, fatal to humans or animals in low doses. Includes discarded commercial chemical products, off specification products, spill residues and certain container residues. At Emory this would include some chemotherapy drugs.

U-Listed Hazardous Waste. Toxic hazardous waste that are harmful to human health and the environment. Includes off-specification commercial chemical products, chemical intermediates, and unused commercial chemical products. At Emory this would include laboratory reagents.

Mixed Waste. Waste that contains biological and/or radioactive materials that are also mixed with hazardous chemical waste.

Hazardous Chemical Material. A solid, liquid, or gas that can harm human health or the environment either by itself or through interaction with other factors. A Hazardous Chemical Material becomes a Hazardous Chemical Waste (see definition below) once the material is no longer needed.

EPA. The United States Environmental Protection Agency (EPA) is the federal agency that governs the disposal of hazardous waste. They do this by enacting the RCRA (see definition below) and providing support to state agencies.

EPD. The Georgia Environmental Protection Division (EPD) is the state of Georgia's agency that governs the disposal of hazardous waste generated in Georgia. Georgia is a Delegated State meaning GA EPD regulations follow EPA regulations and are often more rigorous.

RCRA. The Resource Conservation and Recovery Act (RCRA) is the United States public law that creates the framework for the proper management of hazardous and non-hazardous solid waste.

GHS. The Globally Harmonized System for Classification and Labeling of Chemicals (GHS) includes criteria for the classification of health, physical and environmental hazards, as well as specifying what information should be included on labels of hazardous chemicals as well as safety data sheets.

OSHA. The Occupational Safety & Health Administration (OSHA) is the federal agency that ensures safe and healthy working conditions by setting and enforcing standards.

NRC. The Nuclear Regulatory Commission (NRC) is the federal agency that ensures the protection of the public's health and safety when dealing with nuclear energy.

SDS. A Safety Data Sheet (SDS) is a document that lists information relating to occupational safety and health for the use of various substances and products.

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Universal Waste. Includes lamps (light bulbs), batteries, mercury-containing equipment, and pesticides. These wastes have special regulatory requirements separate from the requirements of hazardous waste.

Used Oil. The EPA defines used oil as “any oil that has been refined from crude oil or any synthetic oil that has been used and as a result of such use is contaminated by physical or chemical impurities.”

1.4 Responsibilities

Environmental Health and Safety Office (EHSO)

- Provides regulatory evaluation, program implementation, and program evaluation (assessments);
- Ensures generators are trained and otherwise informed of how to manage and dispose of regulated waste(s);
- Provides support to ensure regulatory compliance with appropriate regulations.
- Oversees the proper collection, packaging, shipment, and disposal of regulated hazardous and radioactive waste.

Directors, Supervisors, and Managers/Principal Investigators (PIs)

Ensures all staff are informed and trained on proper management and disposal of regulated waste(s) as listed in this document.

Employees

All generators of regulated waste(s) must be informed and trained on proper management and disposal of regulated wastes as listed in this document.

1.5 Training Requirements

All generators of regulated waste(s) must receive regulated waste training from EHSO within 90 days of being hired and annually. Different trainings are provided which correspond to job titles and duties.

1.6 Recordkeeping Requirements

EHSO manages records for chemical, radioactive, and universal waste. See Biohazardous waste section for specific requirements on recordkeeping.

2.0 Chemical Waste Management

The proper management of chemical waste at Emory is essential for safety, protection of the environment, and compliance. EHSO has created these guidelines to translate regulatory requirements in terms that chemical waste generators can successfully implement. This section is broken down into the following criteria:

- Hazardous Waste Identification
- Waste Container Management
- Labeling
- Adding Chemical Waste to a Container
- Container Storage and Closure
- Disposal

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2.1 Hazardous Waste Identification

EHSO will make all final determinations on how waste is classified for disposal. Your obligation as a generator is to describe the waste as accurately as possible. Contact EHSO for guidance contact at 404-712-6622 or by email at chemwaste@emory.edu.

All chemical waste generated must be evaluated as potentially hazardous waste – **it is never acceptable to dispose of chemical waste to the regular trash or sanitary sewer** unless you have specifically cleared the waste stream through EHSO. Chemical waste is considered a regulated hazardous waste when it exhibits any one of the following characteristics:

Helpful information on identifying characteristics can be found on the **Safety Data Sheet (SDS) Database** link available on the EHSO website, <http://www.ehso.emory.edu>



- Ignitable
 - Any liquid with a flashpoint <140 degrees Fahrenheit
 - Solids that burn spontaneously
 - Flammable compressed gas
 - Oxidizers
- Corrosive:
 - Aqueous solutions with pH <2 and >12.5
 - Examples: strong acids, alkaline degreasers, water/wastewater treatment chemicals, debris that is contaminated with this material
- Reactive:
 - Materials that tend to be unstable at normal temperatures and pressures
 - Water reactive materials
 - Explosives
 - Cyanide or sulfide bearing wastes
 - Examples: pyrophoric metals like sodium, cyanide wastes, ethers, peroxides
- Toxic:
 - Wastes that contains any of the chemicals listed in Table 1 of 40 CFR 261.24, in excess of the concentration stated.

Some chemical waste streams have special processes in place (ex. ethidium bromide, silver recovery) - contact EHSO for more information.

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2.2 Waste Container Management

Hazardous chemical waste must be collected in appropriate containers that are compatible with the waste being collected, clean, and in good condition. Once a container is 90% full, EHSO should be contacted for removal. Containers must be closed at all times except at the moment they are being filled. Acceptable containers for liquid and solid waste can be requested through EHSO, see section 2.7 for details.

