

University of North Carolina at Pembroke

Environmental Health & Safety

Hazardous Waste Policy and Procedure

As approved March 2010 by the Faculty Senate

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I. OVERVIEW

The Federal Resource Conservation and Recovery Act (RCRA) established the framework for hazardous waste regulation in 1976. RCRA was enacted by Congress to protect human health and the environment from improper management of hazardous waste. RCRA introduced the concept that the generator of a waste is responsible for the proper waste management from "cradle-to-grave" (i.e., from purchase to disposal). RCRA regulations are found in 40 CFR 260-279.

At the University of North Carolina at Pembroke (UNCP), all hazardous waste disposal is managed by UNCP Environmental Health & Safety Services (EH&S). Chemicals are not allowed to be disposed in drains, in the trash, or by evaporation. All hazardous waste is required to be held in the generating location for subsequent pick-up and disposed.

There are specific regulatory and UNCP requirements for individuals who generate and accumulate chemical waste: minimize and recycle, properly label and identify, and properly contain and dispose chemical waste. The purpose of this document is to assist personnel who generate chemical waste with regulatory compliance. Every lab and shop on campus is subject to unannounced inspections by the Federal Environmental Protection Agency (EPA) and the UNCP Environmental Health and Safety (EH&S) Office as well as by UNCP Health, Safety & Environment Committee. Lack of compliance can result in citation and fines by the EPA.

UNCP is committed to handling its hazardous wastes responsibly by adhering to these objectives.

HAZARDOUS WASTE POLICY & PROCEDURE

1. Reduce the quantity of hazardous waste generated to the lowest practical level.
2. Manage hazardous wastes in a manner that protects the health and safety of students, staff, and faculty at UNCP as well as the surrounding community.
3. Manage hazardous wastes using the most responsible and environmentally sound methods practical. This includes reducing the potential for releases of hazardous waste into the environment and providing quick response to hazardous waste spills to minimize risk to people and the environment.
4. Comply with all federal, state, and local regulations regarding hazardous waste management.

II. APPLICABILITY

The requirements set forth by this procedure apply to all personnel on the UNCP campus to include: all employees, students, contractors, visitors, and invitees.

III. HAZARDOUS WASTE GENERATOR STATUS

UNCP is classified as a Small Quantity Generator (SQG). Being a SQG means that:

1. UNCP generates between 100 kg (220 Lbs) and 1000 kg (2,200 Lbs) per month of RCRA hazardous waste, or
2. Accumulates at any time < than 1 kg (2.2 Lbs) of acute hazardous waste, or
3. Generates in any calendar month more than 100 Kg (220 Lbs) of spill cleanup material contaminated with RCRA acute hazardous waste.

IV. IDENTIFICATION OF HAZARDOUS WASTE

A hazardous waste is a waste that:

1. Causes, or significantly contributes to, an increase in mortality or an increase in serious irreversible or incapacitating reversible illness.
2. Poses a substantial present or potential hazard to human health or the environment when it is improperly treated, stored, transported, disposed of or otherwise managed.
3. The EPA defines hazardous waste by two different methods, characteristic wastes and listed wastes.

A. Characteristic Wastes

Characteristic wastes are defined by exhibiting any of the four characteristics outlined below: ignitability, corrosivity, reactivity, and/or toxicity.

1. Ignitability

- a) A liquid with a flash point of less than 140 degrees Fahrenheit (e.g., alcohols, benzene, toluene, xylene, and acetonitrile)
- b) A non-liquid capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture, or spontaneous chemical changes and, when ignited, burns vigorously and persistently
- c) An ignitable gas
- d) An oxidizer (e.g., nitrates, perchlorates, bromates, permanganates, peroxides, and periodates)

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2. Corrosivity

a) These wastes are defined as having a pH of less than 2 (acidic), or greater than or equal to 12.5 (basic), or it can be any liquid that corrodes steel at a rate greater than 6.35 millimeters (0.25 inches) per year at a test temperature of 130 degrees Fahrenheit. (e.g., inorganic acids, organic acids, and bases).

3. Reactivity

These wastes are those defined as having the potential for dangerous reactions when exposed to atmospheric changes, air, water, or impact. Reactive hazardous wastes are defined as having any of the following properties:

- a) Normally unstable and readily undergoes violent change without detonating
- b) Reacts violently with water
- c) Forms potentially explosive mixtures with water
- d) When mixed with water, it generates toxic gases, vapors or fumes in a quantity sufficient to present danger to human health or the environment
- e) Cyanide or Sulfide bearing waste
- f) Capable of detonation or explosive reaction if it is subjected to a strong initiating source (impact) or if heated under confinement. (e.g., dinitro and trinitro compounds as well as picric acid)
- g) Readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure
- h) Forbidden explosives (49CFR 173.5), Class A explosives (49CFR 173.53), or Class B explosives (49CFR 173.88).

4. Toxicity Characteristic

The characteristic of toxicity is determined through laboratory analysis according to the Toxicity Characteristic Leaching Procedure (TCLP). If an extract of the waste contains the contaminants listed below in concentrations designated by EPA to be hazardous, the waste is hazardous. This list consists of 8 heavy metals, 10 pesticides, and 22 organic chemicals.

B. Listed Wastes

Listed wastes are identified on four lists: F, K, U and P. Materials identified on these lists are hazardous wastes by definition. Hazardous wastes found on these lists are identified by the chemical name, source, or industrial process (K-waste).

1. "F" waste codes: Non-source specific. This list identifies wastes from common manufacturing and industrial processes, such as solvents that have been used in cleaning or degreasing operations. Because the processes producing these wastes can occur in different sectors of industry, the F-listed wastes are known as wastes from non-specific sources. Wastes included on the F-list can be found in the regulations at [40 CFR §261.31](#).

