Indiana University Northwest
Environmental, Health & Safety

Title: Hazardous Waste Management Guide

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Indiana University Northwest	1992, 1995, 1996, 2002	11/20/2003

Purpose:

This guide has been designed to assist the students, staff, and faculty of Indiana University Northwest (IUN) in the safe and economical management of hazardous waste.

Regulatory Reference:

- 40CFR260—262, Environmental Protection Agency, Hazardous Waste Management System—Standards Applicable to Generators of Hazardous Waste
- 329IAC, Indiana Administrative Code, Waste Management

Contents

Section and Title

1.0 Purpose of this Manual

This guide has been designed to assist the students, staff, and faculty of Indiana University Northwest (IUN) in the safe and economical management of hazardous waste. The Environmental, Health & Safety Office (EH&S) coordinates all facets of hazardous waste management in accordance with state and federal regulations, including the identification of hazardous wastes, hazardous waste storage and disposal, and hazardous waste minimization.

The university community plays a vital role in the management of hazardous wastes on the Northwest campus. Proper waste management is dependent upon your day-to-day handling of these wastes in your lab or worksite. Please read the *Guide* carefully and feel free to call EH&S at 981-4230 if you have any questions.

This manual does not address radioactive waste disposal. For further information on this issue, please see the *NWCME Radiation Manual*, available from the Radiation Safety Officer, Brian Kennedy.

2.0 Introduction to the Environmental, Health & Safety Office

The role of the Environmental, Health & Safety Office (EH&S) is to advise and consult in matters relating to the health, safety and the environment of Indiana University Northwest. EH&S maintains reference materials from local, state and federal agencies, particularly with regard to rules and regulations affecting campus operations, and will assist in technical interpretation of these materials.

EH&S staff function as advisors and consultants to deans, directors, heads of academic units, other staff members and students in all areas of environmental health, safety and radiological health. In addition, EH&S will conduct health and risk assessments or investigations when necessary or requested, will assist departmental safety committees in the development of departmental safety programs, and participate in health and safety training and education programs.

2.1 Hazardous Waste Management

IUN generates a wide variety of hazardous wastes. An institution as large as IU has a diverse set of operations ranging from academics to the maintenance of buildings. Nearly all facets of the university community generate some form of hazardous waste.

The following is a sample of the types of hazardous wastes generated at IUN:

- toxic, reactive, explosive, and ignitable laboratory wastes;
- waste solvents from vehicle maintenance, printing and painting operations;
- corrosive wastes from cleaning operations;
- waste photographic fixer from darkrooms; and
- other miscellaneous wastes from across campus.

2.2 Hazardous Waste Contacts

Helpful contacts include:

- Your department's safety officer
- Manager of Environmental, Health & Safety, Kathryn Manteuffel, 981-4230
- IUN Police Department, 980-6501 or 9911

To request a waste pick-up:
Environmental, Health & Safety Office 981-4230

3.0 Your Responsibilities

The success of the hazardous waste management program depends on the conscientious efforts of you and your coworkers. When hazardous materials are mismanaged, they have the potential to pollute the environment and threaten human health. Because you are handling hazardous waste on a day-to-day basis, it is essential that you follow this document's guidelines. You are expected to:

- package, label and store hazardous waste and unwanted chemical products according to the procedures listed in Sections 4.0 – 8.0 until EH&S can take possession of them for subsequent storage and off-campus disposal;
- identify and label all chemical wastes properly so unknowns are not generated;
- whenever you are in doubt, seek the advise of EH&S for procedures on how to handle and dispose of any chemical product; and
- make every effort to reduce the amount of hazardous waste you generate.

4.0 Managing Waste and Unwanted Chemicals

4.1 Our Management System

The success of our hazardous waste management program depends on your cooperation. You should use this management guide to identify hazardous wastes and determine their appropriate route of disposal.

There are three routes of disposal for waste chemicals:

- management by EH&S-You may request an EH&S pickup of your waste and unwanted chemicals;
- disposal of non-hazardous materials into the normal trash or sanitary sewer; and
- chemical treatment, such as neutralization, followed by disposal into the sanitary sewer system. *NOTE: Any treatment method other than neutralization must be incorporated into an experimental procedure to be considered legal.*

When your surplus chemicals are given to EH&S, we first determine whether the chemical is indeed a waste, or whether it can be reused or recycled. If it is a waste, we determine the degree of hazard and the appropriate disposal route. Throughout this process, the university is required to keep records that account for hazardous wastes "from cradle to grave."

Most of your waste is likely need to be handled by EH&S. Waste that can go to the sanitary sewer or be placed in the normal trash is limited due to safety, environmental and legal considerations. If in doubt, it is prudent to have EH&S characterize your waste and determine how it should be managed.

