HAZARDOUS WASTE MANUAL

OFFICE OF SAFETY AND EMERGENCY MANAGEMENT

NORTHERN KENTUCKY UNIVERSITY

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POLICY LINK: **CHEMICAL SAFETY POLICY**
ISSUE DATE: **08/01/2017**
REVISED DATE: **02/13/2023**
TITLE: **HAZARDOUS WASTE MANUAL (PROCEDURE)**

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I. INTRODUCTION

Northern Kentucky University is committed to managing all hazardous materials used and stored at its facilities in a safe and environmentally responsible manner. NKU is committed to maintaining a safe work environment for its faculty, staff, students, and visitors. This manual contains the proper, safe, and environmentally responsible procedures for managing and disposing of waste, thus reducing or eliminating the potential for accidents and release of hazardous materials.

With the enactment on November 19, 1980, of the Resource Conservation and Recovery Act (RCRA), the handling, storage, and disposal of hazardous wastes became strictly regulated under federal, state, and local laws including the “Rules and Regulations” of Sanitation District No. 1. Failure to comply with these regulations could lead to closure of facilities, as well as civil and possibly criminal penalties against the University and the persons generating the waste.

The University has assigned the management of hazardous, biological, and mixed wastes to the Director of Safety and Emergency Management.

All persons in supervisory or management positions are responsible for proper handling and management of waste in their areas and for ensuring that University guidelines for hazardous wastes are followed. Supervisory and management personnel are responsible for ensuring that all persons in their respective areas that handle hazardous waste have been trained and understand the waste handling procedures in their individual lab or work area.

Ultimately the individual using these materials is responsible for following the guidelines contained in this manual. With your cooperation, knowledge, professionalism, and responsible actions, Northern Kentucky University can continue to manage its hazardous waste safely and responsibly.

II. HAZARDOUS WASTE DETERMINATION

The first step in safely managing hazardous waste or potentially hazardous waste is to determine if you really need to use the hazardous constituents or whether something that is less hazardous or non-hazardous could be substituted. If you must use a hazardous material, and it in turn becomes a waste material you must determine if it is a "Hazardous Waste". Federal and state regulations contain lists of specific chemicals and chemical characteristics that determine whether a waste is regulated as hazardous. This procedure will help to identify whether those chemicals which are classified as hazardous and require disposal by Safety and Emergency Management. For the purposes of this program, chemicals that should be considered "waste" are those which are spent or can no longer be used. Contaminated chemicals, chemicals in deteriorating containers, and any other chemicals which are no longer "used and useful" should be considered waste.

A. Listed Hazardous Wastes

Federal and state regulations reference several categories of substances which have toxic, carcinogenic, mutagenic, or teratogenic effects in humans or adverse impact on the environment. Currently there are over 700 listed hazardous wastes. This list can be obtained from Safety and Emergency Management. Many other chemicals do not appear on these lists but are still considered hazardous (e.g. ethidium bromide and malathion). In general, any chemical suspected of having toxic or hazardous properties should be handled by Safety and Emergency Management. You should refer to Safety Data Sheets (SDSs) or other competent reference books such as the Merck Index to make determinations about toxicity. For guidance about whether a waste is hazardous or not, contact Safety and Emergency Management.

B. Characteristic Hazardous Waste

Certain wastes which are not specifically listed by name are regulated as hazardous because they exhibit one or more of the following characteristics: ignitability, reactivity, corrosivity, or toxicity. If wastes exhibit any of these characteristics it must be handled as hazardous wastes and disposed of by the Safety and Emergency Management. Safety Data Sheets, the manufacturer's container labels, and reference books can be used to identify whether one or more of the following four characteristics are present.