Container Selection

Containers should be selected based on the type of waste that is going to be accumulated. The following are the container types provided by EHSO:

Container	Size	Approved for
High Density Polyethylene - pail	5 gallon	Solid
High Density Polyethylene - pail	2.5 gallon	Solid
High Density Polyethylene - pail	0.6 gallon	Solid
High Density Polyethylene - carboy	5 gallon	Liquid
High Density Polyethylene - carboy	2.5 gallon	Liquid
High Density Polyethylene – carboy	1 gallon	Liquid
High Density Polyethylene - container	1 liter	Liquid
Glass - Container	1 liter	Liquid

Container Requirements

Containers that will be used for chemical waste collection must meet the following requirements:

- In good condition
- Compatible with the waste that is being collected
- Clean and uncontaminated from the outside
- Caps that are compatible with the container and the waste
- Labeled properly (see below)

2.3 Labeling

All containers that hold chemical waste must be labeled with the EHSO Hazardous Waste Label and any applicable GHS pictograms at all times. Labels must be legible and written in English. The person(s) accumulating waste must fill-in the following information on the label **before waste can be added**:

- Principal Investigator (P.I.) or department head
- Building/Room #
- Phone # or other contact information
- Characteristic(s) of waste
 - Select any applicable characteristics: ignitable, corrosive, toxic, and/or reactive. Refer to section 2.1 for guidance.
- Primary constituents and concentrations
 - List the chemical constituents in the container and their corresponding percentages.

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Hazardous Waste Label	
PI (lab) or Dept. Head (non-lab)	Doe, John
Bldg./Room #	WMB Room 00B
Phone #	404-727-0000
<input checked="" type="checkbox"/> Ignitable	
<input type="checkbox"/> Corrosive	
<input type="checkbox"/> Toxic	
<input type="checkbox"/> Reactive	
Please list primary constituents and concentrations:	
Dichloromethane	25 %
Water	25 %
Acetone	25 %
Hexanes	25 %
	%
	%
Environmental Health and Safety Office 404-727-5922	

In addition to the Hazardous Waste Label, all chemical waste containers must be labeled with the applicable GHS pictograms. Pictograms are available on the EHSO website, ehso.emory.edu and can be printed and taped to the container. You can find them under Forms/Documents (either GHS Pictogram Label Template - All Symbols or GHS Pictogram Label Template - Flammable Only).

You can obtain guidance on selecting the applicable GHS pictogram by checking the SDS(s) for the constituents in the container; there are often more than one. Using the example Hazardous Waste Label from above, the following pictograms would be appropriate:

- Flame
- Health Hazard
- Exclamation point

Dichloromethane
Water
Acetone
Hexanes

	Exploding bomb (for explosion or reactivity hazards)		Flame (for fire hazards)		Flame over circle (for oxidizing hazards)
	Gas cylinder (for gases under pressure)		Corrosion (for corrosive damage to metals, as well as skin, eyes)		Skull and Crossbones (can cause death or toxicity with short exposure to small amounts)
	Health hazard (may cause or suspected of causing serious health effects)		Exclamation mark (may cause less serious health effects or damage the ozone layer*)		Environment* (may cause damage to the aquatic environment)

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You can access SDS's online or by visiting the EHSO website and clicking the link for Safety Data Sheet (SDS) Database under Resources.



2.4 Adding Chemical Waste to a Container

Personal protective equipment (PPE) must be worn when adding chemical waste to a container. The appropriate PPE can be found on the SDS. Using a funnel is recommended when transferring liquid chemical waste into a waste container to prevent spilling. Funnels cannot be stored in containers. The funnel must be removed after filling and the lid replaced; containers must be closed at all times when not being added to.

Use secondary containment when storing liquid waste and when transferring/transporting liquid waste to the waste container.

Consult with EHSO prior to mixing different chemical wastes. Mixing a hazardous waste with a non-hazardous waste may increase the volume of hazardous waste for disposal or increase disposal costs due to differences in disposal options for certain hazardous wastes. Mixing incompatible materials may be dangerous. DO NOT mix incompatible materials in the same container

2.5 General Prohibitions and Minimization, Highly Hazardous Chemicals

General Prohibitions

- Never dispose chemical wastes to the regular trash or sanitary sewer.
- Chemicals must NOT be disposed of by evaporation.
- Chemicals must never be transported in personal vehicles.
- Do NOT mix or combine waste streams without EHSO approval.

Waste Minimization

- Laboratories should attempt to substitute non-hazardous or less toxic materials into processes and experiments whenever possible; investigate non-hazardous substitutes. Please refer to scientific equipment vendors for "Green" chemicals.
- Laboratories should periodically evaluate their chemical inventory and:
 - Dispose of unwanted/obsolete chemicals through EHSO
 - Purchase only the quantity of chemicals required for specific projects.
 - Be aware that bulk ordering chemicals may cost more when disposal of the excess quantity is considered.
- Laboratories should consider process modifications to decrease the quantity of chemicals used and generated. Microanalysis techniques can greatly reduce the amount of chemical waste generated.

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Certain chemicals must be handled by special procedures due to their highly hazardous nature. These chemicals include expired ethers and other peroxide forming compounds, dry picric acid, dry 2, 4-dinitrophenylhydrazine, or dry benzoyl peroxide. These chemicals can explode during opening or routine handling.

If you encounter these or other highly hazardous chemicals in your laboratory, do not disturb them and immediately notify EHSO to arrange for disposal. Highly hazardous chemicals must NOT be handled by laboratory personnel.

Expired ethyl ether is one of the most common highly hazardous chemicals found in laboratories. Ethyl ether is extremely flammable and can form explosive peroxides after exposure to air and light. Since it is packaged in an air atmosphere, peroxides can form even in unopened containers. Therefore, it is very important to write the date received and the date opened on all ether containers. Opened containers should be disposed of through the EHSO within 6 months of opening.

Unopened containers should be disposed of through the EHSO within 12 months of receipt. Ethers should be purchased in the smallest container practical and be stored away from heat, sunlight and any source of ignition in a flammable storage cabinet or refrigerator/freezer certified for storing flammable materials.