4.2 Hazardous Waste Minimization

The Resource Conservation and Recovery Act (RCRA) outlines proper hazardous waste management, placing special emphasis on waste reduction and recycling. Through waste minimization, you can help reduce unnecessary expenditure of university funds (and ultimately your department's funds) on waste disposal and material procurement by following the guidelines below.

- **Inventory your chemicals**: The most important step you can take toward waste minimization is to maintain a running inventory of chemicals present in your lab. An inventory will prevent you from ordering more of what you already have. It also helps you to store chemical properly and can be an invaluable tool in emergency situations.
- **Order only what you need**: Don't buy a kilogram of material when you plan to use only a few grams. The economy of larger sizes may be offset by the cost of disposing of your excess. Before ordering chemicals, check your current stock; and it may be possible to borrow small amounts of chemicals from other labs. Please take the time to check.
- **Use recycled chemicals whenever possible**: We have an ongoing secondhand chemical program for usable but unwanted chemicals. All secondhand chemicals are in their original containers and may still have their factory seals. Before you call EH&S for disposal or your unwanted but usable chemicals, please check to see whether other labs in your department can use the material. You may contact EH&S for our secondhand chemical inventory before ordering, as well.
- **Substitute non-hazardous or less hazardous materials**: There are many non-hazardous substances for commonly used chemicals, such as chromic acid (see Appendix A). Other alternatives may be much less toxic. These substitutions can be done with satisfactory results in most cases.
- **Do not mix hazardous and non-hazardous waste**: Non-hazardous waste, when mixed with hazardous waste, will become hazardous itself. Do not mix small quantities of hazardous waste with non-hazardous waste because it will increase the volume of hazardous waste produced. Likewise, high concentration waste should not be mixed with low concentration waste.

5.0 What is Hazardous Waste?

This section will help you determine which of your chemical wastes are hazardous. For practical purposes, consider all waste hazardous unless it is listed in Appendix B. The United States Environmental Protection Agency (EPA) and the Indiana Department of Environmental Management (IDEM) consider a waste to be hazardous if it:

- is a listed hazardous waste, or
- exhibits certain hazardous characteristics (see Section 5.1 below).

In addition, EH&S considers numerous other toxic substances to be hazardous. The waste is considered "toxic" if:

- it has an oral LD_{50} for a rat of less than 500 mg/kg;
- the container that the chemical came in identifies it as a toxic or poisonous material; or the chemical is a known or suspected carcinogen, mutagen or teratogen.

A chemical waste exhibiting any of these five criteria is hazardous and must be managed accordingly. When it doubt, have EH&S determine if your waste is hazardous. The remainder of this section provides a detailed discussion of the definition of hazardous waste. Sections 6.0 and 7.0 detail the proper management procedures for chemical wastes.

5.1 Hazardous Waste Characteristics

EPA and IDEM regulate waste materials that meet one or more of the following physical characteristics as hazardous waste.

5.1.1 Ignitability

Ignitable wastes are capable of causing or intensifying a fire during routine handling. A waste is characteristic for ignitability if it has any one of the following properties:

- a liquid with a flash point less than 140^{O} F (60^{O} C);
- a solid, 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;
- an ignitable compressed gas; or,
- an oxidizer.

Examples include, but are not limited to, most organic solvents such as:

Acetone	Ethyl ether	Pentane
Benzene	Heptane	Petroleum ether
Ethanol	Hexane	Toluene
Ethyl acetate	Methanol	Xylene

5.1.2 Corrosivity

Corrosive wastes include highly acidic or highly alkaline chemicals and those that are capable of corroding metal. A waste has the characteristic of corrosivity of it has one of the following properties:

- an aqueous waste with pH 2 or less, or pH 12.5 or greater; or,
- a liquid that corrodes steel at a rate greater than 6.35 mm (0.25 inches) per year.

If a waste exhibits ONLY the characteristic of corrosivity and is NOT a listed waste, it may be neutralized before disposal to the sanitary sewer (see Section 6.1.1). When in doubt, or if neutralization is not feasible, EH&S should manage the waste.

5.1.3 Reactivity

A waste has the characteristic of reactivity if it:

- is normally unstable and readily undergoes violent change without detonating;
- reacts violently with water;
- forms potentially explosive mixtures with water;
- mixes with water to generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment;
- is a cyanide or sulfide bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment;
- is capable of detonation or explosive reaction if subjected to a strong initiating source or heated under confinement;
- is readily capable of detonation or explosive; or,
- is a forbidden explosive or a Class A or Class B explosive.

