

APPENDIX 6

HAZARDOUS WASTE DISPOSAL POLICY AND PROCEDURES

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POLICY FOR THE DISPOSAL OF CHEMICALS

Section I - General Information

A. Purpose

The purpose of the following policy and procedures is to ensure that all hazardous waste is properly and safely managed, from its generation through handling, storage, and preparation for transportation. This policy covers the responsibilities of both the individuals generating the waste (i.e. laboratory personnel) and the Environmental Services Group (i.e. Rutgers Environmental Health & Safety). The management of hazardous waste shall be conducted in accordance with all applicable local, state, and federal laws and regulations.

Rutgers Environmental Health and Safety (REHS) routinely coordinates the collection of all unwanted chemicals. You are encouraged to recycle chemicals that are not expired and that are usable within your department. REHS will also collect and offer chemicals for recycling. A chemical inventory is available on the REHS website.

The following procedures must be followed for the disposal of all unwanted chemicals. These Procedures apply to chemicals that REHS does not authorize for disposal in the regular trash. For information regarding Chemicals allowed for drain disposal, please refer to the Waste Treatment & Drain Disposal section of this policy. The Waste Treatment & Drain Disposal section of the policy contains a list of chemicals that can be disposed of via the sanitary sewer system.

This Hazardous Waste Policy, does not apply to radioactive waste, Regulated Medical Waste (RMW), and mixed wastes (i.e. hazardous waste & radioactive waste or hazardous waste & RMW), each of which is covered by a separate policy.

B. Definitions

General Definitions & Acronyms

Bulking – the consolidation of compatible wastes into a single container for storage/shipment.

Lab Pack – the consolidation of containers of small quantities of waste (i.e. out dated chemicals in their original containers) into a single container for storage/shipment.

EPA – Environmental Protection Agency

ESB – Environmental Services Building

ESG - Environmental Services Group

“P” Listed Waste - Specific chemicals that the EPA deemed Acutely Hazardous wastes when discarded and listed as hazardous wastes from commercial chemical product, intermediates, and residues. These substances have a “P” number and are subject to more rigorous management requirements. The empty containers for “P” waste are to be managed as hazardous waste.

RCRA – Resource Conservation and Recovery Act

REHS – Rutgers Environmental Health & Safety (Department)

SAA - Satellite Accumulation Area – This is a location within a laboratory or room where hazardous waste is stored. The regulations specify for this area to be located “at or near any point of generation” and to be “under the control of the operator” generating the waste.

Definition of Hazardous Waste

Hazardous waste is a waste that is dangerous or capable of having a harmful effect on human health or the environment. A discarded material will be deemed a hazardous waste if it exhibits any of the four hazardous waste characteristics identified below, or if it is contained on one of the four separate types of “listed waste”, identified below.

Characteristic Hazardous Waste (All D-Codes):

- Ignitability: liquids with a flash point of 140°F or below, oxidizers, or spontaneously combustible materials (D-Codes)
- Corrosivity: pH ≤ 2 or ≥ 12.5 , (D-Codes)
- Reactivity: materials that readily explode or undergo violent reactions (D-Codes)
- Toxicity: wastes likely to leach dangerous concentrations of toxic chemicals into ground water (D-Codes)

Listed Hazardous Waste (F, K, P & U-Codes):

- Listed Hazardous Wastes from Nonspecific Sources (F-Codes)
- Listed Hazardous Wastes from Specific Sources (K-Codes)
- Listed “Acutely Hazardous” Waste, from discarded commercial chemical products (P-Codes)
- Listed “Toxic” Waste from discarded commercial chemical products (U-Codes)

Hazardous waste will generally include: all organic solvent waste and solid residues containing those solvents; most waste acids, alkalis, and other corrosive materials; some materials containing heavy metals, explosives, highly reactive materials; and many discarded process chemicals or laboratory reagents. All aerosol cans, which are full or partially full, will be disposed of as hazardous waste. Product wastes containing greater than 10% alcohol will be regarded as ignitable material and disposed of as hazardous waste. More information on the identification and listing of hazardous waste can be found in the Code of Federal Regulations, Title 40, Part 261, and is available on the United States Government Printing Office website: <http://www.access.gpo.gov/nara/cfr/index.html>.