Contact EHSO for guidance at 404-712-6622 or by email at chemwaste@emory.edu

2.6 Container Storage and Closure – Satellite Accumulation Area (SAA)

A specific area, or Satellite Accumulation Area (SAA) must be designated as a chemical waste storage area. The SAA must be:

- In the lab and near the point of generation; wastes may not be transferred to another area or lab for storage.
- Secured from the public and the surrounding environment (e.g. stored in acid or flammable liquid storage cabinets).

Storage

- Waste containers must be stored so that spills cannot reach sinks or floor drains.
- Liquid chemical wastes must be in secondary containment.
- Waste must be collected in appropriate containers that are compatible with the waste being collected, clean, and in good condition.
- Separate wastes into the different categories. Do not mix incompatible materials in the same containers, e.g. collect acids in a separate container from solvents and bases.
- Incompatible chemical wastes must be physically segregated to prevent reaction. Segregation methods include:
 - Storing in separate cabinets
 - Storing in separate secondary containers such as 5- gallon buckets or tubs
 - Refer to the quick reference “Incompatibility of Common Laboratory Chemicals” available on the EHSO website under Forms/Documents.

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- Do NOT fill containers to the top, leave at least 2 inches of space in liquid waste containers to allow for liquid expansion and decanting.
- Waste containers must be closed at all times except when being added to:
 - Containers should be closed with a screw-type lid or other appropriate device (e.g. lidded funnels that screw on the container are acceptable).
 - Plastic wrap, aluminum foil, parafilm and other make-shift lids are not acceptable.
 - Waste containers used to collect waste from a continuous process (e.g. HPLC) must be sealed using rubber stoppers with tubing inserts or other appropriate means.
- Request a Chemical Waste pick up from EHSO.

Capacity

Evaluate storage capacity when establishing your SAA. Your laboratory must NOT store more than:

- 5 gallons (20 liters) of chemical waste in a single container
- 50 gallons of all wastes total

If these limits are ever exceeded, you must immediately contact EHSO for removal.

Closure

Follow the closure procedures for the containers being used, ensure lids are properly closed and tightened for a leak-free fit. Request a waste pick up through EHSO by visiting www.ehso.emory.edu and following the instructions outlined below in Section 2.7.

Empty Container Disposal

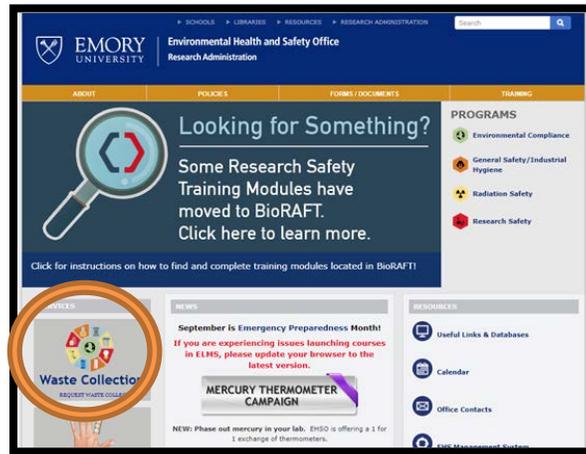
Empty containers that held EPA Registered Pesticides or “P-listed” chemicals must be disposed of through EHSO.

All other empty chemical containers may be disposed to glass or metal recycling. After all contents have been used or disposed to waste containers, the container must be allowed to dry prior to recycling.

2.7 Disposal

To have chemical waste collected you must first submit a pick-up request through EHSO’s online Waste Collection System.

- Visit the Emory EHSO’s primary website at www.ehso.emory.edu and select the Waste Collection icon.
- Instructions on entering waste will be provided on the waste collection webpage, if you have any questions please contact us at 404-712-6622 or by email at chemwaste@emory.edu

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Pick-Up Schedule

Chemical waste is picked up weekly at various locations. The following table reflects the assigned pick-up day(s) for the various buildings and locations.

Schedule	
Building	Collection Day (Weekly)
Rollins Research Center	Monday
Whitehead Biomedical Research Building	Monday
1462 Clifton	Monday
Rollins School of Public Health	Monday
Atwood and Emerson	Wednesday & Friday
Clinic Building A & B	Wednesday
Winship Cancer Institute	Wednesday
Woodruff Memorial Research Building	Wednesday
Yerkes Main Station	Wednesday
Emory University Hospital (Clifton)	Friday
Emory Children's Center	Friday
Health Science Research Building	Friday
Math and Science	Friday
All others on Clifton campus	Friday
Off campus locations	As requested

3.0 Universal Waste Management

Universal Waste is managed differently from other RCRA regulated chemical waste. Universal Waste found at Emory includes:

- Batteries
- Lamps
- Mercury-containing equipment
- Pesticides and containers that previously contained pesticides

This section provides guidelines on how to manage universal waste. If at any point you have questions or concerns, please contact the EHSO's Environmental Compliance Program at 404-712-6622 or by email chemwaste@emory.edu.

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3.1 Used Batteries

Batteries are devices that are designed to receive, store, and deliver electric energy. These can be a variety of types and sizes. Examples of batteries include:

- Lead Acid Batteries: Automobiles, Alarm Systems, Golf Carts, Uninterrupted Power Supplies (UPS)
- Nickel Cadmium (NiCd): Electric Razors, Two-Way Radios, Power Tools
- Nickel Metal Hydride (NiMH): Consumer electronics, Electric vehicles
- Silver cell: Wrist Watches, Pacemakers, Hearing Aids
- Lithium: Cameras, Clocks, Cell Phones, Laptops, Power Tools
- Mercury: Cameras, Clocks, Hearing Aids, Calculators
- Alkaline: Emory manages these batteries as universal waste
- Carbon Zinc: Emory manages these batteries as universal waste

Storage and Labeling

Cover the electrodes of used batteries with non-conductive tape without covering any identifying labels. Used batteries must be labeled with the words "Used Batteries" and the date the battery was removed from service (the accumulation start date).