5.1.4 Toxicity

Toxicity is determined by the "Toxicity Characteristic Leachate Procedure " (TCLP), a laboratory test that measures the concentration of the toxic material that could leach into the ground water if improperly managed. The TCLP must be conducted on any waste that contains any of the specified TCLP contaminants. These contaminants include toxic metals such as lead and mercury, organics such as benzene and chloroform, and pesticides such as endrin (see Appendix C).

NOTE: EH&S assumes any chemical waste with any of the specified TCLP contaminants to be hazardous.

6.0 Management of Specific Waste Types

The following are the techniques and requirements for the management of specific types of hazardous waste. Please adhere to these guidelines. If you have any questions, contact EH&S immediately.

6.1 Acids or Bases, Concentrated Solutions

This section explains the disposal of concentrated solutions of acids, such as hydrochloric, nitric and sulfuric acid, and bases such as ammonium hydroxide.

It is best to turn over concentrated solutions of acids or bases to EH&S due to the work involved in neutralization. Use only disposable containers for waste with a pH less than 3 or greater than 12 because these containers will not be returned.

Any waste that exhibits ONLY the characteristic of corrosivity and is NOT a listed waste can be

neutralized to within a pH range of 5 to 9 before disposal in the sanitary sewer. Flush waste with at least 20 parts water. When in doubt, or if neutralization is not feasible, dispose of the waste through EH&S.

6.1.1 Neutralization Procedures

CAUTION: Vapors and heat are generated during neutralization.

If you choose to neutralize and subsequently dispose of these materials yourself, please adhere to the handling guidelines in the *Laboratory Chemical Safety Plan.*

- ***No not neutralize strongly oxidizing acids such as perchloric acid and chromic acid.***
- Perform all steps slowly.
- Keep containers cool while neutralizing.
- **Acid neutralization**: While stirring, add acids to large amounts of an ice-water and base (sodium carbonate, calcium hydroxide, or 8M sodium hydroxide) solution.
- **Base neutralization**: First add base to a large vessel containing water. Slowly add 1 M solution of hydrochloric acid.
- Neutralize concentrated acid and base solutions to within a pH range of 5 to 9, and then flush them into the sanitary sewer with at least 20 parts water.

6.1.2 Chromic Acid

Chromic acid is a powerful oxidizing agent. It is both toxic and corrosive and can explode on contact with organic materials. Users of chromic acid cleaning solutions have suffered burns to the skin and clothing. Hexavalent chromium is also classified as a carcinogen.

Chromic acid cleaning solutions leave a residue of hexavalent chromium on the glass surface that is almost impossible to remove. This residue has been known to interfere with certain research procedures, since the material can leach into solution.

We urge you to consider the chromic acid alternatives listed in Appendix A.

6.2 Air and Water Reactives

Turn over all air and water reactives, such as those listed below, to EH&S. Package any liquids separately from solids and note any special hazard and/or handling precautions on the waste tag. Examples of these chemicals include:

Acetyl chloride	Lithium metal	Sodium metal
Bromine	Phosphorus (yellow)	Thionyl chloride
Calcium metal	Potassium metal	Trichlorosilane

6.3 Aqueous Solutions of Toxic Metals

All solutions containing toxic metals must be disposed of by EH&S. These include:

Aluminum	Chromium	Nickel

Arsenic	Copper	Selenium
Barium	Lead	Silver
Cadmium	Mercury	Zinc

6.4 Aqueous Solutions of Toxic Organic Chemicals

Try to keep organic wastes separate from aqueous waste so that unnecessary aqueous organic waste streams are not generated.

6.5 Chemically Contaminated Items (CCIs)

Chemically contaminated items (CCIs) can only be put into the normal trash if they are nonreactive, nonignitable, noninfectious, nonradioactive, and the contaminant is not highly toxic. This category includes such disposable lab ware as gloves, bench top coverings, pipettes, test tubes, aprons, etc.

If you feel that the normal trash is not an appropriate disposal route for your CCIs, package them in a 5-gallon plastic bag, which can then be placed conveniently in a 5-gallon plastic bucket. Label the Hazardous Chemical Waste Tag as "Chemically Contaminated Items" or "CCIs" and list chemical contaminants. Call EH&S if you have any questions.

Radioactive CCIs must be handled separately. Refer to the NWCME Radiation Manual.

NOTE: All PCB contaminated lab ware at >/= 50 ppm must be packaged separately and turned over to EH&S for disposal.

6.6 Empty Containers

Bottles are considered "empty" when you have removed all contents possible by normal means (pouring, scooping, etc.). These may be placed in the normal trash. Please triple rinse empty reactives containers.

