



Hazardous Waste Management Manual

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Purpose of Environmental Health and Safety

The purpose of the Environmental Health and Safety Office (EH&S) at the University of Northern Iowa is to promote good practices in matters relating to the health, safety and environment within the university. UNI EH&S maintains a reference library on local, state and federal regulations and provides assistance to the campus in regard to and in interpreting these regulations.

Introduction

The purpose of this manual is to assist university employees and students with the safe management and disposal of hazardous materials. The University Environmental Health and Safety Office coordinates training in hazardous waste management, identification of hazardous materials, waste minimization procedures and collection of and proper disposal of hazardous waste in accordance with federal and state regulations.

The goals of the hazardous waste management program are to:

- protect the health and safety of university employees and students
- protect the health and safety of the general public
- protect the environment
- comply with state and federal regulations

It is the responsibility of the department head to ensure their personnel are aware of any hazards associated with the materials they may be working with and are regularly trained in the proper use of personal protective equipment (PPE) that is necessary while handling hazardous material. It is also the department head's responsibility to ensure their faculty, staff and students are properly trained in university waste handling procedures. Finally, the department head must expect all departmental personnel to follow these procedures.

Definition of Terms

The following are the definitions of some terms that are frequently used when dealing with hazardous chemicals and wastes.

Acutely Hazardous Waste- hazardous chemicals that have the ability to cause a harmful effect after a single exposure. Such wastes are listed as P-wastes by the Resource and Recovery Act (RCRA).

Carcinogen- substance or physical agent that may cause cancer in humans or animals.

Corrosive- substance that causes visible destruction or permanent skin changes in human skin tissue at the point of contact.

Generator- where the waste materials come from and who is responsible for the waste.

Halogenated Waste- any waste that contains one or more of the following elements: fluorine, chlorine, bromine, iodine, or astatine. If a waste is non-halogenated it does not contain any of these elements.

Hazardous Materials- any substance or compound that has the capability of producing adverse effects on the health and safety of humans.

Health Hazard- where there is statistical evidence that when a person is exposed to a chemical, he or she may develop acute or chronic health problems.

Ignitable- a solid, powder, liquid, or a gaseous waste that has a flash point of less than 140 ° F (60 ° C).

LC50(Lethal Concentration)- The concentration of an air contaminant that will kill 50% of the test animals within the first 30 days following exposure.

LD50 (Lethal Dose)-The dose of a substance or chemical that will kill 50% of the test animals within the first 30 days following exposure.

Oxidizer-A substance that gives up oxygen easily to stimulate combustion of organic material.

Reactive Materials-materials that are unstable or undergo rapid or violent chemical reaction when exposed to air, water or other materials. These materials often generate toxic gases or vapors when mixed with water or exposed to pH conditions between 2 and 12.5. Reactive materials can also form potentially explosive mixtures with water, and are capable of detonation or explosive reactions when heated or subjected to shock.

Secondary Containment- a berm, dike or containment unit used to contain waste in a storage area in case of spill. It must be able to accumulate the volume of the largest container in the containment area.

SB-1 (Storage Building 1)-is the designated 180 day hazardous waste storage building for the University of Northern Iowa.

Hazardous Waste Management

The University of Northern Iowa generates many different types of waste.

Examples of waste generated on the UNI campus are:

- flammable, toxic, reactive and corrosive waste from the College of Natural Sciences
- waste solvents from Print Services
- glazes containing heavy metals, paint and paint solvents from the Art Department and Paint Shop
- photographic fixers and developers from campus darkrooms.

It is the generator's responsibility to properly dispose of laboratory chemicals at the university. Building Services employees are not to handle these chemical wastes even if considered nonhazardous.