2. "K" waste codes: Source specific. This list includes certain wastes from specific industries, such as petroleum refining or pesticide manufacturing. Certain sludges and wastewaters from treatment and production processes in these industries are examples of source-specific

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wastes. Wastes included on the K-list can be found in the regulations at [40 CFR §261.32](#).

3. "U" waste codes: Discarded commercial waste products. **The P-list and the U-list** (discarded commercial chemical products). These lists include specific commercial chemical products in an unused form. Some pesticides and some pharmaceutical products become hazardous waste when discarded. Wastes included on the P- and U-lists can be found in the regulations at [40 CFR §261.33](#).

4. "P" waste codes: Acutely hazardous discarded commercial chemical products. Wastes included on the P- lists can be found in the regulations at [40 CFR §261.33](#)

C. Acute Hazardous Waste

Definition of Acute Hazardous Waste - It has been found to be fatal to humans in low doses, or in the absence of data on human toxicity, it has been shown in studies to have an oral LD-50 toxicity (rat) of less than 50 milligrams per kilogram, and inhalation LC-50 toxicity (rat) of less than 2 milligrams per liter, or a dermal LD-50 toxicity (rabbit) of less than 200 milligrams per kilogram or is otherwise capable of causing or significantly contributing to an increase in serious irreversible, or incapacitating reversible illness. All "P" listed wastes and some "F" listed wastes are acute hazardous wastes. Any container containing an acute hazardous waste must be triple rinsed with a solvent capable of removing the acute hazardous waste from the container before it can be considered an "empty" container.

V. HAZARDOUS WASTE ACCUMULATION

A. *Satellite Accumulation*

Once a determination has been made that a laboratory, darkroom, or other facility within the university is generating a hazardous waste, these facilities are then required to comply with EPA regulations pertaining to the accumulation, storage, labeling, and disposal of hazardous waste.

Accumulation of up to 55 gallons of hazardous waste or 1 quart of acutely hazardous waste (P listed wastes and some F listed wastes) may be performed in an area at, or near, the point of generation which is under the control of the person generating the waste. The time limit does not apply while the waste is being accumulated in this fashion.

B. *Hazardous Waste Accumulation Point Requirements*

It is the responsibility of the Principal Investigator (PI) and his/her designee to insure that waste accumulation areas are maintained in accordance with applicable rules and regulations. Waste can be accumulated in "Satellite Accumulation Areas" that are posted as such. The PI must designate a Lab Waste Manager to ensure that the waste is being handled correctly on a day-to-day basis. The PI must also ensure that everyone in the lab has read and is familiar with the below requirements.

All chemical containers must be properly labeled before waste is put in the container. Hazardous waste containers must be marked with the words HAZARDOUS WASTE and the chemical(s) in question. The date waste(s) were first added must be marked as well.

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For those containers with mixtures, a breakdown of the substances by percentage or volume is required. This component is CRITICAL to proper disposal.

Your assistance is needed to prevent the generation of UNKNOWN CHEMICALS. Unknown chemicals are a serious safety hazard and costs for identification and disposal fees can be very high. Proper labeling, inventory and reporting, especially for those containers leaving the facility, will eliminate a great deal of this problem. Any hazardous waste container with "unknowns" will need to be characterized through laboratory analyses by the generating department. Alternatively, EH&S and outside agencies will provide technical assistance in the characterization and the generating department will be debited for this analysis.

It is critical that every effort be made to fully and correctly identify all chemical constituents and their respective concentrations on the container labels. Incorrectly labeled containers could result in improper disposal and subsequent fines being assessed. An improper label could also cause serious and potentially fatal threats to both laboratory and collection personnel. Hazardous Waste labels can be obtained from EH&S at x 6792.

All hazardous wastes shall be collected in sealable containers. Foil or film closures are not acceptable. **DO NOT** put hazardous wastes into sinks, drains or the trash. The waste must be compatible with other wastes in the container and the type of container in which it is stored. The exterior of the container must be free of chemical contamination. Store containers of incompatible waste apart from each other (i.e., keep Oxidizers away from Flammable Solvents). Also, consider safe temperature storage requirements.

Containers shall be kept closed during accumulation except when adding waste to the container.

Choose a central area for waste storage and label with a sign saying "Satellite Accumulation Area". This area should be at or near the process generating the waste. Keep open flame and ignition away from chemicals, especially hazardous waste and chemical containers. No smoking rules apply.

Do not overfill hazardous waste containers. Two inches headspace should be allowed.

Keep all containers properly labeled and complete all requested information (container contents, volume, etc.) for proper storage and disposal of container. Inspect waste containers weekly for leaks and proper labeling.

All employees working in the area must complete Right-To-Know (Hazard Communication) training. All people responsible for hazardous waste in their area must complete Lab Safety training. EH&S provides Right-To-Know (Hazard Communication) training on a regular basis. Contact Human Resources Training section to sign up for training.

Dispose of PEROXIDE FORMING CHEMICALS (i.e., Ethers, Dioxane, Tetrahydrofuran) within 6 months after date of opening or 1 year after date of receipt. Realize that certain chemicals with the passage of time can become shock-sensitive explosives. Attention to detail will save the facility a significant amount of time and money and could save someone's life.

Major laboratory clean-outs must be planned well in advance of waste removal. Please coordinate these activities through EH&S.

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Radioactive materials are not handled in the same fashion as hazardous waste. NEVER MIX RADIOACTIVE AND HAZARDOUS WASTES.

All fires, regardless of size, must be reported to the Instructor and/or EH&S at x 6792.

All Fire Extinguishers used for any fire or discharged to any degree must be reported immediately to the Instructor and/or EH&S at x 6792.