6.7 Potentially Explosive Chemicals

Package each container of potentially explosive chemicals separately from other chemicals. Follow the packaging instructions in Section 7.0 and be sure to note on the Hazardous Chemical Waste Tag the waste's characteristics and any special handling precautions. If you do not feel comfortable handling the chemical, or are unsure of its shock sensitivity, call EH&S for assistance. Potentially explosive chemicals include:

Ammonium nitrate	Hydrazine compounds	Dry picric acid
Diazo compounds	Peroxide-forming agents	Nitrocellulose

6.8 Metallic Mercury

EH&S collects and recycles free-flowing metallic mercury. Package it tightly in a leak-free

container. Place broken mercury thermometers in a one-gallon overpack or a secured plastic bag and turn them over to EH&S.

NOTE: There are alternatives to mercury thermometers, and they should be replaced when non-mercury options are available. In addition, if you use mercury, it is imperative that you have a mercury spill kit available.

6.9 Non-Hazardous Liquid Waste

Most liquid chemical waste will need to be handled by EH&S. However, you might have some non-hazardous waste (listed in Appendix B) that can be flushed to the sewer after 20X dilution with water. These non-toxic chemicals can be flushed to the sanitary sewer because they are:

- water-soluble;
- degradable in the sanitary sewer system; and
- non-hazardous.

Non-hazardous, water-soluble solid chemicals can also be dissolved in water and disposed in the manner. All chemicals poured into the sewer must be followed by at least 20 parts water.

NOTE: If you intend to dispose of more than one liter of any of these materials, or if you are unsure whether or not you should dispose of a certain material, please contact EH&S.

6.10 Non-Hazardous Solid Waste

Most waste chemicals will need to be handled by EH&S, but you might have some non-hazardous waste listed in Appendix B that can be disposed of in the normal trash. These are solid chemicals that have very low toxicity and no positive determination of carcinogenicity. Assume all other chemicals are hazardous waste.

If you plan to dispose of any one of these non-hazardous chemicals, please make sure that it is placed in a tightly sealed container.

NOTE: If you are unsure whether or not you should dispose of a certain material in this manner, please contact EH&S. Only non-hazardous solid materials can be placed in the trash.

6.11 Peroxide-Forming Agents

Peroxides are low power explosives and are very sensitive to shock and heat. A variety of organic compounds react with oxygen from the air to form unstable peroxides. Common examples include:

Aldehydes	Miscellaneous ethers
Compounds with benzylic hydrogens	Isopropyl ether
Compounds with allyl groups	Tetrahydrofuran
Diethyl ether	Vinyls

Dioxane

One of the following conditions must be met before peroxide formers may be accepted by EH&S for disposal. These are requirements enforced by the disposal company, as well as good laboratory safety practices.

- The material must be **less than twelve months old**. This information must be marked clearly in the Hazardous Chemical Waste Tag.
- If the material is **greater than twelve months old but less than two years old**, check for peroxide formation by using peroxide paper. If peroxide formation is less than 100 ppm, add 1 tsp. of hydroquinone per pint of material to prevent the formation of additional peroxides. Mark this information on your waste tag (e.g., "<100 ppm, hydroquinone added") and turn it over to EH&S. If peroxide formation is greater than 100 ppm, CALL EH&S for technical assistance.
- If the material is **greater than two years old but less than five years old**, it should be assessed for other factors such as: duration of exposure to sunlight, volume of the container (i.e., "Is it full?"), security of the seal, exposure to changes in temperature, etc. If you do not know the answer to any of these questions, find someone who does. **Do not open the container to check for peroxide formation**, as the material could be shock-sensitive.
- If the container is **more than five years old**, do not move the container at all. Post a sign reading "DANGER: Possible shock-sensitive chemical" and call EH&S for technical assistance.

6.11.1 Safety Tips for Peroxide Formers

Date new containers when opened and turn then over to EH&S within three months of this date for Category I compounds and within twelve months for Category II and III compounds. Refer to Appendix D for these lists and the National Safety Council's recommendations for labeling of peroxidizable liquids.

- Exposure of any peroxide-forming agent to light or air increases the rate of peroxide formation. Store these agents in full, light-resistant containers.
- Refrigeration does not prevent peroxide formation.
- As is the case with all hazardous chemicals, order only those amounts that you need in order to decrease storage time.
- Be particularly cautious with materials of unknown age! Do not attempt to remove caps from containers that may cause shock or sparks. Call EH&S for advice or assistance when such containers are found.
- Never distill peroxide-forming solvents unless they are known to be free of peroxides. Peroxides concentrated in still residue can be a serious explosive hazard.

6.12 Sharps

Several categories of sharps are generated on campus, such as needles, razors, and sharp glassware. Although most are not considered hazardous waste, they do require special handling for safety reasons. **Regardless of contamination**, sharps should be placed in **puncture-**

resistant, cardboard or plastic containers and labeled as "sharps."