Definition of Hazardous Waste

Hazardous waste consists of those solid wastes which meet one or more of the specific characteristics listed below or are included in one of several EPA promulgated lists. These wastes include: wastes from nonspecific sources (F list), acutely hazardous waste (P list), and hazardous waste (U list). The lists can be viewed on the EPA website at <http://www.epa.gov/epawaste/hazard/wastetypes/listed.htm>

Hazardous Waste Characteristics

For a material to meet the hazardous waste criteria, it must meet one or more of the following criteria:

- Ignitability – D001
Ignitable wastes are capable of causing or intensifying a fire through routine handling. They must have one or more of the following characteristics:
 - must have a flashpoint of less than 140°F (60° C).
 - oxidizers such as nitrate salts and peroxides.
 - solid capable of causing fire through friction, absorption of moisture, or spontaneous chemical changes.
 - flammable gas such as hydrogen.
 - flammable liquids organic solvents such as toluene, acetone, and benzene.

- Corrosivity – D002
A waste is classified as corrosive if it exhibits one of the following characteristics:
 - a liquid which has a $\text{pH} \leq 2$ or ≥ 12.5 is classified as corrosive. (Local restrictions only allow pH between 4 and 10 to be placed in the sewage system.)
 - Has the ability to corrode steel.

- Reactivity – D003
Wastes are determined to be reactive if one or more of the following characteristics are exhibited:
 - capable of detonating if heated or struck.
 - capable of detonating at standard temperature and pressure.
 - reacts violently with air or water.
 - is a cyanide or sulfide bearing compound that have the potential to form toxic gases, vapors or fumes between a pH of 2 and 12.5.
 - forms explosive mixtures with water.
 - generates toxic gases, vapors, or fumes when mixed with water.
 - Normally unstable and undergoes violent change without detonating.
 - DOT explosive

- Toxicity – D004-D043
Wastes are determined to be toxic if one or more of the following characteristics are exhibited:
 - determined to be toxic by the Toxicity Leachate Characteristics Procedure (TCLP). The extraction procedure shows regulated concentrations of one or more of the 39 constituents.

Management of Specific Waste Types

The following are recommended techniques and procedures for dealing with specific types of wastes. If there are any questions please contact the Environmental Safety Specialist at 3-3445 immediately.

High Hazard Chemicals

These chemicals are those that require some sort of neutralization prior to being shipped for disposal. These include certain peroxide forming compounds, organic peroxides, reactive azides, class 4 oxidizers, and multinitrated compounds. If it is not sure whether the chemical in question is one of those listed above, please contact the Environmental Safety Specialist at 3-3445.

Acids and Bases

The following are the recommended procedures for the neutralization of concentrated acids such as hydrochloric, sulfuric and nitric acids and concentrated bases such as ammonium hydroxide. The neutralization of concentrated acids and bases should only be performed in a hood and should be part of experimental procedures whenever possible.

- Do not neutralize acids such as hydrofluoric, perfluoric and chromic acid. These acids are either highly toxic or considered a strongly oxidizing acid.
- Perform steps slowly and ensure you are wearing chemical splash goggles and proper gloves.
- Keep containers cool while neutralizing.
- Add acid to water never water to acid.

- Perform in large plastic beakers or pails.
- Acid neutralization: add acid to large amounts of ice water and base (sodium carbonate, calcium hydroxide, or 8 M sodium hydroxide)
- Base neutralization: add base to large amounts of water in a large plastic beaker then add a solution of 1 M hydrochloric acid.
- Neutralize until reaction is completed or between pH 5 and 9 then flush with at least 20 times the volume of the waste being poured.

Solvent Wastes

Halogenated (chloroform and methylene chloride) and non-halogenated solvents (such as propanol, toluene and methanol) should be kept separate whenever possible. Such wastes should be properly packaged and labeled with university EH&S labels. If it is necessary to mix solvent waste, the waste container should be labeled with a Mixed Hazardous Waste Container label. Properly filled containers should be sealed and collected for transport to the permanent waste storage facility (SB-1).

Organic Wastes

Whenever possible, halogenated and non-halogenated organic wastes should be kept separate. Such wastes should be properly packaged and labeled with university EH&S hazardous waste container labels. If it is necessary to mix organic waste, the container should be labeled with a Mixed Hazardous Waste Container label. Properly filled containers should be sealed and collected for transport to the permanent waste storage facility (SB-1).