Large batteries can have the label directly applied to the battery, while smaller batteries can be placed in a sturdy container with the label applied to the outside of the container. Containers of used batteries must be closed at all times unless adding used batteries. Used batteries can be stored on-site for 6 months and must always be stored indoors, away from floor drains.

Disposal

To schedule a pick-up with EHSO, refer to the Section 2.7 of this document. You can refer to the [Used Battery Recycling poster](#) available at www.ehso.emory.edu.

3.2 Used Lamps

Lamps are the bulb or tube portion of an electric lighting device that is designed to produce radiant energy. These can be in a variety of types and sizes. Examples of lamps include:

- Ultra Violet (UV) lamps from Insect Traps, Sun Tanning equipment, and biological safety cabinets
- Fluorescent lamps found in lighting fixtures
- High-Intensity Discharge (HID): Mercury Halide, High-Pressure Sodium, Mercury Vapor
- Halogen: Light Emitting Diode (LED), High Intensity Discharge (HID)
- Incandescent: Lighting Fixtures, Photo sensors
- Compact Fluorescent Lamp (CFL): Lighting Fixtures
- Metal Halide: Mercury-Vapor, Sodium Vapor
- Broken lamps – all types

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Storage and Labeling

Immediately after a used lamp is placed into a box, drum, or container, label the box, drum, or container with the words “Used Lamps” and the date the lamp was removed from service and placed into the box, drum, or container (the accumulation start date). The used lamps must be stored in sufficient-sized boxes, drums, or containers and must fit entirely.



Boxes, drums, and containers of used lamps must be closed at all times with tape unless adding used lamps. Boxes, drums, and containers of used lamps can be stored on-site for 6 months and must always be stored indoors or protected from the weather.

Disposal

Please contact EHSO for proper disposal locations. Containers of spent lamps should not be stored for more than 6-months of the accumulation start date.

You can refer to the [Used Lamps Recycling poster](#) or the [Used Lamps Toolbox Training](#) available at www.ehso.emory.edu.

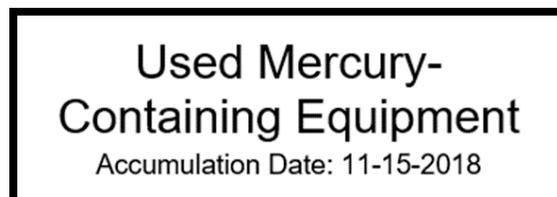
3.3 Used Mercury-Containing Equipment

Mercury-containing equipment are devices that contain elemental mercury integral to its function. Examples of mercury-containing equipment include:

- Thermometers
- Thermostats
- Barometers
- Sphygmomanometers

Storage and Labeling

Used mercury-containing equipment must be put into a sturdy, closeable container and labeled with the words “Used Mercury-Containing Equipment” and the date the first piece of used mercury-containing equipment was removed from service and placed into the container.



Containers of used mercury-containing equipment must be closed at all times unless adding used mercury-containing equipment. Used mercury-containing equipment can be stored on-site for 6 months and must always be stored indoors, away from floor drains.

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To schedule a pick-up with EHSO, refer to Section 2.7 of this document.

3.4 Used Pesticides and Containers that Previously Contained Pesticides

Pesticides are substances intended for preventing, destroying, repelling, or mitigating any pest. Pesticides are regulated under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of the EPA. Pesticides can be identified by having an EPA-registered identification number. Examples of used pesticides include recalled, suspended, or cancelled pesticides under FIFRA.

Disposal

Expired or unwanted pesticides and empty containers that previously contained pesticides may not be disposed of in the regular trash or recycled. To schedule a pick-up with EHSO, refer to Section 2.7 of this document.

4.0 Radioactive Waste Management

The authorized user/radiation permit holder is responsible for maintaining accurate inventory records for all radioactive material (RAM) possessed including radioactive waste. RAM received is managed online through the EHS Assist database. All RAM users must receive training on how to use the EHS Assist database. Contact the Radiation Safety Office to schedule training. Clinical areas are responsible for maintaining their own inventories.

Only trained staff shall handle, package or dispose radioactive wastes. If you have questions regarding training, handling procedures or personal protective equipment (PPE) that should be used, contact your Building Liaison by visiting www.ehso.emory.edu, selecting "Office Contacts," selecting "Research Building Liaison" and locating the contact for your building.

Upon receipt of Radioactive Materials (RAM), the authorized user/radiation permit holder is responsible for maintaining accurate inventory records for all RAM possessed. RAM received in the lab must be recorded in the online EHS Assist Inventory System. All laboratory RAM users must have training on how to use the EHS Assist database. Contact the Radiation Safety Office to schedule training.

4.1 Radioactive Waste Identification

Radioactive waste is regulated by the NRC and EPD. Radioactive waste is any waste that contains radioactive material(s). This waste is primarily generated by the routine use of radionuclides in life science research and human clinical applications. The majority of radioactive wastes tend to be dry solid materials contaminated by contact with RAM, liquid wastes collected during experiments, scintillation vials used to count or analyze samples and empty or partially used stock vials.

Sealed radioactive sources may require disposal but constitute a special waste stream and need to be handled on a case by case basis. In general, sealed sources of radioactivity may NOT be disposed in categories outline below, contact EHSO if you have sealed sources for disposal.

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When hazardous chemicals and radioactive materials are comingled, it is referred to as “Mixed Waste” and requires additional consideration prior to disposal. Minimization of these wastes is important because of the significantly higher disposal costs.

4.2 Waste Container Management

EHSO provides appropriate containers for waste collection. The PI is responsible to ensure the waste stream being generated is compatible with the container provided and to contact EHSO if an alternate container is needed. The containers shall be maintained in good condition to ensure waste is contained and there are no leaks.