All CHEMICAL SPILLS AND OR RELEASES must be cleaned up properly and safely. All spills in amounts greater than 0.5 liter or 1 pound, or of ANY acutely hazardous materials require a response from the Instructor and/or EH&S. Any size spill directly to the ground or water must also be immediately reported.

If you have any questions, please call EH&S at x 6792.

In the event of a FIRE call 9-911 then UNCP Campus Police at 521-6235

In the event of a CHEMICAL SPILL, contact EH&S at 521-6792.

There are currently four Hazardous Waste Satellite Accumulation Areas at UNCP:

- Art Department
- Biology Department
- Chemistry Department
- Facilities Operations

C. Container Management

All hazardous waste accumulation points are required to follow proper container management practices while accumulating hazardous wastes. Proper practices are outlined below:

- Use containers compatible with the waste collected.
- Place only compatible wastes in the same container. Label all containers with the words "Hazardous Waste" and include the contents, identify components if a mixture.
- Containers must be kept closed when not being filled.
- Keep incompatible wastes separated; use secondary containment if necessary.
- Leave at least two inches of headspace in the waste container to allow for any expansion while waste is in storage.
- Choose a central storage area at or near the point of waste generation and mark with a sign saying "Satellite Accumulation Area." All waste should be stored in this area.
- Perform and document weekly inspections of containers for leaks, corrosion, bulging and proper labeling.
- Transfer waste from leaking containers to intact ones. Contact EH&S at x 6792 if assistance is needed.
- Use appropriate personal protective equipment when handling waste.
- The following chemical wastes must be placed in glass containers. These chemicals cannot be placed in plastic high density polyethylene (**HDPE**) containers.

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- o Amyl chloride
- o Aniline
- o Benzyl alcohol
- o Bromine
- o Bromobenzene
- o Bromoform
- o Butadiene
- o Butyric acid
- o Carbon disulfide
- o Cedarwood oil
- o Chlorinated solvents
- o Concentrated acids
- o Cinnamon oil
- o Cresol
- o Cyclohexane
- o O-dichlorobenzene
- o P-dichlorobenzene
- o Diethyl benzene
- o Diethyl ether
- o Ether
- o Ethyl chloride, liquid
- o Nitrobenzene
- o Perchlorethylene
- o Phenol/Chloroform mixtures
- o Nitric acid
- o Thionyl chloride
- o Toluene
- o Trichloroethene
- o Trichloroethylene
- o Vinylidene chloride
- o Xylene
- o Brominated & fluorinated solvent

Special precautions need to be taken when dealing with water or air reactive and explosive materials that are no longer wanted. With the passage of time, many materials become explosive hazards. Some ethers, dioxanes, tetrahydrofuran and others fall into this category as well as dry picric acid. Elemental sodium and potassium are water reactive and can cause considerable damage if they come in contact with water. White phosphorus is spontaneously combustible in air and can also cause extreme damage and injury. These are just a few of many hazards that can be found on campus and research labs. If you find any of these materials, DO NOT MOVE THEM. Call EH&S at (910) 521-6792.

D. Special Wastes

1. Gas Cylinders - Generators should attempt to establish accounts with suppliers who will allow the return of unused product and empty cylinders. Generators must ensure that aging cylinders are picked up before the integrity of the valve and cylinder is compromised. The department may be billed directly for cylinders that require special handling and disposal procedures such as unknown or old cylinders.

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2. Peroxide Formers - Must be picked up by within six (6) months after date of opening or one (1) year after date of receipt. Common peroxide formers are ethyl ether, ethylene glycol dimethyl ether (vinyl ethers, isopropyl ether, potassium metal and sodium amide).

3. Ethidium Bromide - Concentrated stock solutions must be handled by the appropriate department. EH&S will provide technical assistance as requested. The rinsate and destained gels can be placed down the sink and into the trash.

4. Reagents -The following reagents contain mercury and should be handled as hazardous waste:

Dobbin's Reagent
Millon's Reagent
Hayem's Solution
Hopkins-Cole Reagent
Nessler's Reagent
Hubb's Reagent
Rohrbach's Solution
Tyrosine Reagents
Jacquemart's Reagent
Sachsse's Solution
Knapp's Solution
Spiegler's Reagent
Mercresin
Tanret's Reagent
Meyer's Solution

Other hazardous reagents include: Flemming's Solution (osmium, chromic acid), Folin-Dennis Solution (mercuric cyanide), Fisher's Reagent (phenyl hydrazine), and Erlicki's Solution (chromium).

5. Dinitro and Trinitro Compounds - These compounds must be picked up by before the contents have dried. Some are potentially shock sensitive when the moisture content is less than 10 percent. Picric acid is a common example of this type of compound.

6. Photochemical - If a silver recovery unit is not used, must handle the fixer. No concentrated photo chemicals of any kind can be placed in the trash or sink.

7. Used Oil - All vacuum pump oil, synthetic oil, transmission and brake fluids, lubricating greases, etc. must have the words "Used Oil" on the container.

a) Keep containers and tanks in good condition. Don't allow tanks to rust, leak, or deteriorate. Fix structural defects immediately.

b) Never store used oil in anything other than tanks and storage containers. Used oil may also be stored in units that are permitted to store regulated hazardous waste. Tanks and containers storing used oil do not need to be RCRA permitted, however, as long as they are labeled and in good condition. Storage of used oil in lagoons, pits, or surface impoundments that are not permitted under RCRA is prohibited.

c) Don't mix used oil with anything.

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d) If there is a spill:

(1) Call EH&S at 6792 for assistance.

(2) Take steps to prevent leaks and spills. Keep machinery, equipment containers, and tanks in good working condition and be careful when transferring used oil. Have sorbent materials available on site.

(3) If a spill or leak occurs, stop the oil from flowing at the source. If a leak from a container or tank can't be stopped, put the oil in another holding container or tank.