Nonhazardous Waste

Liquid chemical wastes should never be poured down the sink or solid waste placed in the trash unless it is certain the waste is considered non-hazardous to human health or the environment. Liquids determined as non-hazardous should be poured down the sink with at least 20 times the volume of the waste being poured. Non-hazardous solids should be placed in separate receptacles double lined with trash bags and labeled as non-hazardous waste. Chemical waste should never be placed in normal trashcans. If it is not certain whether the chemical is hazardous, contact the Environmental Safety Specialist at 3-3445.

Inorganic Wastes

Inorganic wastes containing compounds of silver, mercury and chromium should be kept separate from other types of waste and placed in their respective containers. Waste containing barium, lead and cadmium may be mixed with each other. These wastes should be properly packaged and labeled with university EH&S hazardous waste labels. When hazardous inorganic waste is mixed, the waste container should be labeled with a Mixed Hazardous Waste Container label. Properly filled containers should be sealed and collected for transport to the permanent waste storage facility (SB-1).

Restricted Wastes

Chemical wastes containing elements of nickel, zinc, or copper, with the exception of those containing nitrate salts, are not considered hazardous wastes by the EPA; however, these chemicals are designated as 'Restricted Waste' under the Harmful Waste Ordinance from the Cedar Falls Department of Public Works. Chemical Wastes consisting of these elements must be placed in containers labeled with university EH&S non-hazardous waste labels. Properly filled containers should be sealed and collected for transport to the permanent waste storage facility (SB-1).

Aerosol Cans

Empty aerosol cans in which both propellant and liquid have been completely depleted may be placed in the trash. Aerosol cans that are not empty must be labeled with university EH&S hazardous waste labels and collected for transport to the permanent waste storage facility (SB-1).

Gas Cylinders

Compressed gas cylinders and propane tanks should be returned to their suppliers. Lecture bottles in good condition should be redistributed to other areas in the college. Partially full or full cylinders not returnable to the vendor or lecture bottles exhibiting signs of deterioration must be labeled with university EH&S hazardous waste labels. The cylinders are then packaged, sealed and transported to the permanent waste storage facility (SB-1).

Paint Waste and Stains

Inks, latex and oil based paints, paint thinner, stains and mineral spirits must be placed in containers with university EH&S hazardous waste labels. The containers should be sealed and transported to the permanent waste storage facility (SB-1).

Rags and Paper Towels

Paper towels used for cleanup of paints and oil should be placed in a container labeled with university EH&S hazardous waste labels. The containers should be sealed and subsequently collected for transport to the permanent waste storage facility (SB-1). EH&S recommends using cloth rags in place of paper towels for these may be cleaned by a cloth cleaning service.

Ceramic Glazes

Glazes containing heavy metals must be placed in containers labeled with university EH&S hazardous waste labels. The containers must be sealed and collected for transport to the permanent waste storage facility (SB-1).

Batteries

Alkaline and zinc batteries may be discarded in the trash. All rechargeable, lead acid and automotive batteries must be collected for recycling. Small rechargeable batteries less than 2 lbs may be dropped off at either the CEEE lobby (the Call2Recycle box) or at the EH&S office for disposal. The battery must be placed in one of the sealable bags provided, be placed in its original shipping bag, or have the battery leads taped with nonconductive tape. If the battery is greater than 2 lbs, the battery must be dropped off at the Physical Plant Electrical Shop with both leads taped with nonconductive tape. Non rechargeable batteries containing mercury, lithium or silver should be sealed in a plastic bag and collected for transport to the permanent waste storage facility (SB-1).

Mercury

Mercury and mercury containing items should be properly packaged, sealed and labeled with university EH&S labels. The containers should be collected for transport to the permanent waste storage facility (SB-1).

Nanomaterials

Nanoparticles and materials must be considered toxic waste even though the properties have not yet been fully investigated. Used nanomaterials must be properly packaged, sealed and labeled with university EH&S hazardous waste labels. The containers should be collected for transport to the permanent waste storage facility (SB-1). The label must specify the name and size of nanomaterial waste that was used to generate the waste.