- **Ignitable**
  A waste exhibits the ignitable characteristic if it is a liquid with a flash point of less than 140 degrees Fahrenheit (60 degrees Celsius). This includes most non-halogenated solvents such as methanol, acetonitrile, ethanol, gasoline, and ethyl ether. The University also treats as hazardous waste chemicals which are flammable solids, such as magnesium dust, solid naphthalene and nitrocellulose.
- **Corrosive**
  A waste exhibits the corrosive characteristic if it is a liquid with a pH of less than 2 or more than 12.5 and must be treated as hazardous waste. It cannot be disposed of in the sanitary sewer without first being neutralized (provided it has no other dangerous properties such as toxicity). Examples include hydrochloric acid, photographic chemicals, sodium hydroxide, and corrosive cleaning agents. Dilution of acids or bases with water is not an acceptable practice. It is required that acids and bases be neutralized as part of the experimental procedure.
- **Reactive**
  A waste exhibits the reactive characteristic if it is unstable, explosive, water or air reactive, a strong oxidizer, an organic peroxide, or contains cyanide or sulfide bearing materials that release toxic gases in contact with acids. Examples include picric acid, potassium metal, metallic picrates, trinitrotoluene, and old ethers.
- **Toxic**
  A waste exhibits the toxicity characteristic if an extract from the waste contains any of the contaminants in Table 1 at a concentration greater than or equal to the value in that table. In the absence of concentration data, waste containing any of these constituents should be considered hazardous.
  Many chemical wastes produced at the University are not on this list but are still considered hazardous for our program purposes and cannot be disposed of in the sink or regular trash. A more detailed discussion of these materials is found below and in Section IV.

Table 1

Maximum Concentration of Constituents for Toxicity Characteristic

Contaminant	**Concentration** (mg/L)
Arsenic	5.0
Barium	100.0
Benzene	0.5
Cadmium	1.0
Carbon tetrachloride	0.05
Chlordane	0.03
Chlorobenzene	100.0
Chloroform	6.0
Chromium	5.0
o-Cresol	200.0

m-Cresol	200.0
p-Creso	200.0
Cresol	200.0
2,4-D	10.0
1,4-Dichlorobenzene	7.5
1,2-Dichloroethane	0.5
1,1-Dichloroethylene	0.7
2,4-Dinitrotoluene	0.13
Endrin	0.02
Heptachlor	0.008
Hexachlorobenzene	0.13
Hexachlorobutadiene	0.5
Hexachloroethane	3.0
Lead	5.0
Lindane	0.4
Mercury	0.2
Methoxychlor	10.0
Methyl ethyl ketone	200.0
Nitrobenzene	2.0
Pentachlorophenol	100.0
Pyridine	5.0
Selenium	1.0
Silver	5.0
Tetrachloroethylen	0.7
Toxaphene	0.5
Trichloroethylene	0.5
2,4,6-Trichlorophenol	400.0
2,4,5-Trichlorophenol	2.0
2,4,5-TP (Silvex)	0.2
Vinyl chloride	0.2

C. Non-Hazardous Wastes

As a rule, persons who generate chemical waste should not pour it down the sink or put it in the regular trash unless they are certain that the waste is non-hazardous to humans or the environment. University personnel should consult Safety Data Sheets, the manufacturer's container labels, reference manuals, or call Safety and Emergency Management for guidance on how to dispose of these materials. In general, only non-hazardous solids should be disposed of in the regular trash. Non-hazardous free liquids that are water soluble may be disposed of down the sink. Free liquids that are not water soluble should be referred to Safety and Emergency Management for disposal. Materials that have strong or unpleasant odors should be referred to Safety and Emergency Management for disposal. Chemicals in damaged containers should be placed into appropriate secure containers. If it is not safe to do so, they should be referred to Safety and Emergency Management for disposal.

D. Unknown Waste/Chemicals

All waste materials picked up by Safety and Emergency Management must be completely and accurately identified. Materials that are not identified are referred to as "unknowns". When an unknown is discovered, an attempt must be made to identify its contents immediately. Typically,

the contents can be identified by consulting individuals who work in the area where the material was used. If this fails to positively identify the material, then some elementary analysis on the material must be performed. Elements of this analysis may include:

- pH on liquids
- Flash point
- Reactivity with water (on a very small scale)
- Specific gravity
- Flammability (on a very small scale)
- Water Solubility

If the persons with the unknown cannot or choose not to perform analysis of the unknown, then the University's hazardous waste contractor will perform the analysis for a substantial fee. Maintenance of labels, periodic inspections of chemical stocks, and good chemical hygiene practices will prevent the occurrence of unknowns. The University's Laboratory Chemical Hygiene Plan also has specific requirements for labeling chemical containers. Individuals should consult the Laboratory Chemical Hygiene Plan or call Safety and Emergency Management for specific information on these labeling.