TYPE	PACKAGE	LABELING	DISPOSAL
Biohazardous metal and glass	Puncture proof biohazard container (red)	"sharps" and use a biohazard waste tag	Department Biosafety Officer
Radioactive	Puncture proof container	See NWCME Radiation Manual for labeling procedures	NWCME Radiation Safety Officer
Chemically contaminated	Puncture proof container	"sharps" and "CCIs"	EH&S
Uncontaminated metal sharps	Puncture proof container	"sharps" and "solid waste"	EH&S or biohazardous waste container
Uncontaminated glass	Puncture proof container	"glass sharps" and "solid waste"	Normal trash disposal

6.13 Silica Gel

Accumulate silica gel in 5-gallon plastic buckets (or 1-gallon) plastic overpacks for small generators). Store all containers closed and label "Waste Silica Gel." Only gel should be accumulated in these containers—no plastic wrap or instruments.

6.14 Solid Chemicals

Package tightly capped containers of hazardous solid chemicals, precipitates, semisolids, or gels according to the general instructions given in Section 7.0. Decant off free liquids and pack in separate containers. Assume all solids are hazardous unless they are listed in Appendix B.

6.15 Organic Solvents

Place your organic solvents in a safety can (Very small generators can use other containers if a safety can is not practical.). Label your safety can or containers as contents are added so that you will be able to account for 100% of the chemical composition of the can. Do not depend on your memory when it is time to fill out your Hazardous Chemical Waste Tag! Waste must have a pH of no less that 3 and no more than 12 or it will be rejected.

NOTE: All safety cans should be labeled with the words "hazardous waste."

6.15.1 Substances Which Should NOT Be Put Into Safety Cans

Safety cans are to be used for solvents, only. The following substances are inappropriate for incineration and should NOT be placed in your safety cans in any concentration:

- acid and base solutions
- aqueous solutions of toxic organic chemicals

- metals (e.g., Sb, As, Ba, Cd, Cr, Pb, Hg, Ni, Se, Ag)
- vacuum pump oil
- sulfides or inorganic cyanides
- strong oxidizers or reducers
- water reactive substances
- unknowns
- water
- stench compounds
- any materials which react with organic solvents

6.16 Strong Oxidizers and Reducers

Turn over all oxidizers and reducers, such as those listed below, to EH&S for proper disposal.

Strong oxidizers:	***Strong reducers:***
Chromic acid (fresh)	n-Butyl lithium
Metallic chlorates	Calcium hydride
Metallic nitrates	Metallic sulfides
Metallic perchlorates	Sodium hydride
Metallic permanganates	Stannous chloride
Perchloric acid	

6.17 Unknown Chemicals

You must make every effort to provide an accurate description of all chemicals that you give us. Unknown chemicals present serious legal and safety problems for the university. Without an accurate description, it is difficult to handle and dispose of the chemical safely. Disposal companies will not accept chemical waste without an analysis, and an analysis of one sample could cost $1000.

Often you can deduce the contents of an unknown container by locating the original generator, even if they are in another part of the country. If this is not successful, a fellow researcher may be familiar with the kinds of chemicals used in a particular research lab.

You can reduce the occurrence of unknown chemicals by being thorough in maintaining chemical container labels. Make periodic reviews of chemical stock and be sure to label all waste containers as they are filled.

6.17.1 Moving? CALL EH&S!

EH&S often receives unknown and unwanted chemicals when new personnel enter a laboratory. To alleviate this problem, it is your responsibility to sort through your chemical inventory, exchange what you can with other researchers, and turn over the rest to EH&S for characterization. Give EH&S a call if special pick-up arrangements are needed.

6.18 Vacuum Pump Oil

Uncontaminated vacuum pump oil can be recycled and should be labeled as "Used Oil" before turning it over to EH&S for recycling.

7.0 Hazardous Waste Packaging and Labeling

Good packaging increases safety in handling and transporting chemicals. Proper identification of the materials is also important. Because of hazardous waste regulations, we must know 100% of the composition of all waste materials. Please follow these rules when turning over materials to EH&S.

NOTE: Directions are summarized on the back of the Hazardous Chemical Waste Tags (Appendix E).

7.1 Container Storage

- Federal and state regulations require that all waste containers be closed while not in use. Storing an open waste container in a hood or anywhere in your work area is a violation.
- Label containers as "hazardous waste" and list contents of the container on the Hazardous Chemical Waste Tag during accumulation. Alternatively, a "hazardous waste" sticker with contents listed may be used until the waste is delivered to EH&S for disposal.
- As a general rule, different wastes (solids vs. liquids, solvents vs. aqueous) should be accumulated in separate waste containers. This simplifies cataloging of waste constituents in a particular container, reduces the risk of reaction between incompatible wastes and avoids the costly disposal of complex mixtures. This guideline does not preclude the mixing of wastes that could obviously be mixed together, such as compatible solvent waste.
- Do not put liquid waste in plastic containers, as the containers tend to degrade and leak.
- Separate and protect ignitable waste from ignition sources.
- Notify EH&S when the waste container is full and requires pickup.