Section II – Generator / Laboratory Personnel Responsibilities

A. Waste Generation & SAA Management

Waste Generation:

- Waste chemicals must be collected in individual, leak proof, sealed containers. The chemicals must be compatible with container material (*e.g.* acids must not be placed in a metal container). Glass containers may be safely used for virtually anything except hydrofluoric acid, acid fluoride salts, and very strong alkalis.
- Waste chemicals must not be placed in an unwashed container, which contains any incompatible residual material, from previous chemical storage.
- Select the smallest container available that will properly hold the material, with sufficient headspace above the surface of the liquid to allow room for expansion. Five-gallon carboys, pails, and fifty-five-gallon drums are available from REHS as needed. Do not use your own drums or pails without prior approval from REHS, as they may not meet US Department of Transportation requirements.
- Any containers holding a hazardous chemical or waste shall be kept securely closed, so there is no leak of hazardous waste or escape of vapors during storage, except when it is necessary to add or remove chemicals or waste. Ensure that lids, bungs, or rims are tightly in place.

- Broken or intact hypodermic needles or syringes that are contaminated by chemicals **must not** be disposed with medical waste. This includes needles that have been used in chemical laboratories **only** for chemical procedures such as the removal of a solution from a vial through a septum or adding liquid to a gas chromatograph. Collect these (chemically contaminated syringes and sharps) in a separate sharps container that is appropriately labeled with the Rutgers University black and white hazardous waste label. Please place the Rutgers hazardous waste label (or place an X) over the biohazard symbol on the sharps container.
- See Section IV for Waste Treatment, Drain Disposal and Waste Minimization information.

Container Labeling

- All containers must be clearly identified and labeled with the proper chemical name(s) of the substance(s) at the start of collection. Trade names, acronyms, abbreviations, codes, or formulas **are not acceptable**.
- All chemical waste which cannot be recycled, because it is either spent, past the manufacturer's expiration date, or has been mixed or contaminated with another substance must be labeled with a Rutgers University black and white **Hazardous Waste Label**. This label must be affixed to the container prior to adding any waste material into the container. It is also acceptable to write the words "Hazardous Waste" on the original manufacturer's label. Note the latter is only acceptable if the chemical is in its original container. Hazardous waste labels may be obtained by calling REHS. **Waste Labeling (or writing the words "Hazardous Waste" on the manufacturer's label) must not be completed on bottles containing unopened / unexpired pure chemicals, as these materials may be recycled (by redistribution). Please place these chemical containers in the SAA and identify them on your Request for Hazardous Waste Disposal Form as "chemicals for reuse"**.
- The concentration of each chemical or mixture component must be identified on the label. The units of concentration must be on the label together with their numerical values. When the solute is either a liquid or gas, the concentrations must be stated as, **percent by weight** or **percent by volume** or **molar concentration**. For containers being filled with multiple concentrations of a variety of compatible materials, the chemical concentrations can be added to the label when the container is full.
- The hazardous waste label must be completely filled out with all the laboratory contact information.

Unidentified Waste:

State and federal transportation regulations for waste haulers prevent REHS from collecting substances that are unidentified (unknown). The responsibility for establishing the identity of an unknown substance rests with department wishing to dispose of it. Upon request, REHS will furnish the names of state-certified analytical laboratories.

Satellite Accumulation Areas:

- Hazardous waste must be stored in the laboratory Satellite Accumulation Area (SAA), at or near the point of generation and under the control of the operator generating the waste. Typically there is an SAA in each laboratory. REHS will assist with the determination of appropriate locations for satellite accumulation areas.
- Chemical wastes must be segregated by general waste type (*e.g.* flammables, poisons, acids, and alkalis) and arranged so that incompatible substances will not mix. Incompatibles are those pairs

of substances that, when mixed, either react violently or emit flammable or poisonous gases or vapors. Below are a few general principles that must be followed for safe hazardous waste storage and chemical storage:

1. Store acids and bases separately.
 2. Keep acids apart from cyanides or sulfides
 3. Acids should never be put into steel containers.
 4. Water-reactive, strong acids such as organic acid halides, organic acid anhydrides, inorganic acid anhydrides, and strong acidic salts must be kept apart from both alkalis and water.
 5. Oxidizing agents must be kept apart from reducing agents and organic compounds.
 6. Water-reactive agents must be stored apart from water, aqueous solutions, and acids.
 7. Air-reactive materials must be packed in containers that are sealed off from the atmosphere.
 8. Explosive and shock-sensitive materials present risks that require special handling. Consult with REHS before handling or preparing for disposal.
- Hazardous waste must be stored in secondary containment. Incompatible materials must not be stored in the same secondary containment bin.
 - Containers must be arranged so that identification is readily visible.
 - State and federal regulations allow up to fifty-five gallons of hazardous waste, or one quart of acutely hazardous waste in a Satellite Accumulation Area (SAA). Once accumulation limits are met, container labels must be dated with the start date excess accumulation begins. When the limit is reached, excess waste must be removed from the SAA within three days.
 - Do not allow spill residues to accumulate in the bottom of the SAA bins.