General Requirements

Radioactive waste is segregated by waste type (dry solid, liquid, vial, etc.) and then further segregated by half-life. If you have questions about segregation or generation of mixed wastes with new research projects, contact EHSO for assistance at 404-712-6622 or by email at chemwaste@emory.edu

Packaging and Labeling

EHSO will provide containers and supplies for Dry, Liquid and Scintillation Vial Waste as well as Radioactive Waste Tags. Do not use alternate packaging unless specific approval has been obtained from EHSO beforehand.

EHSO provides the following containers for radioactive waste collection.

Table 1.0 – Container Types for Radioactive Waste Collection

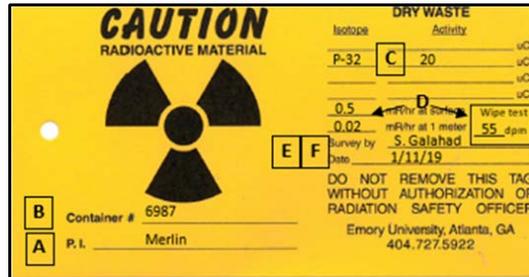
Waste Stream	Container	Provided By
Dry Solid Waste	5-gallon plastic pail plastic liner	EHSO
Liquid Waste	1-gallon plastic jug with lid	EHSO
Scintillation Vials	5-gallon plastic pail with vermiculite and plastic liner	EHSO
Sharps	Sharps container or other hard sided container sufficient to prevent puncture. Sharps containers can be disposed into a dry solid waste container.	PI

Each container should be set up as instructed for each waste stream. A Waste Tag shall be started and attached to each container prior to adding waste. It shall include the PI and the isotope being collected as in the example below. Cards must be legible and written in English. If the card becomes illegible at any time, it must be replaced with a new completed one.

CAUTION RADIOACTIVE MATERIAL  Container # _____ P. I. <u>Merlin</u>	DRY WASTE Isotope _____ Activity _____ uCi P-32 _____ uCi _____ uCi _____ uCi _____ mR/hr at surface _____ Wipe test _____ _____ mR/hr at 1 meter _____ Survey by _____ Date _____
	DO NOT REMOVE THIS TAG WITHOUT AUTHORIZATION OF RADIATION SAFETY OFFICER Emory University, Atlanta, GA 404.727.5922

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When the container is ready to be closed and picked up, complete the Waste Tag.



The image shows a yellow radioactive waste tag with a black radiation symbol in the center. The text on the tag includes:

- CAUTION RADIOACTIVE MATERIAL**
- DRY WASTE**
- Isotope: P-32, Activity: 20 uCi
- Survey by: S. Galahad, Date: 1/11/19
- Wipe test results: 55 dpm
- Survey results: 0.5 mR/hr at 1 meter, 0.02 mR/hr at 1 meter
- Container #: 6987, P.I.: Merlin
- Emory University, Atlanta, GA 404.727.5922

- A. PI Name
- B. Container #
- C. Isotope and activities
- D. Survey Results
 - Wipe test results of container exterior (top, bottom, and sides) recorded in dpm.
 - Meter survey results at contact and one meter recorded in mR/hr.
- E. Enter the name of the person surveying the container.
- F. Enter the date the survey was conducted.

How to Survey a Container
Wipe Test:

- Each container shall be surveyed by a wipe test.
- The wipe test shall cover at least 300cm² and shall include the top, bottom, and sides of the container.
- The total wipe test results shall be below 200 dpm for EHSO to accept the container for transport.
- If the results exceed 200 dpm, decontaminate the container and contact EHSO for assistance.

Meter Survey:

- Each container shall be surveyed with a calibrated GM or ion chamber.
- Measure all sides of the container at contact including top and bottom and record the highest measurement in mR/hr.
- Take a measurement at one meter from point on the container with the highest surface reading and record it in mR/hr.

Container Closure and Pick-up Request

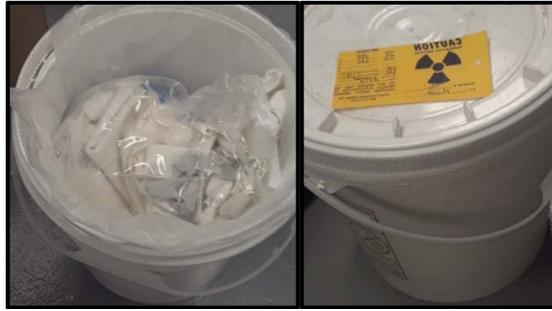
Follow the closing instructions for each type of waste container, perform the container survey and complete the Radioactive Waste Tag.

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Accepted Contents:

- Dry lab trash – paper plastic gloves etc.
- Puncture hazards (sharps, pasteur pipettes pipette tips, glass) must be placed into a sharps box or hard sided container prior to being deposited in dry waste containers.

Container Set Up:

- Complete Rad Waste Tag with the Isotope(s) and the PI name.
- As container is filled, evaluate dose rates and shield as necessary.
- Waste container must be kept closed when not being added to.


Restrictions and Precautions:

- Do not overfill containers
- No hazardous wastes
- No lead (pigs, shields, etc.)
- No lucite glass or plastic shields
- No metal or equipment
- No free liquids or scintillation vials
- Ensure container is covered when not being added to
- Deface radioactive material symbols, stickers, tape, etc. prior to adding to container

Closing Container:

- Tie, tape, or zip tie plastic liner.
- Close the pail and screw top lid.
- Perform wipe test and meter survey, ensure wipe test results are below 200 dpm.
- Complete the Waste Tag as described above.
- Request a waste pick-up through EHS Assist on EHSO's website.