III. HAZARDOUS WASTE HANDLING AND DISPOSAL REQUIREMENTS

Northern Kentucky University is inspected annually by state and federal agencies for compliance with hazardous waste regulations. Failure to meet all regulations can lead to a Notice of Violation (and fines) from these agencies. The most cited violations at universities involve failure to properly label hazardous waste containers, failure to properly identify the contents of the waste containers, and failure to maintain closed containers in laboratories and work areas.

A. Labeling

All hazardous waste containers must have a label that states HAZARDOUS WASTE, and must list the constituents of the waste. This labeling must be done at the time waste is first placed into the container. Be specific when labeling waste (e.g., xylene instead of non-halogenated solvents and ethanol instead of alcohol). Do not use abbreviations or chemical formulas. If necessary, a list may be placed next to the hazardous waste label. Hazardous waste labels may be purchased or you can use laboratory tape, etc. as long as it states HAZARDOUS WASTE and has the specific names of the waste constituents. Containers, once full or the waste stream is no longer being generated, should be dated, initialed, and scheduled to be transported to the satellite accumulation area immediately.

B. Proper Containers and Storage

Proper containers for accumulating and storing hazardous waste must be provided by the person who generates the waste. Generally, the best containers for hazardous waste are the ones that the materials came in. Other containers, such as 5 gallon jugs, are acceptable as long as the container and any residue left inside are compatible with the waste. All containers must have tight-fitting lids. Corks, ground-glass stoppers or parafilm are not proper substitutes for a tight-fitting lid. Any chemical stored in an unacceptable container or a container without a lid should be transferred immediately to another container by the generator. Safety and Emergency Management can provide guidance in selecting proper containers.

When not actually pouring waste into or out of the container the top must be securely fastened. You cannot leave a funnel sitting in the container.

By state and federal regulations, at no time can more than 55 gallons of waste be allowed to accumulate in any lab or storage area. When the generator has a full container, a work order should be submitted. The waste will be removed by Safety and Emergency Management as soon as possible. Waste must not be stored over drains, in sinks, or in an area where a spill would contaminate any soils or outside areas. Waste must be stored in a secure place where it is always under the control of the generator. Waste stored outside of labs must be kept under lock and key at all times and inspected regularly.

Incompatible materials whether waste or unused chemicals should never be mixed.

Incompatible materials when mixed may cause explosions, fires, or may generate flammable or toxic gases resulting in serious health hazards. If in doubt do not mix! Caution must be exercised in any area where chemicals or wastes are stored to ensure incompatible materials are segregated appropriately. Segregate by hazard class, not by alphabet. If possible do not store waste with "good" chemicals (products). Flammable waste should be kept away from heating sources. Safety and Emergency Management can provide information on proper storage of flammable and combustible materials.
The pairs below are examples of incompatible materials:

oxidizers	and	flammables
elemental metals	and	hydrides
acids	and	cyanides
acids	and	sulfides
acids	and	bases
acids	and	flammables
acids	and	chlorine compounds
acids	and	alcohols
acids	and	elemental metals
amines	and	chlorine compounds
water or air reactives	and	anything
organic peroxides	and	anything
phenol	and	formaldehyde
sodium azide	and	aqueous lead

This list is not all inclusive. You should always consult Safety Data Sheets

(SDS) or other chemical information sources such as Bretherick's Handbook or the Merck Index for compatibility. Halogenated waste materials (those containing halogen compounds such as chlorine or fluorine) should be separated from non-halogenated compounds, unless unavoidable. This is for both economic and safety reasons. The halogenated wastes, while much less flammable, are generally more toxic than non-halogenated waste materials. The disposal cost of non-halogenated solvents is approximately one third that of halogenated solvents.

C. Special Waste

Where possible, mercury compounds should be eliminated from the laboratory. It is very important not to mix mercury with other materials due to the difficulty (and cost) of disposing of mercury and mercury compounds. Due to special packing needs, any waste containing Bromine should be placed in one quart or smaller containers.

D. Aerosol Containers

Aerosol containers that are not empty and are no longer considered usable by a department must be sent to Safety and Emergency Management for a usability determination. Pickup of

aerosol cans can be requested from Safety and Emergency Management through the Facilities Management work request system. If it is determined that the product is no longer of use to the University, the can will be punctured and drained. Once punctured and drained, the can shall be recycled. The contents of the can shall be collected as hazardous waste. Aerosol cans that are still considered useful will be made available to other departments through the Supply Closet Events.