Universal Waste

Fluorescent lamps, LCD projection lamps, mercury containing items, and pesticides are considered universal waste. Fluorescent lamps are collected by building custodians and placed in their original shipping containers for recycling. LCD projection lamps should be packed in their original containers and shipped to the Warehouse-0196 for recycling. Mercury containing items and pesticides are designated 'Universal Waste'. These wastes should be properly packaged, sealed and collected for transport to the permanent waste storage facility (SB-1).

Light Ballasts

PCB containing light ballasts collected by university staff should be placed in properly labeled containers and transported to the permanent waste storage facility (SB-1). PCB ballasts are disposed of using UNI's approved vendor. Non-PCB ballasts are disposed of in the normal trash.

Laboratory Oil Waste

When disposing of oil and associated oil waste in the laboratories, such waste should be placed in suitable plastic or safety tins and labeled as "Used Oil" and collected for transport to the permanent waste storage facility (SB-1).

Photographic Waste

Some fixers, developers, stabilizers and old film are often considered hazardous waste depending upon chemical constituents. Contact EH&S for a proper waste determination and proper disposal method. Old and spent photographic film may be recycled for its silver content. Blanket wash is considered hazardous waste. All hazardous photographic waste should be properly packaged, sealed and collected for transport to the permanent waste storage facility (SB-1).

Ink Cartridges

Empty or obsolete ink cartridges from ink jet printers and plotters should be sent to Campus Supply at mail code 0193 or 0195 in order to be recycled.

Sharps, Syringes, and Needles

Building Services provides containers for collection of all biologically contaminated sharps, syringes and needles. Collection of these will be done upon request and will pick them up when the container is full.

Collect metal sharps not contaminated with biohazardous materials (e.g., used only with chemicals) in rigid, leakproof, puncture resistant plastic containers labeled with a "Non-Infectious Syringes and Metal Sharps Only" label. These can be disposed of in the normal trash.

Laboratory glassware

Glassware (including chemical containers) should be decontaminated if possible and placed in a puncture resistant box prior to disposal in the dumpster. Ensure glass disposal

boxes are not overfilled or used as disposal for normal trash. The boxes should never be used for disposal of dirty glassware or normal everyday trash.

Antifreeze

Antifreeze used in laboratory equipment such as immersion coolers and recirculating chillers used for cooling should be placed in proper containment and labeled with university EH&S nonhazardous waste labels. The containers should be sealed and collected for transport to the permanent waste facility (SB-1).

Unknown waste

Every effort should be made to determine contents of waste containers; however, if unmarked or unlabeled containers are discovered, the container will be labeled with university EH&S hazardous waste labels. Name of product will be marked as "Waste for Characterization." This will notify EH&S that a waste characterization needs to be determined. EH&S will contact the approved vendor for waste characterization. This waste should be properly packaged, sealed and collected for transport to the permanent waste facility (SB-1).

Hazardous Waste Packaging and Labeling

Container requirements

The importance of proper containers cannot be overemphasized. Containers that are not compatible with the type of waste pose a significant danger to university employees and students and the general public.

General Guidelines

The following is a list of guidelines for selecting and managing proper containment for hazardous waste. If wastes are not placed in accordance with the following rules, collection will not take place until the situation is remedied.

- Container must be compatible with waste (see Container Selection), clean, and in good condition.
- Container cap must be screw type, tight fitting and lined and in good condition—corks and stoppers are not allowed.
- The container must have proper head space-1.5 inches for wide mouth containers, 3 inches for tapered or boston round containers.
- The container must be labeled appropriately.
- Barrels and cans should be no more than 4/5's full and in good condition.

Container Selection

The following criteria have been established for the collection of hazardous materials and should be strictly observed.

- Flammable liquids: wherever possible store in original manufacturer's containers or use UL listed containers.
- Concentrated acids and bases: 2.5 liter safety 'acid' bottles.
- Trace contaminated solid wastes: double bag using polyethylene bags, seal the bags, place in sturdy cardboard cartons and seal the cartons with tape.
- Solid Wastes-place in plastic pales or wide mouth plastic high density polyethylene (HDPE) bottles.
- Aqueous solutions: glass bottles and HDPE plastic bottles.
- Plastic milk jugs, glass stoppered bottles, plastic soda bottles and food containers are not considered acceptable waste containers.