(4) Contain spilled oil. For example, containment can be accomplished by erecting sorbent berms or by spreading a sorbent over the oil and surrounding area.

(5) Clean up the oil and recycle the used oil as you would have before it was spilled. If recycling is not possible, you first must make sure the used oil is not a hazardous waste and dispose of it appropriately. All used cleanup materials, from rags to sorbent booms, that contain free-flowing used oil also must be handled according to the used oil management standards. Remember, all leaked and spilled oil collected during cleanup must be handled as used oil. If you are a used oil handler, you should become familiar with these cleanup methods. They may also be part of a spill response action plan.

(6) Remove, repair, or replace a defective container or container immediately.

8. Universal Waste

a) Batteries - Alkaline batteries can be disposed of in the trash. Other batteries which contain hazardous metals such as mercury, lead, silver, and cadmium must be disposed of properly. EH&S can provide used battery collection containers, as required.

b) Mercury Containing Devices - Many types of equipment contain elemental mercury. Equipment must be free of mercury devices before it is recycled or discarded.

Examples include:

Heating and air conditioning thermostats

Tilt switches used in silent light switches, washing machine lids, chest type freezers

Pressure gauges, displacement / plunger relays

Flow meters

Sump pump float switches

Thermometers, monometers

Fluorescent Lights containing mercury

Mercury containing devices must be disposed of in a proper manner.

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c) Agricultural Pesticides - Pesticides that have been recalled or banned from use, are obsolete, have become damaged, or are no longer needed due to changes in cropping patterns or other factors. They often are stored for long periods of time. These pesticides must be disposed of in a proper manner.

E. Empty Container Rule

CFR 261.7 Residues of hazardous waste in empty containers.

- a. Any hazardous waste remaining in either
 1. An empty container or
 2. An inner liner removed from an empty container, as defined in paragraph (b) of this section, is not subject to regulation under parts 261 through 265, or part 268, 270, and 124 of this chapter or to the notification requirements of Section 3010 of RCRA.
- b. Any hazardous waste either
 1. A container that is not empty or
 2. An inner liner removed from a container that is not empty, as defined in paragraph (b) of this section, is subject to regulation under parts 261 through 265, and parts 268, 270, and 124 of this chapter and to the notification requirements of Section 3010 of RCRA.
- c. A container or an inner liner removed from a container that has held any hazardous waste, except a waste that is a compressed gas or that is identified as an acute hazardous waste listed in 261.31, 261.32, or 261.33(e) of this chapter is empty if:
 1. All wastes have been removed that can be removed using the practices commonly employed to remove materials from that type of container, e.g., pouring, pumping, and aspirating, and
 2. No more than 2.5 centimeters (one inch) of residue remain on the bottom of the container or inner liner, or
 1. No more than 3 percent (3%) by weight of the total capacity of the container remains in the container or inner liner if the container is less than or equal to 110 gallons in size, or
 2. No more than 0.3 percent (0.3%) by weight of the total capacity of the container remains in the container or inner liner if the container is greater than 110 gallons in size.

A container that has held a hazardous waste that is a compressed gas is empty when the pressure in the container approaches atmospheric.

A container or an inner liner removed from the container that has held an acute hazardous waste listed in 261.31, 261.32, or 261.33(e) is empty if:

The container or inner liner has been triple rinsed using a solvent capable of removing the commercial chemical product or manufacturing chemical intermediate;

The container or inner liner has been cleaned by another method that has been shown in the scientific literature, or by tests conducted by the generator, to achieve equivalent removal, or

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In the case of a container, the inner liner that prevented contact of the commercial chemical product or manufacturing chemical intermediate with the container has been removed.

VI. SPILL CONTROL PROCEDURES

All areas generating hazardous wastes must have spill control measures in place to deal with minor non-emergency type spills. Spill kits should be readily accessible to those working in the area. Only minor, non-emergency spills may be cleaned up by those working in the area. Minor non-emergency spills are limited to those spills of non-acutely hazardous materials of less than 500 milliliters in volume or 1 pound in weight. If a minor spill occurs, use the following procedures:

- Secure area, notify supervisor and others.
- Consult MSDS, determine if the spill can be managed.
- Assemble spill control equipment.
- Don the appropriate personal protective equipment
- Absorb and containerize the spilled material
- Label the container with: The contents of the container, the words "Hazardous Waste", and the accumulation start date.
- Store spill container with other compatible hazardous waste.

All spills should be reported to the designated safety manager. Always call EH&S at 6792 concerning any questions you have regarding a spill or in the event the amount spilled is greater than those listed above, or of any acutely hazardous materials is spilled. Any size spill directly to the ground or water must be immediately reported to EH&S.

VII. WASTE PICK-UP PROCEDURES

A. Hazardous waste will be delivered to the appropriate department's satellite accumulation area.

B. Containers must be labeled "Hazardous Waste" and include an exact and complete list of chemicals (no abbreviations or chemical formulas) in the container(s), amounts, and total weight or volume of chemicals.

C. Follow established procedure to dispose of accumulated hazardous waste.

VIII. WASTE MINIMIZATION

Waste minimization is any action that reduces the amount and/or toxicity of chemical wastes that must be shipped off-site for disposal as hazardous waste. The success of any waste minimization program is dependent on the conscientious participation of every individual at UNCP. There are two methods of waste minimization:

A. Source Reduction

The most desirable method of waste minimization is source reduction. This is any activity that reduces or eliminates the generation of chemical hazardous waste at the source. Good

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materials management, substitution or less hazardous materials, and good laboratory procedures can accomplish this. Examples include:

- Date chemical containers when received so that older ones will be used first.
- Purchase chemicals in the smallest quantities needed
- Label ALL chemical containers to prevent the generation of unknowns
- Avoid the use of reagents containing arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver
- Eliminate the use of chromic acid cleaning solutions altogether, and use non-hazardous solutions such as Alconox.