CAUTION		DRY WASTE	
RADIOACTIVE MATERIAL		Isotope	Activity
		P-32	100 <input type="checkbox"/> μ Ci
			<input type="checkbox"/> μ Ci
			<input type="checkbox"/> μ Ci
		0.5 mR/hr at surface	Wipe test
		0.02 mR/hr at 1 meter	55_dpm
		Survey by S. Galahad	
		Date 1/11/19	
DO NOT REMOVE THIS TAG WITHOUT AUTHORIZATION OF RADIATION SAFETY OFFICER			
Container # 5987		Emory University, Atlanta, GA	
P.I. Merlin		404.727.5922	
Completed Rad Tag for Dry Solid Waste			

TITLE:

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4.4 Radioactive Liquid Waste

Container: 1 Gallon plastic jug with lid.

Segregate liquids by aqueous and non-aqueous/organic characteristics

Table 3.0 – Radioactive Liquid Segregation

Aqueous	Non-Aqueous / Organic
<ul style="list-style-type: none"> Water, salts or buffered solutions All contents must be readily soluble in water or readily dispersible biological material⁽¹⁾ pH must be between 6 and 9 	<ul style="list-style-type: none"> Mixtures of organic liquids such as ethanol methanol acetonitrile with or without water pH should be between 2 and 12

Then segregate radionuclides as follows:

Group	Segregation	Examples
Half-life < 30 days	These isotopes may be comingled	Tc-99m, F-18, I-131, P-32
Half-life > 30 days	Isotopes with half-lives greater than 15 days shall be collected in separate containers	I-125, S-35, H-3, C-14

If radionuclides with half-lives greater than 30 days must be comingled for an experiment, contact EHSO for additional guidance.

Container Set Up:

- Complete Rad Waste Tag with the Isotope and the PI name.
- Complete the Radioactive Waste chemical with all chemical constituents.
- As the container is filled, evaluate dose rates and shield as necessary.
- Liquid wastes must be stored in secondary containment.
- Waste container must be kept closed when not being added to.

Radioactive Liquid Waste Label

PI (lab): Lancelot

Bldg./Ro: Rollins

Phone #: 4-xxxx

List primary constituents and concentrations to total 100%:

Cell culture media	80 %
fetal bovine serum	10 %
bleach	10 %
	%
	%
	%

QUESTIONS OR CONCERNS CONTACT EHSO AT
404-727-5922 – CHEMWASTE@EMORY.EDU

Restrictions and Precautions:

- Do not over fill containers; do not fill more than 90%.
- Do not mix aqueous and hazardous wastes.

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Closing Container:

- Secure screw top lid.
- Perform wipe test and meter survey, ensure wipe test results are below 200 dpm.
- Complete the Rad Waste Tag as described above.
- Complete Radioactive Liquid Waste label.
- Request waste pick up thorough EHS Assist on EHSO website.

CAUTION		LIQUID WASTE	
		Isotope	Activity
		H-3	500 uCi
		C-14	600 uCi
		0.5	mR/hr at surface
		0.02	mR/hr at 1 meter
		Survey by	S. Galahad
		Date	1/11/19
		Wipe test 65_dpm	
Container # 6988		DO NOT REMOVE THIS TAG WITHOUT AUTHORIZATION OF RADIATION SAFETY OFFICER	
P. I. Merlin		Emory University, Atlanta, GA 404.727.5922	

4.5 Radioactive Liquid Scintillation Vial Waste

Container: 5 Gallon plastic pail with liner and vermiculite

Segregate vials into two groups, those used with 'biodegradable' cocktails and those containing cocktails with hazardous constituents such as toluene and xylene.

Table 4.0 – Liquid Scintillation Vial Waste Segregation

Biodegradable Cocktail examples	Hazardous Cocktail examples
<ul style="list-style-type: none"> • Ultima Gold • Ultima Gold F • Opti-Fluor O • Ecolume • CytoScint • Biosafe 	<ul style="list-style-type: none"> • Ultima Gold MV, AF, AP • Ultima Flo M, AF, AP • Insta-Gel Plus • Pico-Fluor • Hionic Fluor • Flow Scint II, III

Then segregate radionuclides as follows:

Group	Segregation	Examples
Half-life < 30 days	These isotopes may be comingled	Tc-99m, F-18, I-131, P-32
Half-life > 30 days	Isotopes with half-lives greater than 15 days shall be collected in separate containers	I-125, S-35, H-3, C-14
If radionuclides with half-lives greater than 30 days must be comingled for an experiment, contact EHSO for additional guidance.		

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Accepted Contents:

- Capped scintillation vials.

Container Set Up:

- Complete the Rad Waste Tag with the Isotope and the PI name.
- Indicate the Scintillation Cocktail that is going to be used.
- As the container is filled, evaluate the dose rates and shield as necessary
- The waste container must be kept closed when not being added to.

Restrictions and Precautions:

- Do not overfill containers.
- No other trash or contaminated items (gloves, paper, pipette tips)
- No free liquids.
- Deface the radioactive material symbols, stickers, tape, etc. prior to adding to the container.

Closing Container

- Tie, tape, or zip tie the plastic liner.
- Close the pail and screw top lid.
- Perform the wipe test and meter survey, ensure the wipe test results are below 200 dpm.
- Complete the Rad Waste Tag as described above. You will need to add the container # and the cocktail used.
- Request a waste pick up through EHS Assist on EHSO's website:
<https://ehsoassist.emory.edu>

4.6 Radioactive Waste – Stock Vials

Empty Stock Vials:

- Empty stock vials may be disposed of as Dry Solid Waste.
- H-3, C-14, S-35 stock vials can be kept in the plastic containers (pigs).
- High energy beta emitters such as P-32 or gamma emitters such as I-125 must be removed from their lead shielding containers (pigs) prior to being disposed in Dry Solid Waste.
- If removing the stock vial from the shielded pig results in elevated dose rates, return the vial to the shielded pig and dispose as Partially Used & Full Stock Vials described below.
- Account for any trace activity through EHS Assist.
- Follow the Radioactive Dry Solid Waste section of this document.