IV. OTHER WASTE REQUIREMENTS

A. Biohazardous Waste

Biohazardous wastes are human, animal or plant tissue or fluids that are contaminated with pathogenic organisms.

All biohazardous wastes must be clearly marked with the universal biohazard label (see below). If biohazardous waste also contains hazardous or radioactive material, it must be identified as containing both materials; this type of waste should not be generated if at all possible. Materials that contain viable organisms and require incineration should be placed in leak-proof sealed biohazard Red Bags. Materials that are to be sterilized and rendered non-pathogenic are to be placed in orange biohazard waste bags. All sharps materials (needles, syringes, scalpels, etc.) must be placed in marked biohazard sharps buckets. Biohazardous waste is permanently disposed of on a regular basis by an outside vendor and is scheduled by Safety and Emergency Management.

UNIVERSAL BIOHAZARD SYMBOL

B. Gas Cylinders

Any gas cylinders required to be disposed of as hazardous waste will be disposed of through Safety and Emergency Management at the expense of the user or department. Rental and return of gas cylinders to gas vendors is the recommended practice for the management of cylinders. This eliminates the creation of a hazardous waste. The purchase of lecture bottles or other non-returnable pressurized gas cylinders is strongly discouraged because of the difficulty and cost of disposing of the empty containers. Any gas cylinders required to be disposed of as hazardous waste will be disposed of through Safety and Emergency Management at the expense of the user or department.

C. Waste Oils and Lubricants

Waste oils and petroleum lubricants are not classified as hazardous waste by EPA.

However, the University has chosen to manage these products in an environmentally-conscious manner.

D. Aerosol Cans

Aerosol cans with product or propellant left inside may not be disposed of in normal trash. Best practice for aerosols is to use 100% of the product as intended. Any aerosol can with product

left inside must be collected and disposed of by Safety and Emergency Management.

E. Broken Glassware

Broken glassware should be placed into an appropriate broken glassware container. Since they will be picked up by the custodial staff these containers should be labeled with the words "Broken Glass". Do not place broken glassware, pipettes, or other sharp-edged materials of any type into the regular trash.

F. Empty Containers

Containers that have held hazardous materials should have their labels defaced, should be triple rinsed with water or a suitable solvent to remove any residue, and then should be disposed of in the regular trash.

V. WASTE MINIMIZATION

Northern Kentucky University is committed to reducing both the amount and toxicity of hazardous wastes that are generated as a result of University operations. The University is required by law to develop strategies to reduce its hazardous waste. Listed below are a few strategies that you as a generator should consider in order to meet the goal of reducing hazardous waste.

A. Substitution

Replace the toxic or other hazardous materials you use with less hazardous or nonhazardous substances. This is the best way to minimize hazardous waste. Mercury thermometers can be replaced with alcohol thermometers. The debris and mercury from a thermometer must be treated as hazardous waste, while a broken alcohol thermometer can be disposed of as broken glassware. Chromium- and acid-based glassware cleaning solutions can be replaced with alconox or no-chromix glassware cleaners. Toluene-based flammable scintillation cocktails can be replaced with non-flammable cocktails. Safety and Emergency Management can assist laboratories and others in finding substitutes for hazardous chemicals.

B. Microchemistry

Use minute quantities and small-scale chemistry instead of large amounts of chemicals in laboratory experiments. The use of computer modeling instead of experimentation, especially in teaching situations, should be considered as an alternative to the creation of chemical wastes.

C. Redistillation

Reclaim solvents for reuse by using a distillation process in the laboratory. This method will reduce the amount of replacement solvents and the volume of hazardous waste generated.

D. Laboratory Destruction

Some chemicals can be neutralized or made exempt from hazardous waste regulations by destruction in the laboratory. This must be done as part of the experiment and must be done according to documented methods. If you are uncertain, contact Safety and Emergency Management prior to attempting laboratory destruction to ensure that the process will be safe and that the end result will meet regulatory requirements. An example of lab destruction would be neutralizing a strong acid or alkaline with a buffering solution. Note that neutralization must take place as part of an experiment. Waste cannot be accumulated for neutralization at a later date. Laboratory destruction is considered to be a less desirable strategy than substitution or microchemistry.