B. Recycling

The second most desirable approach is recycling. When a waste material is used for another purpose, treated and reused in the same process, or reclaimed for another process, it is considered recycling. Examples include:

- Purchase compressed gas cylinders only from manufacturers who will accept empty cylinders.
- Do not contaminate used oil with solvents because this prevents the oil from being recycled.
- Recirculate unused or excess chemicals within the department.
- Return excess pesticides to the distributor.

IX. HAZARDOUS WASTE STORAGE TIME LIMITATIONS

All hazardous waste generators have a time limit on how long hazardous waste can be stored once it is designated hazardous waste. For SQGs there is a 180-day accumulation storage limit for designated hazardous waste. After 180 days of storage by the SQG the hazardous waste must be sent to a permitted treatment, storage, and disposal facility.

X. SHORT LIST OF INCOMPATIBLE MATERIALS

This is not a complete list of incompatible materials. It contains some of the more common incompatible materials. Always research the material you work with to be safe.

DO NOT CONTACT

ALKALI METALS, such as calcium, potassium and sodium with: water, carbon dioxide, carbon tetrachloride and other chlorinated hydrocarbons.

ACETIC ACID with: chromic acid, nitric acid, hydroxyl containing compounds, ethylene glycol, perchloric acid, peroxides and permanganates.

ACETONE with: concentrated sulfuric acid and nitric acid mixtures.

ACETYLENE with: copper (tubing), fluorine, bromine, chlorine, iodine, silver, mercury or their compounds.

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AMMONIA, ANHYDROUS with: mercury, halogens, calcium hypochlorite or hydrogen fluoride.

AMMONIUM NITRATE with: acids, metal powders, flammable liquids, chlorates, nitrates, sulfur and finely divided organics and other combustibles.

ANILINE with: nitric acid, hydrogen peroxide or other strong oxidizing substances.

BROMINE with: ammonia, acetylene, butadiene, butane, hydrogen sodium carbide, turpentine or finely divided metals.

CHLORATES with: ammonium salts, acids, metal powder, sulfur, carbon, finely divided organics or other combustibles.

CHROMIC ACID with: acetic acid, naphthalene, camphor, alcohol, glycerine, turpentine and other flammable liquids.

CHLORINE with: ammonia, acetylene, butadiene, benzene and other petroleum fractions, hydrogen, sodium carbides, turpentine and finely divided metals.

CYANIDES with: acids.

HYDROGEN PEROXIDE with: copper chromium, iron, most metals and their respective salts, flammable liquids and other combustible materials, aniline and nitromethane.

HYDROGEN SULFIDE with: nitric acid, oxidizing gases.

HYDROCARBONS, generally, with fluorine, chlorine, bromine, chromic acid or sodium peroxide.

IODINE with: ammonia or acetylene.

MERCURY with: acetylene, fluminic acid or hydrogen.

NITRIC ACID with: acetic, chromic or hydrocyanic acids, aniline, carbon, hydrogen sulfide, flammable liquids or gases or other substances which are readily nitrated.

OXYGEN > OXYGEN with: oils, greases, hydrogen flammable liquids, solids or gases.

OXALIC ACID with: silver or mercury.

PERCHLORIC ACID with: acetic anhydride, bismuth and its alloys, alcohol, paper, wood and other organic materials.

PHOSPHORUS PENTOXIDE with: water.

POTASSIUM PERMANGANATE with: glycerine, ethylene glycol, benzaldehyde or sulfuric acid.

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SODIUM PEROXIDE with: any oxidizable substance, for instance: methanol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerine, ethylene glycol, ethyl acetate, furfural, etc.

SULFURIC ACID with: chlorates, perchlorates.

XI. BIOHAZARDOUS WASTE (Regulated Medical Waste)

Some wastes associated with biological materials must be disposed of in special ways because they may have been contaminated with infectious organisms or agents. These potentially infectious or biohazardous materials are defined by NC regulations as **Regulated Medical Waste**. These wastes include the following:

- All sharps, e.g. glass implements, needles, syringes, blades, etc. coming from facilities using infectious materials
- Biologically-cultured stocks and plates, human blood or tissues

For disposal of these wastes, the lab personnel:

1. Sterilize or disinfect waste materials associated with viral, bacterial or other agents infectious to humans (by autoclave or chemical treatment equivalent to 1:10 bleach solution).
2. Place all biohazardous wastes, except for sharps, directly into the red bag-lined medical waste boxes provided by Environmental Health & Safety (EH&S).
3. Place sharps into labeled sharps containers which when filled are placed into the medical waste box.
4. When the Medical Waste box is filled, seal the bag liner and box and notify your contact person for pick-up.

IMPORTANT LABELLING REQUIREMENT: Lab personnel must apply an adhesive-backed label completed with generator information to each bag or container (such as autoclaved bags or filled sharps containers) placed into the medical waste box. EH&S provides such a label that has space to record Date, Building, Lab #, and Contact Person. Apply this label to all containers placed inside the medical waste box AND to the exterior of the sealed medical waste box before it is made available for pick-up. Alternatively, the inner bags and containers can be marked clearly with a permanent marker to indicate "UNC-Pembroke, Pembroke, North Carolina."

Other wastes generated in these facilities that are not contaminated with biological agents or materials **are not** treated as biohazardous and may be discarded in the regular trash container, with recyclables, or into other specially designated waste containers. These include such items as recyclable and non-recyclable waste glass, gloves, unused plates or tubes, etc.

In order to clarify how these various wastes are to be handled in laboratories using biological materials, the waste stream chart has been developed and put into use for all departments generating research waste. It is intended for laboratories using biological and/or chemical materials.