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Partially Used & Full Stock Vials:

- Non-empty stock vials shall be disposed separately from other wastes.
- These stock vials can be left in their plastic and lead shielded containers and packed into sealed zip-lock bag or packed into a plastic liner that is then tied, taped or zip tied closed.
- Account for the activity through EHS Assist.

Container Set Up:

- Complete Rad Waste Tag with the Isotope and the PI name.
- If multiple stock vials (more than 4) are being processed for disposal, separate them by isotope and pack each isotope separately.
- Evaluate dose rates and shield as necessary.
- Practice good contamination control techniques when handling stock vials, the risk of contamination is significant.
- Do NOT pour off stock vials into liquid waste containers.
- If you have any questions or concerns, please contact EHSO before preparing stock vials for disposal.

Closing Container:

- Tie, tape or zip tie the plastic liner.
- Perform the wipe test and meter survey, ensure the wipe test results are below 200 dpm.
- Complete the Rad Waste Tag, include the text "STOCK VIAL."
- Request waste pick up though EHS Assist on EHSO website.
 - Select container type VIAL: Long Lived Lab Vials.
 - Add the text "Stock Vials" in the comments section.

CAUTION RADIOACTIVE MATERIAL  STOCK VIALS Container # # 6995 P.I. Merlin		DRY WASTE	
		Isotope S-35	Activity 250 uCi
0.03 mR/hr at surface 0.02 mR/hr at 1 meter		Wipe test 25 dpm	
Survey by S. Galahad Date 1/11/19		DO NOT REMOVE THIS TAG WITHOUT AUTHORIZATION OF RADIATION SAFETY OFFICER Emory University, Atlanta, GA 404.727.5922	

Container Type	-- None --
Open Date	-- None --
Sealed Date	1LIQ : 1 Gallon Liquid 20GDR : 20-Gallon Dry 5GDRY : 5-Gallon Dry 5GLSV : 5-Gallon LSV LVS : SHORT-LIVED VIALS SEEDS - BOX OF BRACHY SEEDS
ed Disposal Date	VIAL : Long Lived Lab Vials
if Container Con	
if checked, enter	
Comments	Stock Vials

4.7 Radioactive Waste – Other

Other forms and types of radioactive waste may arise as research aims change and evolve. Contact EHSO for instructions with special situations or research specific waste streams that are not addressed in this document.

Large pieces of equipment that have been used with radioactive materials will require a special survey to allow de-posting and release. Follow the guidance for the Equipment Hazard Tag program to release lab equipment.

5.0 Biohazardous Waste Management

Biohazardous waste is sometimes also referred to as infectious waste, biomedical waste,

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or biological waste and is regulated by the Georgia Department of Natural Resources. Biohazardous waste may contain bodily fluids, which could potentially be infectious. Therefore, regulations are in place for proper management and disposal. All handlers of biomedical waste must complete Bloodborne Pathogens Training and practice Universal Precautions. Please contact the Research Safety Office for additional guidance.

Departments must set up accounts with Emory-approved vendors for biohazardous waste. EHSO does not collect biohazardous waste for disposal. For more information on how to set up an account, visit www.ehso.emory.edu, select "Office Contacts," and select "Research Building Liaisons." From there, contact the corresponding EHSO staff member to assist with your questions.

5.1 Biohazardous Waste Identification

Biohazardous waste is any waste that has come into contact with any bodily fluids, including: blood, plasma, sputum, vomit, feces, urine, and any other secretions. Biohazardous waste must be placed into red or orange bags, boxes, or containers that have the trefoil on them (see below in "Labeling"). If a bag, box, or other container contains this symbol, proceed with caution when adding or handling this waste. Some examples of biohazardous waste include paper towels, cloths, needles, syringes, petri dishes, and other laboratory waste.

5.2 Waste Container Management

Once you are aware that you will be accumulating biohazardous waste, you must have the appropriate containers for waste collection. These containers, including their lids, must be composed of materials that are compatible with the waste being collected. The containers must be clean and in good condition that doesn't allow for any disruption or leaking of material from the container. Containers that will be collecting liquid biohazardous waste should only be filled up to 90% of the container's volume and should be closed at all times when not collecting waste.

Container Selection

Containers should be selected based on the type of waste that is going to be accumulated in the container. Departments are responsible for purchasing biohazardous containers. These are not provided by EHSO. Some examples include:

- Sharps (needles, syringes, razor blades, etc.) must go into a designated sharps container with a closeable lid.
- Solid biohazardous waste must go into a biohazard bag inside of a biohazard box. These should have plastic lids that sit upon the opening of the box.
- Liquid biohazardous waste is sometimes mixed with chemical waste. Liquid waste must go into a designated liquid waste container with a leak-proof lid.



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Container Requirements

Containers that will be used for biohazardous waste collection must meet the following requirements:

- In good condition.
- Compatible with the waste that is being collected.
- Clean and uncontaminated from the outside.
- Labeled properly (see below).

5.3 Labeling

Biohazardous waste bags, boxes, and containers must be marked with the trefoil below:


5.4 Adding Biohazardous Waste to a Container

Personal protective equipment (PPE) must be worn when adding biohazardous waste to a container. The PPE will depend on the biological agents present and can range greatly. If you are unsure which PPE you should use, visit www.ehso.emory.edu, select "Office Contacts," and select "Research Building Liaisons." From there, contact the corresponding EHSO staff member to assist with your questions.

When adding sharps to a sharps container, proceed with extreme caution to avoid a potential needle stick. Avoid re-capping needles. When adding dry waste to a biohazardous bag inside of a box from Stericycle, only fill the box three-fourths of the way full, and do not compress the waste.

5.5 Container Storage

Waste containers must be closed when not actively accumulating waste and stored in a designated area inside your laboratory or building near the point of generation. This area must be secured from the public and the surrounding environment. Biohazardous waste with potential to release odors should be stored in a refrigerator or freezer.