University faculty and staff with ideas or suggestions on ways to safely decrease the amount and/or toxicity of waste generated are encouraged to contact Safety and Emergency Management so that the information can be passed on to other University operations. Generators who would like assistance in reducing their waste generation should contact Safety and Emergency Management who will assist them with ideas and/or a review of their operations. A useful publication entitled "Less is Better" (available from the American Chemical Society) focuses specifically on the reduction of laboratory waste.

VI. EMERGENCY AND SPILL RESPONSE

The purpose of this section is to provide information to persons working with chemicals on the steps to take when chemicals are spilled or released. Safety and Emergency Management is the lead University department for responding to releases and accidents involving hazardous materials.

A. Spill Response Procedures

Persons involved with a spill or release of any hazardous material should evaluate the potential danger to themselves, others and the environment before attempting any action (which they must then be properly trained or equipped to handle).

Minor spills of known materials should be cleaned up immediately by personnel in that area. Appropriate personal protective equipment should be used (i.e. chemical protective gloves, safety glasses and clothing covers, such as aprons and lab coats).

For moderate size spills of known materials that cannot be cleaned up without assistance, call Safety and Emergency Management. Safety and Emergency Management will provide technical assistance, equipment, supplies, and guidance. All personnel not directly assisting with the cleanup should be kept away from the area involved.

Larger spills of known materials, spills of unknown materials, spills that result in fire or explosion, or spills that are immediately dangerous to life and health, should be treated as emergencies. Evacuate the immediate area of the spill and call University Police (x7777 or 911). In larger incidents, evacuate the entire building, either personally or with the assistance of University Police. Once at a safe location, call University Police (x7777 from any campus phone or 911) and stay on the line until told to hang up by the police dispatcher. Those persons involved with the incident are to remain in the area outside the involved building to assist the emergency response agencies. Information, such as the chemicals or biohazardous agents involved, will be needed by the various responding agencies. After relaying the vital information, lab personnel should notify the principal investigator and the department chair.

If any emergency involves personal injury or chemical contamination, call x7777 from any campus phone or 911 and ask for an ambulance to be sent to the area. Be sure to state the type of contaminant on the victim. In cases where corrosive chemical exposure to the eyes or body of an individual occurs, safely and carefully assist the injured person to an eyewash station, deluge shower or combination unit. For other chemicals consult the SDSs for that chemical and follow the recommendations in the first aid section. A copy of the SDSs should be available for the ambulance crew and should accompany the victim to the hospital. For exposures to the eyes, flushing with water for a minimum of 15 minutes is recommended. The person should be seen immediately by a physician.

B. Spill and Release Reporting

Spills and releases of hazardous materials in other than insignificant amounts should be

reported to Safety and Emergency Management. If the spill or release also involves a radioactive material, then the Radiation Safety Officer should be notified as well.

C. Spill Response Equipment

Each area storing or using hazardous materials should have absorbent materials capable of at least stopping the spread of spilled chemicals to drains or other areas. Examples of absorbent materials would be towels, pads, vermiculite, and sorbent booms. Areas that have only small amounts of chemicals could use lab towels or paper towels when compatible with the spilled material. Other areas, such as chemical storerooms and maintenance shops, will require more extensive supplies of sorbent materials. Other protective equipment, such as gloves and eye protection, can be worn for spill cleanup as well as normal chemical usage.

D. Management of Materials from Spill Cleanup

Materials that are generated as a result of spill cleanup are considered to be hazardous waste if the original material when disposed of would be hazardous waste. These materials must be placed into appropriate sealed containers and will be managed as any other hazardous waste, i.e., requiring proper labeling and waste tickets.

APPENDIX A

Definitions and Terms

Generator - A person or institution that creates hazardous waste.

Hazardous Material - A material capable of causing harm to humans or the environment.

Hazardous Waste - A waste material that meets one or more of the characteristics identified in state and federal regulations and this manual.

EPA - Environmental Protection Agency.

RCRA - Resource Conservation and Recovery Act, federal act that regulated hazardous wastes.

Satellite Accumulation Point - The place in the lab or work area where hazardous wastes are stored until they are ready for pick up. There must be less than 55 gallons of hazardous waste at any one time at the satellite accumulation point.

Container - A waste receptacle that is capable of being securely sealed and transported. The container must be compatible with the waste stored in it.

Label - Required wording on each container of hazardous waste. It must state the words “Hazardous Waste” and the name of all chemicals contained within.