Animal Bedding Waste

This waste is picked up by Facilities operations personnel and is not to be mixed with other waste. All animal bedding is bagged by animal care personnel and placed in specially provided gray carts for movement to the pick-up location. Bags should be filled only to a depth and weight that will allow for effective tying of the bag by animal facility staff and for ease of handling by one person. For example, several partially-filled bags should be tied and placed in the gray carts rather than one or two full bags (bag weight should not exceed 40 pounds). This will help to prevent repetitive motion injury to staff and help to prevent bags from being ripped open while being handled.

The carts are maintained a clean and in a sanitary condition by the animal facility staff. Any spills of bedding when loading the truck are cleaned up by the Facilities Maintenance trash crew.

Animal Carcasses

Freezers are provided in each animal facility for storage of carcasses that have been bagged and sealed. The frozen carcasses are picked up on a regular schedule for appropriate disposal by a contracted firm. Freezers are cleaned and defrosted as necessary by animal laboratory personnel to keep them in a sanitary condition.

Animal Waste from Animal Room

Animal bedding, carcasses, and tissue are placed in biohazard bags by the research staff. All animal bedding is autoclaved before being placed in medical waste boxes by animal care staff and disposed of in the medical waste stream. Bagged animal carcasses and tissue are placed in the provided storage freezer and removed by animal care staff to medical waste boxes for pick-up by Facilities Maintenance as part of the medical waste stream.

Patient Care Waste Disposal

All disposable wastes generated at Nursing facilities and Student Health Services (SHS) from patient rooms and as part of direct patient care are considered potentially infectious and are disposed of in the medical waste stream. Syringes, needles, and other sharps are placed in the provided sharps container which, when filled and sealed are placed in the provided medical waste box. When boxes are filled and sealed, they are removed by the custodial staff for later pick-up.

Patient care waste generated at other sites on campus by medical response personnel (i.e. Public Safety) are placed in biohazard bags and brought to SHS for medical waste disposal or handled by responding EMS personnel.

A program is in place to ensure that needles and syringes generated as part of personal diabetes care will not be an exposure hazard to others. Collection containers are available

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from SHS which, when filled, are returned to Student Health for proper disposal in the medical waste stream.

Broken Glass and Other Sharp Objects

Place non-contaminated glassware and non-regulated sharp objects in a plastic bag, within a cardboard box. EH&S recommends this manner for disposal of all glass items.

Housekeeping will pick up these boxes if they are sealed and identified with a label indicating: **“CAUTION, GLASS AND SHARPS, NONHAZARDOUS MATERIAL ONLY”**. You can acquire labels from EH&S.

Regulated Sharps

North Carolina law required special handling of hypodermic needles, syringes with attached needles, capillary tubes, slides and coverslips, and scalpel blades. Dispose of these items in a hard-walled container. You must use one-gallon metal cans for accumulation and disposal of regulated sharps. Glass bottles are not acceptable, as they could break during handling or compaction. Metals cans are available from EH&S. Do not overfill these cans; this could expose personnel to sharps protruding out the lid opening.

For non-infectious regulated sharps, you can place the metal cans into a “glass or sharps” box for disposal when the can fills. You can also place these in the ordinary trash for disposal. Make sure to tighten and tape the lid before disposing of the can. The can must be labeled for non-infectious waste only. For disposal of infectious regulated sharps, such as needles and scalpels contaminated with known or suspected human pathogens, you must label the metal can with a biohazard symbol. This indicates that the can must be steam sterilized (autoclaved) before disposal. Similar to the requirements for bags of infectious waste, make sure to put heat-sensitive autoclave tape in an X-pattern over the biohazard symbol on the metal can prior to autoclaving and disposal.

Do not use plastic-walled containers for disposal of infectious waste sharps. These containers cannot withstand autoclaving, and require incineration for disposal. Do not use these containers for disposal of non-infectious waste either; these containers do not belong in the waste stream that goes to the landfill. The county landfill could reject an entire waste load from the University if they found a single plastic-walled sharps container in it.

Other Regulated Sharps

Place broken glass and other sharps contaminated with carcinogens or radioactive material in the containers provided for these waste streams. Metal cans are not suitable for sharps contaminated with trace carcinogens or short-lived radioactive material, since these wastes are incinerated. Plastic walled containers with tight fitting lids are appropriate for disposal of these waste streams.

For long-lived radioactive materials, any type of hard-walled container is suitable.

Disposal of Compressed Gas Cylinders

Disposal of non-returnable, e.g., lecture-sized cylinders that are not “empty” can be very expensive, especially for reactive gases. Compressed gas suppliers generally are not licensed to receive hazardous waste, and thus cannot accept non-returnable cylinders.

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However, suppliers can accept reusable cylinders with residual gas. Make every effort to purchase from suppliers who have a cylinder return program.

Disposal of Infectious Waste

You must decontaminate infectious wastes before disposal to sewerage system, general waste, chemical waste, radioactive waste or any other disposal system. Liquid infectious wastes such as human blood or pathogenic cultures must be autoclaved prior to sanitary sewer disposal. Do not attempt to disinfect this waste with bleach.

Decontaminated wastes placed into general waste must be in an autoclaved bag marked with heat sensitive tape to signal that the material has been decontaminated.

XII. DISPOSAL OF RADIOACTIVE WASTES

It is important to dispose of **radioactive wastes** in accordance with radiation protection regulations. This avoids exposure to personnel and contamination of the environment. It also avoids regulatory penalties and the possible loss of radioactive material use privileges. Radioactive wastes are not permitted to be disposed in the sanitary landfill and must not be placed in any container used for the collection of non-radioactive waste, no matter how temporary the use is intended.

Key terms are identified by bold type and defined at the end of the Chapter.