7.2 General Waste Packaging Instructions

- Containers must be free of contamination on the outside, securely closed and capable of containing the waste inside. Containers size should fit the amount of waste inside as nearly as possible to reduce disposal cost.
- Do not use biohazard bags for the storage of chemical wastes.
- Containers must be labeled with a Hazardous Chemical Waste Tag. If you conduct an inventory and dispose of large quantities of unused chemicals, EH&S will waive the tagging requirement when the original labels are intact and legible. Call for details.
- Tags must state each chemical constituent present in the waste container and corresponding percentages or quantities. Toxic chemicals, other than mercury and PCBs, that constituent less than 1% may be listed as "trace." Please write legibly.
- Waste constituents must be spelled out completely—no abbreviations, formulas or

structures.
- Additional Tags may be used for more than ten constituents. Be sure to fill in the information on the top three lines of the continuation Tag, and sign and date both.
- Additional hazard information may be placed in the lower left-hand corner. A pH is required for aqueous solutions. Please allow time for reactions to end before reading pH.
- Affix Tags to containers with a rubber band.
- Hazardous Chemical Waste Tags are available from EH&S.

7.3 Additional Waste Packaging Instructions for Solvents

- Safety cans are mandatory for ignitable solvents and advised for halogenated solvents. Glass bottles are discouraged, but will be accepted from very small generators.
- Accumulate other waste streams (acids, metals, etc.) in separate containers. Solvents should be free of all other wastes, including aqueous wastes and water.

8.0 Chemical Spill Response Procedures

Accidents resulting in the release of chemicals will occur despite the best effort to work safely. It is essential that personnel have a spill response plan that includes appropriate procedures and materials to adequately contain and cleanup a spill. The following procedures should be used as a guide to help design an effective spill control plan for your work area (Refer to the Laboratory Chemical Safety Plan for information on spill kit contents, and the Chemical Spill Response Guide for detailed information on spills.).

8.1 Major Spills

In the event of a spill which:
- involves the release of a type or quantity of chemical which poses an immediate risk to health;
- involves an uncontrolled fire or explosion; or,
- involves serious personal injury;

1. Evacuate as necessary and keep others from entering the affected area until assistance arrives.
2. Dial 6501 or 9911 for assistance and be prepared to provide details of the situation.
3. Stay onsite until assistance arrives.

8.2 Minor Spills

In the event of a spill involving the release of a type or quantity of chemical that does not pose an immediate risk to health, and does not have the potential to become an emergency within a short time period:

1. Notify other laboratory personnel of the accident.

2. Isolate the area. Close laboratory doors and evacuate the immediate area if necessary.
3. Remove all ignition sources and establish exhaust ventilation. Vent vapors to the outside of the building only (open windows and turn on fume hood).
4. Choose appropriate personal protective equipment (goggles, face shield, impervious gloves, lab coat, apron or coveralls, boots, respirator, etc.). NOTE: All personnel must have medical approval and be fit tested before using a respirator. Contact EH&S for more information.
5. Confine and contain the spill. Cover with appropriate absorbent material. Sweep solid material into a dustpan and place in a sealed plastic container. Decontaminate the area with soap and water after cleanup and place the residue in a plastic bag or another sealed plastic container. Call EH&S for a pickup.

For consultation or assistance, call EH&S during regular business hours and the IU Northwest Police Department all other times.

APPENDIX A: Chromic Acid Alternatives

SUGGESTED ALTERNATIVES TO
CHROMIC ACID CLEANING SOLUTIONS

PRODUCT	MANUFACTURER
No Chromix	Gordax Laboratories
RBS 35 Concentrate	Pierce Chemical
RBS Solid	Pierce Chemical
S/P Laboratory Detergent Concentrate	American Scientific Products
S/P Contrad 70	American Scientific Products
Alconox	American Scientific Products Fisher Scientific Company
Fisherbrand Sparkleen	Fisher Scientific Company
FL-70 Concentrate	Fisher Scientific Company
Liquinox Liquid Detergent	Fisher Scientific Company
Isoclean	Lab Safety Supply
Count-Off	New England Nuclear Company
Life Away Concentrated Decontaminant	Research Products International Corp

APPENDIX B: Non-Hazardous Chemical Wastes

CHEMICALS FOR THE NORMAL TRASH

You can safely dispose of many solid chemicals in the normal trash if the containers are tightly capped and of good integrity. Examples are given on the following list. These chemicals were selected because they:

- Have oral-rat LD_{50} toxicity values higher than 500 mg/kg, and
- Have no positive determination for carcinogenicity according to the National Institute of Occupational Safety and Health (NIOSH) *1979 Registry of Toxic Effects of Chemical Substances.*

If you intend to dispose of more than five pounds of any one of these chemicals, call EH&S for further evaluation.