5.6 Disposal and Recordkeeping

Biohazard waste containers must be closed very carefully to avoid any potential exposures or injuries. For box style containers the biohazard bag must be goose-necked and taped securely, then the exterior box can be taped closed. Biohazardous sharps containers must be securely closed before placing in the biohazard box.

Schedule pickups with the vendor on a regular basis depending on how much biohazardous waste the department generates. All personnel that

Example: vendor waste disposal record

HAZARDOUS MATERIAL SHIPPING DOCUMENT TRANSPORTER: Stericycle, Inc. 1024 Joy Lake Rd. Lake City, GA 30280 (866) 753-7422		
For Stericycle Customer Care Call 1-866-782-7422 Stericycle Customer # 4006092 Site # 023		
EU7551-Radiation-Whithead 615 Michael St NE Atlanta, GA 30324218 REGULATOR #: Phone #: (404) 274-1244 Contact : George Solston		
SERVICE DATE: 3/25/19 3:12:58 PM		
SHIPPING DOCUMENT #: MDC00061		
UN291, REGULATED MEDICAL WASTE, N.O.S., 6.2, PGL For DOT HAZMAT Emergency Response Call: CHEMTREC 1-800-424-9300 Customer No.: 21122		
TOTAL CONTAINERS COLLECTED: 15 TOTAL VOLUME COLLECTED: 64.500 CU FT		
SUMMARY (Cont Type) QTY : CF		
U43 Medium Path/Chemo Box D1	15	64.500
INC054B U43	INC054D U43	INC054E U43
INC054F U43	INC054G U43	INC054H U43
INC054I U43	INC054J U43	INC054K U43
INC054L U43	INC054M U43	INC054N U43
INC054O U43	INC054P U43	INC054Q U43
INC054R U43	INC054S U43	INC054T U43
I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.		

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dispose of biomedical waste must maintain records of waste disposal for three years. See example of waste vendor record.

This link is to an instructional video on how to properly pack biomedical waste:
(<https://youtu.be/e5sQMoX-X5w>)

6.0 Miscellaneous Items Requiring Regulated Disposal

6.1 Used Oil and Oil Contaminated Water

All oil is regulated under the EPA and should never enter a drain or be thrown in the trash. This includes petroleum-based oils, mineral oils, vegetable oil, and FOG (fats, oils and greases).

Storage and Labeling

Used oil must be stored:

- In sturdy, compatible, containers approved for liquids and labeled “Used Oil.”
- Containers exceeding 55 gallons must be in secondary containment
- Containers of any quantity must be in secondary containment if there is a floor drain present in the room.

Each location where oil is stored should have a spill response kit present. Contact EHSO for a spill response kit if needed.

Used oil containers that exceeds 55 gallons must be inspected for leaks monthly and documented on the SPCC Monthly Inspection Record; available under “Forms/Documents” at www.ehso.emory.edu

Refer to the Used Oil Recycling Poster available under “Forms/Documents” at www.ehso.emory.edu.

Disposal

Used oil containers can be stored on-site until they are full. To request containers or schedule a pick-up with EHSO, refer to Sections 2.2 and 2.7 of this document.

6.2 Broken Glass

Broken glass is not considered biohazardous waste unless it has come into contact with a bodily fluid. Broken glass must be stored in a broken glass container that must be purchased by the department.

Broken glass containers must be lined with plastic bags. When the container is full, tape the container closed and leave it in the hallway for the building custodian to collect.



6.3 Chafing Fuel (e.g., Sterno™)

Chafing fuel (e.g., Sterno™) and other food heating devices are permitted in specific public spaces and must be attended and used appropriately. Refer to the “Get the Facts” publication Chafing Fuel Management and Disposal available at www.ehso.emory.edu for more information. These fuels must be disposed of through EHSO.

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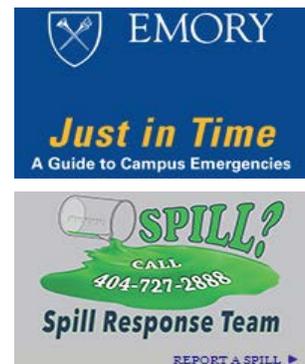
Emory Dining - Place cooled and capped chafing fuel in containers provided by EHSO. To request containers or schedule a pick-up with EHSO, refer to Section 2.7 of this document.

7.0 Spills

Chemical spills must be cleaned up immediately. Spill clean-up debris must be treated as chemical waste.

Chemical spills that cannot be safely mitigated by laboratory personnel are considered major spills and should immediately be reported to EHSO or Emory Police. **Call EHSO at 404-727-2888** (24 hour response line) or **call Emory Police at 911 from any campus phone or 404-727-6111**.

Refer to the Office of Critical Events Preparedness and Response (CEPAR) Just-In-Time Guide to Campus Emergencies available on CEPAR.

**8.0 References**

- EPA: <https://www.epa.gov>
- RCRA: <https://www.epa.gov/rcra/resource-conservation-and-recovery-act-rcra-regulations#haz>

9.0 List of Associated Documents

The following documents can be found at www.ehso.emory.edu under "Forms/Documents":

- Ballast Recycling Poster
- Battery Recycling Poster
- Chafing Fuel Management and Disposal
- Ethidium Bromide Disposal (Liquids and Gels) Quick Facts
- Hazardous Waste Label
- Oil Recycling Poster
- Regulated Waste Collection Schedule
- Regulated Waste Guidelines
- Regulated Waste Poster
- SPCC Monthly Inspection Record
- Theater Studies Chemical Disposal Quick Facts
- Toolbox Training: Ballasts
- Toolbox Training: Proper Management Aerosols
- Toolbox Training: Regulated Waste Management
- Visual Arts Chemical Disposal Quick Facts