Metal cans must never be used for corrosive chemicals due to metal corrosion caused by the acid or base. Only plastic coated safety bottles should ever be used for the safe transport of caustic material.

Mixing of wastes

It is extremely important not to mix incompatible chemicals and substances together. The result could be fire, explosion or the generation of toxic or flammable gas. It is recommended to always separate waste by hazard class and always consult the Material Safety Data Sheet before combining different types of wastes.

Proper labeling

It is important that hazardous waste be labeled for several reasons.

- Protect the safety of university employees and students.
- Keeping waste from being mixed with incompatible material.
- Prevent the waste from becoming unknown.
- Ensure regulatory compliance.
- Improves handling efficiency.

Containers that are improperly labeled or do not have a label will not be collected. Common Waste labels recognized by the University of Northern Iowa are shown below.

For containers with only a single type of hazardous waste the label below is suitable. It is important that all information is filled out if waste is to be accepted.

<p style="text-align: center;">Hazardous Waste Container</p> <p style="text-align: center;">Name of Product <i>Manufacturer's Name(no abbreviations or chemical formula are allowed)</i></p> <p style="text-align: center;">University of Northern Iowa, Cedar Falls IA 50614</p> <p style="text-align: center;">EPA #984568584</p> <p style="text-align: center;">Generator Information (Print)</p> <p>Name: <i>Generator name (if known)</i> _____</p> <p>Department: <i>Department where waste generated</i> _____</p> <p>Campus Address: <i>4 digit departmental mailing code</i> _____</p> <p>Phone: 319-273- <i>Generator phone number</i> _____</p> <p style="text-align: center;">Box no. <i>Container #</i> of <i>Total # of same type of waste</i></p> <p>Department accumulation start date: <i>Date when waste begins being accumulated in container</i></p> <p style="text-align: center;">HW storage facility start date: <i>Office use only</i></p>

Containers with multiple types of hazardous waste should have the following label. It is important to remember approximate percentages of each chemical should be written on the label. Since multiple types of wastes are being placed in the containers, waste type should be circled and any additional hazards such as 'carcinogenic' or 'water reactive' should be written under the heading of waste hazards.

Packaging requirements

In order for chemical waste to be safely transported to the permanent waste storage facility, guidelines have been developed by the University EH&S Office.

The guidelines are:

- Compressed gas cylinders will only be transported with valve caps on. Lecture bottles must be packed in a sturdy shipping box packed with packing peanuts.
- 1 gallon high density polyethylene (HDPE), 1 gallon amber glass or 2.5 liter clear safety bottles can be either shipped in original shipping boxes or in designated flip-top shipping containers packed with vermiculate. Shipping boxes should have handles.
- Containers of 1 liter or less will be shipped in flip-top shipping containers or in HDPE plastic pails with lids packed with vermiculate. (Containers must be purchased by the generator)..
- Pump and hydraulic oil should be collected separately and poured back into their original containers or collected in 5 gallon safety cans and labeled as "Used Oil."
- Drums, safety cans and pails that are used for hazardous waste do not require any additional packaging to be transported to the permanent waste storage facility (SB-1). Safety cans and pails must have handles for transport.
- An MSDS sheet must be provided for every known type of hazardous waste that is shipped.

Request for Hazardous Waste Pickup

When it is necessary for waste to be picked up the following form is to be completed and emailed to PHPworkorders@uni.edu and should be filled out as shown. Workorders must be submitted within 24 hours after the material has been properly prepared for transport to the permanent waste storage facility (SB-1). This ensures waste reaches the facility within the 3 days as allowed by RCRA.

1.ORIGINATOR: (Name of generator)

2.PHONE NUMBER:(Generator phone number)

3.ASSIGNED TO: (Transportation)

4.DESCRPTION W/CONTACT: (Generator should indicate number of cardboard boxes, fliptop containers, plastic pails, or drums to be picked up. The description should indicate where the waste is to be picked up from including Building and Room number to be delivered to SB-1. Ensure you list personnel who can be contacted in case either transportation or Physical Plant staff have any questions or may need additional information)

5. BUILDING: (Building location)
ROOM NUMBER: (Room location)

6. ADDITIONAL COMMENTS: Any hazard information or special precautions to be taken while moving the chemicals. Also include location of MSDS sheets that are to be transported with the waste.