Disposal to the Sewer

Only trace quantities of radioactive material associated with glassware cleaning may be discarded to the sewer. Specific authorization from the Safety Office is required for any exceptions. All authorized releases must occur in a designated, posted drain. Records of each release, including radionuclide, quantity, chemical and/or physical form, date, and time must be documented and maintained.

Segregation and Packaging Radioactive Waste for Pickup

EH&S will provide assistance in obtaining radioactive waste **containers** and in the removal of **radioactive wastes** from laboratories. Each container requires the completion of a Radioactive Waste Disposal Record. Blank records are delivered with empty containers and are also available from EH&S. Three standard containers are used; specially marked cardboard boxes for dry waste, 4 liter glass bottles for **liquid waste**, and 30-gallon drums for scintillation vials. Specific authorization from the EH&S is required for any exceptions.

All waste must be **segregated** by half-life category:

- a. Short-lived, half-life \leq 165 days;
- b. Long-lived, half-life \geq 165 days.

There are seven types of **radioactive waste**:

1. Biological Materials *and animal carcasses*,
2. Dry Solids,
3. Liquids,
4. Scintillation Vials,

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5. Source Vials,
6. Mixed Wastes, and
7. Pigs, *shielding*.

The following packaging requirements must be met for waste removal.

1. **Biological Waste**

- a. Segregate wastes according to half-life category:

Short-lived, half-life \leq 165 days,
Long-lived, half-life \geq 165 days.

Tritium (^3H), carbon 14 (^{14}C), and Iodine 125 (I-125) in concentrations less than 0.05 $\mu\text{Ci/g}$ (μCi = microcurie; μCi A unit or quantity of radiation equivalent to one-millionth of a curie).

- b. Place waste in a clear plastic bag in a freezer.
- c. Each bag must be labeled with a radioactive materials sticker, listing the Authorized User's name, radionuclide, activity and date.
- d. The serial number from the Radioactive Waste Disposal Record must be written directly on the plastic bag, using a "permanent" marker.

2. **Dry Waste**

- a. Segregate wastes according to half-life category.
- b. No free liquids, lead shielding, scintillation vials or organic solvent are allowed.
- c. **Sharps must be placed in a hard-walled plastic or cardboard container before being placed in the dry waste box.**
- d. Infectious dry wastes must be sterilized by autoclaving before placement in radioactive waste containers. Autoclaving radioactive infectious waste must be specifically approved by the Radiation Safety Office.
- e. Source vials containing short-lived radionuclides may be placed in the short-lived dry waste box after first removing any lead shielding material. Do not place source vials in the dry waste box if they create unacceptable radiation levels (> 2 mrem/hour at 1 foot from a box).
- f. Empty source vials for long-lived radionuclides may be placed in the long-lived dry waste. Residual liquids, up to a few milliliters, may be absorbed on a pad or towel and added to the dry waste container. This procedure may be used only for source vials containing less than 10 mCi.
- g. Minimize the amount of glass and metal by washing these materials and disposing as ordinary trash.
- h. To prepare the box delivered by the EH&S:
 1. Turn the folded box upside down.
 2. Fold the bottom flaps with opposing sides in (do not weave).
 3. Secure bottom flaps with reinforced packaging tape.
 4. Turn the box to the upright position.
 5. Place the yellow plastic bag provided by the EH&S in the box and fold the bag opening over the lip of the box.
- i. Prior to requesting pickup, the box must be close by sealing the bag with tape and taping the lid in place. Tape the Radioactive Waste Disposal Record to the top of the box

3. **Liquid Waste**

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- a. The bottle is delivered with a blank yellow tag attached.
This tag must contain the following before waste is added:
Authorized User's name.
Radioactive Waste Disposal Record Serial Number.
Radionuclide(s),

When the bottle is full, the tag must also include:

Activity
Date when the activity is recorded.

- b. Segregate wastes according to half-life category.
- c. Do not mix biodegradable and non-biodegradable liquids.
- d. No solids, including filters, pipette tips, stir bars, gels and vials, are allowed.
- e. Use only the four-liter bottles provided by EH&S, unless other arrangements have been made with the EH&S Hazardous Materials Manager.
- f. Glass bottles must have secondary containment (rubber safety bucket or plastic container).
- g. Leave at least a 10% headspace.
- h. Chemical constituents, including water and scintillation media trade names, and their percentages must be listed on the Radioactive Waste Disposal Record.
- i. Remove external contamination prior to waste pickup.

4. Scintillation Vials

- a. Use only drums provided by EH&S.
- b. Segregate by half-life category.
- c. Vials must be packed upright in flats or sealed plastic bags containing no more than 100 vials. Place these bags in a lined drum.
- d. Segregate vials according to the type of scintillation media:
Biodegradable or non-hazardous media that do not meet the criteria of a hazardous waste.
Non-biodegradable or ignitable, which becomes a mixed waste during use.
- e. Chemical constituents or scintillation trade names must be listed on the Radioactive Waste Disposal Record.
- f. No dry vials, test tubes, dry wastes or non-scintillation fluids are allowed.
- g. Vials must have tight, secure tops to prevent leakage during storage and waste handling.

5. Source Vials

- a. **Source vials** containing short-lived radionuclides may be placed in the short-lived dry waste box. Do not place source vials in the dry waste if they create unacceptable radiation levels (>2 mrem/hr at 1 foot from the box).
- b. Empty source vials for long-lived radionuclides may be placed in the long-lived dry waste. Residual liquids, up to a few milliliters, may be absorbed on a pad or towel and added to the dry waste container.
This procedure may be used only for source vials containing less than 10 mCi. Otherwise, the residual contents must be emptied into the appropriate liquid waste container.
- c. Contact EH&S for removal of:
Long-lived sources with activities greater than 10 mCi,
Short-lived sources which yield surveys of > 2 mrem/hour at 1 foot from a vial or source.