Acutely Hazardous Waste Information (P-Listed Waste):

Acutely hazardous wastes are listed in 40CFR261.33(e), (also see appendix 1 of this Policy). They may be a commercial chemical product, off-specification commercial product, spill residues of an acutely hazardous material, or a substance is the sole active ingredient of a formulation (*e.g.* pesticides). The list of acutely hazardous waste is available on the REHS website.

Daily Laboratory Inspections:

- Waste containers must be inspected daily for signs of leakage, corrosion or any other forms of deterioration.
- Check to ensure that all containers are capped and properly labeled. These inspections need only be visual and do not have to be documented.
- Any containers found to be leaking or deteriorating must have their contents transferred into a new container.
- Any spillage that occurs when adding waste to the container must be cleaned up immediately.

B. Request for Waste Removal

Request for Waste Pick-up / Removal

Hazardous waste collection is performed by REHS on a routine basis and can be requested by faxing a hardcopy request or by an electronic submission through the REHS web site (see below for details). With either method, the requestor must include the following information:

- Requester: The name of the person submitting the form. This person should have knowledge of the waste in the event that REHS personnel have questions.
- Telephone #: A contact number for the requester or someone else with knowledge of the waste.
- Substance Location: Include the building name and room number. In addition, if the SAA is not readily apparent, the location of the waste container should also be noted in the event that REHS performs the waste pick-up when no lab personnel are present.
- Chemical Name: Use full chemical names. Do not use formulas or abbreviations. Include all the constituents of each waste container.
- Quantity: Include the number of containers of waste and their volumes.

Example:

Water 50%, Acetonitrile 30%, Methanol 20%	2 X 5 gallon cans
Water 50%, Acetonitrile 30%, Methanol 20%	4 X 1 gallon bottles
Acetone 100%	3 X 1 liter bottles
Hydrochloric Acid 90%, Mercuric Chloride 5% Lead Citrate 5%	1 X 100 ml

- If REHS supplies you with 5-gallon waste cans or pails, be sure to note how many replacement containers are needed. Note any additional information about the waste that you feel may be pertinent.
 - In the event that waste containers to be collected are intermingled with containers that you want to keep, it is helpful if you mark which containers that are being offered for disposal.
 - Remember that REHS cannot accept unknown materials. All waste containers must be labeled and their contents identified.
 - All waste containers must have a tightly fitting cap that will not leak during transport. Be sure that you have the correct cap for your bottle. The bottles of the various chemical manufacturers all have differently threaded caps that are not interchangeable with one another, (i.e. Fisher bottle caps do not fit Aldrich bottles and vice versa). Improperly capped waste bottles **will leak** and will not be picked up by REHS..
 - **Request for Hazardous Waste Disposal can be sent by one of these two methods**
(Blank forms can be obtained from REHS or copied from Appendix 2 of this Policy)
 - Via Fax to: **732-445-3109**
 - Via Email on Web Page at: **rehs.rutgers.edu.**
Click on “**Environmental Services**”
Click on “**Hazardous Waste Disposal**”
Complete the necessary information
Click on “**Submit**” at the bottom of the form
- [Click Here to Access](#)
- For the New Brunswick/Piscataway campuses, the pick-up will occur within 5 to 10 working days after the request form is submitted. REHS schedules routine hazardous waste pick-ups on the Newark and Camden campuses every 30 to 60 days. Manage your waste accordingly. Do not wait to submit a request form until your waste containers are completely full.

Section III – REHS Environmental Services Responsibilities

A. Waste Handling & Storage Prior to Shipment

Waste Handling

- When hazardous waste is picked up by REHS each container will be checked to ensure it is properly labeled and sealed.
- During each laboratory pick-up, an inspection of hazardous waste management will be performed. A copy will be left in the lab or with the lab contact, which outlines the necessary corrective actions.
- All waste containers are either shipped from the location for disposal or brought back to the Environmental Storage Building (ESB) on Busch Campus.
- Hazardous waste, which is brought to the ESB, is logged in the computerized Operating Record.
- The flammable solvents are consolidated (i.e. bulked) into 55-gallon drums. These drums are stored in the Flammable Storage Room of the ESB.
- The other “lab pack” waste is segregated by waste type and stored in the Cell Storage Section of the ESB.
- The “lab pack” items are segregated according to their classification until a sufficient amount is available for packing. Prior to shipping, compatible “lab pack” items are packed into a drum or other container and prepared for shipment.