Waste Minimization Procedures

Institutions are encouraged by the EPA to explore alternatives that will minimize their use of hazardous chemicals. Waste minimization not only saves the university money but also promotes a safer work environment by minimizing the possibility of harmful exposure and the chance of potentially dangerous accidents. Possible minimization procedures are:

- Maintain a proper inventory of chemicals. This prevents ordering more chemicals than needed. It also provides a system for the proper storage of chemicals as well.
- Order on an “as needed” basis or only order when the supply is nearly depleted.
- Never order in bulk unless it will be used in less than 1 year’s time. If you only need a few grams do not order one kilogram. This ensures the chemical viability and reduces storage space.
- Substitute hazardous chemicals with non-hazardous ones. Chemicals used for cleaning glassware such as chromic acid can be replaced with non-hazardous agents such as spark-leen oralconox.
- Whenever possible do not mix non-hazardous wastes with hazardous wastes. When this occurs the non-hazardous waste becomes hazardous. Small quantities of hazardous wastes mixed with non-hazardous wastes will also increase the volume of waste produced.
- Use non-mercury containing equipment. Order either alcohol or digital thermometers and barometers instead of those that contain mercury. Mercury containing thermostats should be replaced with those that are digital.

Hazardous Waste Satellite Accumulation Area Requirements

Satellite Accumulation Area Posting

The Environmental Protection Agency defines a Satellite Accumulation Area as a storage area near the point of generation and under the control of the operator of the process generating the waste. In order to be compliant with this definition, waste accumulation can only occur in the laboratory or in the same suite of laboratories where the waste is generated.

All areas where hazardous waste will accumulate and be stored will be posted with the sign 'Hazardous Waste Satellite Accumulation Area' which contains emergency contact information, container compatibility rules, requirements for labels, UNI EH&S contacts and proper disposal procedures. Hazardous waste needs to be accumulated in the same area (either the same lab or lab suite) in which they are generated. Such areas should be locked when not manned.

At the University of Northern Iowa in order to be compliant with EPA regulations and to maintain a safe working atmosphere the following rules have been established. These rules must be posted in all designated Satellite Accumulation Areas.

Hazardous Waste Satellite Accumulation Area Rules and Responsibilities

1. **Generator Responsibility**
 - The generator is responsible for making hazardous waste determinations. If assistance is required contact EH&S.
 - The generator will provide the necessary MSDS sheets for each type of hazardous waste generated.
 - The generator will provide the necessary shipping containers in order for Transportation to transfer hazardous waste to SB-1.

2. **Accumulation Containers**
 - Ensure waste is accumulated in proper containers (Check Hazardous Waste Manual).
 - Ensure container is properly closed when not in use.
 - Ensure Accumulation Containers are allowed adequate “head space.”
 - Ensure outside of waste containers are kept clean.

3. **Label All Containers**
 - Label containers with approved waste labels.
 - Identify hazardous materials/constituents of containers (Do not use generic or trade names).
 - Write date when satellite accumulation begins.

4. **Accumulation time**
 - Never accumulate more than 55 gallons of hazardous waste or 1 quart of acutely hazardous waste on site.
 - The generator is responsible for ensuring waste is moved to the 180 day facility.
 - Where possible transfer full containers to the 180 day facility.
 - Ensure waste from discontinued projects, experiments, cleanouts, and lab storage areas are transferred to the 180 day facility.

5. **Satellite Accumulation Area Requirements**
 - Satellite Accumulation Areas must have readily available spill kits.
 - Satellite Accumulation Areas are at or near the point of generation
 - Liquid waste must be stored in a secondary containment area. The secondary containers will also be labeled for type of waste it will contain.

6. **Generator control**
 - If one or more generator shares the same satellite area, each generator is responsible for their waste.

7. **Questions**
 - For questions regarding waste determination, lab cleanouts or training contact the University EH&S Office (3-3445) or by email at Gordon.Krueger@uni.edu.