A

Acid, Ascorbic
Acid, Benzoic
Acid, Boric
Acid, Casamino
Acid, Citric
Acid, Lactic
Acid, Oleic
Acid, Phosphotungstic
Acid, Phthalic
Acid, Salicylic
Acid, Silicic
Acid, Stearic
Acid, Succinic
Acid, Tartaric
Agar
Albumen
Aluminum Hydroxide
Aluminum Metal
Aluminum Oxide
Amino Acids (alpha and naturally occurring salts)
Ammonium Bicarbonate
Ammonium Carbonate
Ammonium Chloride
Ammonium Citrate
Ammonium Lactate
Ammonium Phosphate
Ammonium Sulfate
Ammonium Sulfamate

B

Base, Blood Agar
Beef Extract
Beeswax
Brain Heart Infusion
Brom Phenol Blue
Broth Nutrient
Buffer Solution

C

Calcium Borate
Calcium Sulfate

Calcium Carbonate
Calcium Chloride
Calcium Citrate
Calcium Floride
Calcium Lactate
Calcium Oxide
Calcium Phosphate
Cerelose (Glucose)
Charcoal, Animal
Chromatographic Absorbent
Crystal Violet
Cobalt Oxide
Copper Oxide

D, E, F, G

Dextrose
Drierite
Extract, Malt
Extract, Yeast
Ferric Chloride
Ferric Nitrate
Ferrous Ammonium Sulfate
Galactose
Gelatin
Glucose
Graphite
Gum Arabic
Gum Guaiac

H, I, K, L

Hematoxylin
Iron Oxide
Kaolin
Lactose
Lithium Carbonate
Lithium Chloride
Lithium Sulfate
Litmus Mild

M

Magnesium Borate
Magnesium Carbonate
Magnesium Chloride
Magnesium Citrate
Magnesium Lactate
Magnesium Oxide
Magnesium Phosphate
Magnesium Sulfate
Maltose
Manganese Acetate
Manganese Chloride
Manganese Dioxide
Manganese Sulfate
Methyl Red
Methyl Salicylate
Methylene Blue

P

Paraffin
Potassium Chloride

Pepsin
Peptone
Petroleum Jelly
Potassium Acetate
Potassium Bicarbonate
Potassium Bisulfate
Potassium Bitartrate
Potassium Bromate
Potassium Bromide
Potassium Carbonate
Potassium Citrate
Potassium Lactate
Potassium Iodide
Potassium Phosphate
Potassium Sodium Tartrate
Potassium Sulfate
Potassium Sulfite
Potassium Sulfocyanate
Pumice

S

SDS (Sodium Dodecyl Sulfate)
Sodium Acetate
Sodium Ammonium Phosphate
Sodium Benzoate
Sodium Bicarbonate
Sodium Bisulfate
Sodium Bisulfite
Sodium Borate
Sodium Bromide
Sodium Carbonate
Sodium Chloride
Sodium Citrate
Sodium Formate
Sodium Iodide
Sodium Lactate
Sodium Phosphate
Sodium Salicylate
Sodium Silicate
Sodium Succinate
Sodium Sulfate
Sodium Sulfite
Sodium Tartrate
Sodium Thioglycollate
Sodium Thiosulfate
Sodium Tungstate
Starch
Strontium Carbonate
Strontium Phosphate
Strontium Sulfate
Sucrose
Sulfur
Sugars
Sugar Alcohols

T, U, W, Z

Talcum Powder
Thymol
Tin Metal
Tin Oxide
Trypticase
Urea
Zinc Oxide

APPENDIX C: TCLP Contaminants

MAXIMUM CONCENTRATION OF CONTAMINANTS FOR THE TOXICITY CHARACTERISTIC (TCLP)