B. Waste Shipment

- The REHS Environmental Services Group (ESG) will make all arrangements for proper off-site disposal hazardous waste.
- All drums require the proper hazardous waste (RCRA) and DOT labeling.
- The waste vendor or REHS completes the Hazardous Waste Manifest Form and packing slips.
- A **Hazardous Waste Manifest Form** is utilized for each shipment and the returned copies (from the Disposal / Transfer Site) are retained in the ESG files located at REHS.

C. Waste Inspections

Weekly Storage Location Inspections

- The ESB / Reactives shed is inspected on a weekly basis
- The Cook/Douglas 90 day Storage Shed is inspected on a weekly basis
- The Camden 90 Day Storage area is inspected on a weekly basis
- The Newark 90 Day Storage area is inspected on a weekly basis

- The Manager of Environmental Operations is responsible for scheduling an alternate inspector in the event that the primary inspector is unable to conduct the weekly inspection (i.e. sickness, vacation). If the supervisor is unable to locate an alternate inspector, the Supervisor will perform the inspection.
- Records of these inspections will be maintained at each location and annually placed in the ESG files at REHS.

Section IV – Miscellaneous Information
Treatment/Drain Disposal & Waste Minimization

A. Waste Treatment & Drain Disposal
 (pH Neutralization of acids and alkalis only)

General Information

Research and instruction in laboratories continually produces small amounts of aqueous wastes. In such cases, laboratory workers must decide whether to pour particular solutions down the drain or keep them for pick-up by REHS personnel. This guide will help them make such decisions.

Typically, unwanted chemicals are collected by REHS for disposal. This is done in accordance with Section A. "Policy for the Disposal of Chemicals." Certain materials are suitable for drain disposal. These should be carefully considered to ensure they do not cause damage to the plumbing system or cause other problems such as odors in a building. The materials, which are suitable for drain disposal, are listed in the tables that follow. Other materials are prohibited from drain disposal without prior approval from REHS. If you have questions about the suitability of other materials for drain disposal, or about the proper disposal of any laboratory material, please contact REHS at (732) 445-2550.

Drain disposal of dilute acids and alkalis

Acids and alkalis, which have been rendered neutral by the experimental process may be discarded by drain disposal. Neutralization should be done in small quantities (i.e. no larger than 1 liter). This should be done as part of the experiment generating the waste. It is inappropriate to collect a quantity of waste, from multiple experiments, and conduct batch neutralization process.

Proper care must be taken to adjust solutions to a pH of between 6 and 9. Generally, 1N hydrochloric acid can be used to neutralize alkaline materials and 1N sodium hydroxide can be used to neutralize acid materials. When creating these 1N solutions, remember to SLOWLY add the acid to the water or the alkali to the water, not vice versa. Drain disposal is properly done in the following manner:

- a. Protective gear (gloves, laboratory apron, and safety goggles) must be worn.
- b. Before pouring the solution, turn on the tap to get a good flow of water to wash it down. Make sure that the sink and drain lines are washed free of any substances that will generate noxious gases when mixed with the solutions. These substances include cyanides, sulfides, bisulfides, sulfites, bisulfites, nitrates, and nitrites.
- c. Pour the solution down the drain slowly, making sure that before, during and after pouring, the tap is turned on to provide a strong flow of water that aids in washing it down the drain.

Table 1: DRAIN-DISPOSABLE SUBSTANCES

SOLUTIONS ADJUSTED TO A pH OF 6 to 9		POLYHYDROX- ALCOHOLS
Hydrobromic acid	sodium hydroxide	1,2-propylene glycol
Hydrochloric acid	potassium hydroxide	glycerol (glycerine)
Hydriodic acid	ammonium hydroxide	mannitol
Nitric acid	potassium carbonate (potash)	sorbitol
Phosphoric acid	sodium carbonate (soda ash)	
Phosphorous acid	sodium pyrophosphate	
Sulfuric acid	trisodium phosphate	
Acetic acid		
Formic acid		

ALL VITAMINS	ALL NATURALLY- OCCURRING AMINO ACIDS	ALL SUGARS
l-ascorbic acid (vitamin c)	alanine	arabinose
Choline	cysteine	fructose
Inositol	glycine	galactose
Nicotinic acid (niacin)	histidine	glucose
Pantothenic acid	leucine	lactose
Pyridoxine (vitamin b6)	lysine	maltose
Riboflavin (vitamin b2)	serine	sucrose
Thiamine (vitamin b1)	tryptophan	
	tyrosine	