6. Mixed Wastes

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Liquids and scintillation vials are subject to EPA regulation if they possess characteristics of hazardous waste. These characteristics include ignitability (flashpoint < 140 0 F) and corrosivity (pH < 2 or > 12.5). Failure to comply with the following rules may result in EPA fines of up to \$27,000 per day per occurrence.

a. *All containers of mixed waste must be labeled or marked with the words "Hazardous Waste".*

b. *All containers of mixed waste must remain closed at all times except when waste is being added or removed to the container.*

7. **Pigs**

Lead pigs or other lead-containing materials must not be placed in the radioactive waste containers. The lead will be picked up and recycled. These items must be wipe-tested for removable contamination prior to calling for a pickup. A copy of the survey results, in DPM, must be attached to a Radioactive Waste Disposal Record. Removable contamination must not exceed 600 DPM.

• **Radioactive Waste Pickup**

Call the appropriate satellite accumulation area, to request a pickup of **radioactive waste** and replacement of containers. Administrative Support will ask for the following information:

- Authorized User's name,
- Caller's name,
- Building name and room number,
- Phone number,
- Type of waste (biological, dry, liquid, scintillation vials, source vials, pigs),
- Serial numbers (from Form 102) for each waste container to be picked up, and
- The number and type of replacement containers needed.

Calls must be received by noon on Friday for waste to be scheduled for pickup the following week.

• **Radioactive Waste Readiness Checklist**

Before requesting a pickup of waste, check to ensure that the following has been done:

1. **Dry Waste**

- a. Liner sealed,
- b. Lid taped on box, and
- c. **Radioactive Waste Disposal Record** is completed.

2. **Biological Waste**

- a. Sealed in clear plastic bag,
- b. Frozen,
- c. Labeled with permanent marker,
- d. List weight of waste,
- e. List activity / weight in uCi/g, and
- f. **Radioactive Waste Disposal Record** is completed.

3. **Scintillation Vials**

- a. Liner sealed,
- b. Lid placed on drum,
- c. List name of media or chemical constituents, and
- d. **Radioactive Waste Disposal Record** is completed.

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4. Liquids

- a. Lid in place,
- b. 10% head space, and

c. **Radioactive Waste Disposal Record** and yellow tag is completed.

• **Laboratory Radioactive Waste Procedures**

Only standard **radioactive waste containers**, provided or approved by EH&S are allowed. The building dumpster pickup times and housekeeping information must be completed in the space provided on the procedure, and it must be conspicuously posted at each **radioactive waste container or waste storage** area.

• **Shared Space for Storage of Radioactive Waste**

Two or more Authorized Users may enter an agreement and be approved for a single, shared **radioactive waste** storage space. A shared space approval offers significant space-saving advantages. It also requires excellent mutual responsibility and cooperation between the Authorized Users and their staffs. Each member of the agreement must work to assure that the group consistently meets all the associated safety requirements. These requirements include:

1. Each person must be an Authorized User and be individually approved for the room.
2. The room must be posted and secured by lock. Access control must be sufficient to preclude entry by unauthorized persons. The room must be locked when unattended.
3. Each Authorized User is responsible for conducting monthly radiation safety surveys of the room. A single individual may do the survey or each Authorized User may conduct their own. In any case, a copy of each monthly survey must be maintained by each Authorized User.
4. Multiple Authorized Users may share **radiation waste** collection **containers**, if they individually maintain the required **Disposal Record** sheet and record the identity of the appropriate Authorized User with each record entry.
5. Good radiation safety practices shall be maintained.
6. Good housekeeping practices shall be maintained.

Room authorization will be terminated for individual Authorized Users who do not meet these requirements. The room authorization will be terminated for all Authorized Users if these requirements are not met and no responsible individual can be identified.

• **Definitions:**

Biodegradable - Refers to scintillation cocktails, which contain no hazardous chemical constituents.

Biological Waste - Animal carcasses and bedding material contaminated with radioactive material.

Container - Refers to a box, bottle or drum in which radioactive waste is collected and transported.

Dry Waste - Radioactive waste that does not contain free liquids. Dry waste may be damp from aqueous materials, but must not contain organic solvents or other material regulated as a hazardous waste.

Liquid Waste - Radioactive waste material to be disposed of that does not contain solids.

Mixed Waste - A radioactive waste that also exhibits the characteristic of a hazardous waste. Examples include chloroform, solvents with a flash point less than 140o and corrosive liquids with a pH <2 or >12.5.

Non-biodegradable - Refers to scintillation cocktails that contain hazardous chemical constituents (solvents).

Non Water Miscible Liquid - A liquid that is not miscible in water, e.g., chloroform, xylene, benzene, toluene, etc.

Pigs - A shielded container used in the transport and storage of source vials. Pigs are constructed of lead, plastic, or a combination of the two.

Radioactive Waste - Material to be disposed of that contains, or may contain, radioactive material.

Radioactive Waste Disposal Record - Also called the Form 102 (Appendix A). This is a record of all waste collected in a container. It is to be completed by the laboratory generating the waste. It also serves as a DOT shipping document for the container.

Scintillation Media - A liquid preparation to which a radioactive specimen is added for assay in a liquid scintillation counter. There are two categories of scintillation media waste: biodegradable and non-biodegradable.

Sealed Source - A capsule containing radioactive material designed to be used without opening. Federal and State regulations prohibit opening sealed sources.

Source Vial - A vial in which stock radioactive material is delivered.

Water Miscible Liquid - A liquid or mixture of liquids that is miscible in water, e.g., water, mineral acids, acetic acid, ethanol, methanol, acetone, phenol, etc.

XIII. Access to MSDS Online

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XIV. Training

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