EPA HW NUMBER	CONTAMINANT	CHARACTERISTIC LEVEL (mg/L)
D004	Arsenic	5.0
D005	Barium	100.0
D018	Benzene	0.5
D006	Cadmium	1.0
D019	Carbon Tetrachloride	0.5
D020	Chlordane	0.03
D021	Chlorobenzene	100.0
D022	Chloroform	6.0
D007	Chromium	5.0
D023	o-Cresol	200.0
D024	m-Cresol	200.0
D025	p-Cresol	200.0
D026	Cresol	200.0
D016	2,4-D	10.0
D027	1,4-Dichlorobenzene	7.5
D028	1,2-Dichloroethane	0.5
D029	1,1-Dichloroethylene	0.7
D030	2,4-Dinitrotoluene	0.13
D012	Endrin	0.02
D031	Heptachlor (and its hydroxide)	0.008
D032	Hexachlorobenzene	0.13
D033	Hexachlorobutadiene	0.5
D034	Hexachloroethane	3.0
D008	Lead	5.0
D013	Lindane	0.4
D009	Mercury	0.2
D014	Methoxychlor	10.0
D035	Methyl ethyl ketone	200.0
D036	Nitrobenzene	2.0
D037	Pentachlorophenol	100.0
D038	Pyridine	5.0
D010	Selenium	1.0
D011	Silver	5.0
D039	Tetrachloroethylene	0.7
D015	Toxaphene	0.5
D040	Trichloroethylene	0.5
D041	2,4,5-Trichlorophenol	400.0
D042	2,4,6-Trichlorophenol	2.0
D017	2,4,5-TP (Silvex)	1.0
D043	Vinyl chloride	0.2

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APPENDIX D: Peroxidizable Compounds

TEXT SUPPLIED BY ETSC
(Emergency Technical Services Corporation),
1107 WEST LUNT
SCHAUMBURG, ILLINOIS

The following list of materials is representative of those compounds which form peroxides:

I. Peroxide hazard on storage (these compounds form peroxides that may explode even without being concentrated).

Isopropyl ether	Divinyl ether
Potassium metal	Potassium amide
Sodium amide (sodamide)	Vinylidene chloride

II. Peroxide hazard on concentration (distillation or most likely evaporation).

Dioxane	Ethyl ether
Tetrahydrofuran	Acetal
Cumene	Cyclehexene
Cyclopentene	Diacetylene
Dicyclopentadiene	Ethylene glycol dimethyl ether
Furan	Methyl acetylene
Methyl cyclopentane	Methyl-i-butyl ketone
Tetrahydronaphthanlene	Vinyl ethers

III. Hazards due to peroxide initiation of polymerization (when stored as a liquid, the peroxide forming potential increases and certain of these monomers [especially butadiene, chloroprene, and tetrafluoroethylene] should be considered as a peroxide hazard storage).

Butadiene	Chlorobutadiene (Chloroprene)
Chlorotrifluoroethylene	Styrene
Tetrafluoroethylene	Vinyl acetate
Vinyl acetylene	Vinyl chloride
Vinyl pyridine	

Storage and Handling Procedures:

Each person responsible for a laboratory should be required to make and maintain an inventory listing of the peroxidizable materials in the laboratory. The inventory should be reviewed every three months, as which time samples from List I, three months or older and Lists II and III samples twelve months or older would either [be] tested for peroxides [or] discarded.

Quantities of peroxidizable compounds should be purchased according to short-term needs to assure that peroxide buildup, which may accompany long-term storage, is minimized. Purchase in package sizes corresponding to use requirements to minimize exposure to air from multiple openings of the container.

APPENDIX E: Hazardous Chemical Waste Tag

HAZARDOUS CHEMICAL WASTE TAG

(see directions on reverse side)

PRINT YOUR NAME:_____

ROOM NUMBER:_____ PHONE:_____

TOTAL AMOUNT IN CONTAINER:_____ CONTAINER SIZE:_____

COMPLETE CHEMICAL COMPOSITION (list % or amount of each constituent including water/solvent):

1._____ 6._____

2._____ 7._____

3._____ 8._____

4._____ 9._____

5._____ 10._____

Check if applicable:

___ Flammable?
___ Corrosive? pH ____
___ Oxidizer?
___ Highly Toxic?
___ Reactive/Explosive?

I certify this information is true and that I have done my best to reduce the volume and toxicity of this waste.

_____ _____
Signature Date

REVERSE SIDE

1. All waste must be stored and turned over to EH&S in a securely closed screw top container capable of containing the waste inside. The container size should fit the amount of waste inside the container as dead air just takes up space when it is packed in a waste drum.
2. As a general rule, different waste types (solid vs. liquid, solvent vs. aqueous) should be accumulated in separate waste containers.
3. Abbreviations and structures are NOT accepted. Spell out each chemical constituent.
4. Every container needs a tag. Attach a tag to the neck of each container with a rubber band.
5. Do not put liquid waste in plastic containers, as they tend to degrade and leak.
6. While accumulating waste, list the contents of the waste container on this tag to keep a running total.
7. Store all waste containers closed.
8. Make sure the container is labeled as “hazardous waste” or with words identifying its contents.
9. The Hazardous Chemical Waste Tag and labeling requirement may be waived when turning over unwanted or surplus stock chemicals to EH&S. The chemicals must be in their original container with their proper, legible, original label. Call EH&S for guidance.
10. If you have any questions about the labeling or tagging requirements, please contact your department’s safety officer or EH&S personnel at (219) 981-4230.