CHEMICALS* COMMONLY USED ON THE FARM AND IN THE HOUSEHOLD (No pesticides of any kind)		
Acetylsalicylic acid (aspirin)	casein	sodium bicarbonate
Alum (sodium aluminum sulfate)	citric acid (sour salt)	sodium bisulfate
Ammonium alum (ammonium aluminum sulfate)	corn syrup	sodium bitartrate
Borax (sodium tetra- Borate decahydrate)	dextrin	sodium carboxy- methylcellulose
Boric acid	gelatin	sodium chloride
Calcium chloride	magnesium sulfate (epsom salt)	sodium citrate
Calcium phosphate, monobasic	potassium aluminum sulfate (potassium alum)	sodium dihydrogen phosphate
Calcium superphosphate	potassium bitartrate (cream of tartar)	sodium hypochlorite
Calcium triple superphosphate		sodium mono- hydrogen phosphate
		sodium nitrate
		sodium potassium tartrate (rochelle salt)
		sodium silicate
		sodium sulfate (glauber's salt)
		urea

* For any chemical containing sodium, the corresponding potassium or ammonium (salt) compound may be substituted.

B. Waste Minimization

Chemical Reuse

Unused and unopened chemicals being disposed of as waste due to a change in research or discontinuation of a specific research protocol will be redistributed to other laboratories that can utilize the chemical. Sharing unused chemicals will reduce the amount of chemical waste generated. Specific applicable chemicals (typically stable compounds with a long shelf life) will be picked up by REHS and segregated in the ESB. These chemicals are cataloged on a list that is available on our web page ([HTTP://rehs.rutgers.edu](http://rehs.rutgers.edu)). Please contact the REHS Environmental services group at (732) 445-1828, for delivery of a chemical for reuse from this list. The Environmental Services Group will deliver the chemical/s to your laboratory. Chemicals being redistributed will be tracked on a spreadsheet by REHS.

Microscaling

Microscale chemistry is a pollution prevention method that decreases the amount of chemical waste generated during laboratory experiments. This concept was first introduced by chemistry professors at Bowdoin College in Brunswick, Maine. Standard chemistry procedures are re-written for individual experiments and specialized microscale equipment is utilized to perform the work. In some cases, the amount of a particular chemical needed for an experiment has been decreased by as much as 99 percent. Microscaling has the following benefits:

- Reduce chemical waste produced at the source.
- Improve laboratory safety by decreasing potential exposure to chemicals and reducing fire and explosion hazards.
- Improve air quality due to greatly reduced volumes of solvents and other volatile substances used.
- Reduce laboratory costs for chemical purchase and disposal.
- Reduce the time required to perform experiments due to shorter chemical reaction times.
- Decrease the amount of storage space necessary for chemicals.
- Encourage students to think about waste minimization.
- Decrease disposal costs for the university
- Increase environmental awareness for the university

Inventory Control

Each laboratory is encouraged to maintain an appropriate inventory of chemicals in their laboratory as a method to reduce unnecessary purchase and disposal. The following methods can reduce the amount of chemicals in a laboratory and minimize waste generated from expired or unwanted excess chemicals:

- Check your laboratory inventory and the REHS chemical redistribution list before ordering.
- Purchase smaller containers of chemicals or fewer containers of chemicals.
- Avoid purchasing larger quantities of chemicals to save on raw material costs. (Chemical disposal costs are often much higher than the initial purchase cost.)
- Do not accept “free” samples from chemical manufacturers, unless you are certain that you will be using the materials. (Again, chemical disposal costs are often much higher than the initial purchase cost.)
- Rotate stock of chemicals in the laboratory to ensure the older chemicals are used before the newer chemicals.

Substitution of Less Hazardous Chemicals

In some instances, chemicals that are more environmentally friendly may be substituted for traditionally used chemicals.

Examples:

Propylene Glycol	instead of	Ethylene Glycol
Ethyl Alcohol	instead of	Methyl Alcohol
Alcohol Thermometers	instead of	Mercury Thermometers
Alconox, Pierce RBS35 and Nochromix	instead of	chromic acid cleaning solutions
Detergent and hot water	instead of	Organic solvent cleaning solutions

This Hazardous waste policy is designed to provide guidance for everyone at Rutgers University regarding the proper disposal of hazardous waste. If anyone has additional questions regarding hazardous waste disposal they are encouraged to contact the Environmental Services Group in REHS at (732) 445-2550.