



Chemical Waste Disposal Guide

The inappropriate disposal of potentially hazardous chemicals is illegal and can have serious repercussions.

The Chemical Engineering Department at NED University of Engineering and Technology is committed to safely and properly disposing of all hazardous wastes. Moreover, the department is dedicated to promoting waste minimization and pollution prevention in all its activities.

Under no circumstances should hazardous wastes be discharged into the environment to "save money," as a matter of "convenience," or due to carelessness in planning, preparation, operations, or design. Assistance in preventing or resolving such issues is always available from the department's HSE team.

If you suspect or have knowledge of the inappropriate disposal of potentially hazardous materials or deviations from the advice and guidance outlined in this guide, you should immediately report these concerns to the HSE team within the Chemical Engineering Department.

No member of the Chemical Engineering Department at NED University of Engineering and Technology will be discriminated against or be subject to any reprisal for reporting suspected violations of the department's policies on the disposal of potentially hazardous materials.

Definition of Chemical Waste

Any chemical that exhibits hazardous characteristics as defined by EPA rules and regulations is unusable or unwanted in any way and poses a potential hazard to individuals, the environment or public health is a chemical waste.

Examples:

- Waste and opened surplus chemicals
- Expired or off-specification chemical
- Carcinogens and cytotoxic (antineoplastic) agents
- Empty chemical drums and other chemical containers with a capacity of 10 gallons and greater
- Thermometers and other items containing mercury
- Non-returnable gas cylinders and lecture bottles or pressurized chemicals
- The residue of spill clean-up materials-contaminated rags and absorbents
- Used oil—motor, vacuum pump, lubricating oils, etc.
- Pesticides



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- Used solvents
- Batteries
- Paint, paint thinners, brush cleaners, linseed oil, thinner contaminated rags

Waste Minimization

The Environmental Protection Agency's (EPA) policy for hazardous waste management prioritizes waste minimization.

Waste minimization is any action that:

- Decreases the amount of hazardous waste generated
- Reduces the inherent toxicity of the waste

The costs associated with properly disposing of chemical wastes and safely storing chemicals in the research laboratory are inextricably linked. Researchers are encouraged to limit the number and type of chemicals purchased whenever possible. Ordering additional chemicals is easier than disposing of unwanted or unused surplus chemicals.

In some cases, there are no acceptable waste disposal options.

Rethink how you purchase, handle and store laboratory chemicals to control the increasing costs of proper chemical waste disposal and the inherent hazards of storing and working with hazardous chemicals.

Waste minimization benefits you, the university, and the environment by:

- Significantly lowering costs
- Reducing potential health hazards
- Reducing potential long-term liabilities for disposal
- Promoting environmental ethics
- Preventing pollution



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It is the responsibility of every lab staff that generates waste to incorporate the principles of waste minimization into experimental design.

Source Reduction and Waste Minimization Tips

- Substitute less hazardous chemicals whenever possible.
- When planning experiments or demonstrations, examine all wastes generated and ask if they could be minimized and how.
- Reduce the scale of processes so that less waste is generated.
- Minimize the volume of waste solutions containing mercury and heavy metals.
- Mark the contents of all chemical containers to prevent the generation of unknowns.
- Actively manage the inventory of all hazardous materials used in your laboratory or work location. Ask others in your department if they could use your unwanted chemicals.
- Neutralize, quench or destroy hazardous by-products as the last step in experiments.
- Separate halogenated from non-halogenated solvents, separate aqueous and solvent wastes if possible. When in doubt, call HSE team in assistance.

The Chemical Engineering Department at NED University is dedicated to managing all hazardous waste in compliance with EPA regulations. In an effort to streamline waste disposal, we have established procedures for disposing of waste to the University's Services Department. Disposal procedures for specific waste streams generated within our department are outlined below:

Hazardous Waste Disposal Process: The Chemical Engineering Department follows the university's established procedures for hazardous waste disposal, which involve the responsible transfer of waste to the University Services Department responsible for waste management.

Waste Segregation: Waste generated within the Chemical Engineering Department is segregated into appropriate containers, clearly labeled with the waste type and hazard classification.

Waste Storage: Hazardous waste is stored securely within the Chemical Engineering Department's designated storage area until it is ready for disposal. During this time, waste containers are maintained in good condition to prevent leaks or spills.

Waste Collection: When it is time to dispose of hazardous waste, the Chemical Engineering Department coordinates with the University Services Department responsible for waste management. The Services Department will collect, transport, and dispose of the hazardous waste in accordance with local regulations.



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Documentation: Proper records, including waste manifests, are maintained to ensure compliance with all regulatory requirements. These records are made available to regulatory authorities upon request.

Training and Education: All personnel within the Chemical Engineering Department are trained in the proper handling, labeling, and disposal of hazardous waste to ensure safety and regulatory compliance.

Emergency Response: In the event of a hazardous waste spill or emergency, the Chemical Engineering Department follows established university protocols to ensure the safety of personnel and the environment.

The Chemical Engineering Department at NED University operates in accordance with the university's commitment to environmentally responsible practices. By coordinating the disposal of hazardous waste through the University Services Department, we aim to maintain compliance with all regulations and minimize environmental impact.

Chemical Waste Disposal Overview

- Collect chemical waste in sturdy leak-proof containers.
- Keep hazardous chemicals away from sinks or surrounding areas to prevent fugitive releases.
- Do not dispose of hazardous chemicals via the sink, as non-hazardous trash.
- Evaporation is not an acceptable waste disposal method. The only exceptions are insignificant, residual amounts of liquid associated with lab ware or containers.
- Always label and seal chemical waste containers.
- Always enter an accumulation start date.
- Identify all constituents by chemical name. No abbreviations, trade names, or chemical formulas!
- List the concentration of constituents.
- Chemical waste has unique labels, store waste containers properly.



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- The caps must be tight. No open funnels or filling aids may be left in containers.
- Use bins to segregate acidic from caustic waste streams and to provide secondary containment. Segregate nitric acid waste containers from organic waste containers.

Chemical Waste Collection Areas - Applied Chemistry Lab ,Chemical Engineering Department

Regulations define any location where small amounts of chemical waste are temporarily stored as a "Waste Accumulation Area" or WAA. To be considered a WAA, waste must be stored at or near the point where the waste is generated.

Within the Applied Chemistry Lab of the Chemical Engineering Department, WAAs are designated for the safe storage of chemical waste. These WAAs may be located inside laboratory.

In the Applied Chemistry Lab, WAAs are set up with proper signage to indicate their status as Waste Accumulation Areas. Each WAA within the Chemistry Lab is equipped with secondary containment to prevent spills and leaks.

To ensure safety and compliance within the Environmental Lab:

WAAs within the Chemistry Lab are designed to hold chemical waste volumes that do not exceed regulatory limits. Specifically, these WAAs are intended to contain small quantities of waste generated during experiments and FYDP works.

Incompatible chemical wastes within the Applied Chemistry Lab are stored separately to prevent any chemical reactions. Separate containment bins or designated areas within the lab are utilized for this purpose. Routine waste pickups are requested to keep accumulated waste volumes within WAAs to a minimum. This ensures timely disposal of hazardous waste materials. The Chemical Engineering Department's Environmental Lab is committed to adhering to all regulatory guidelines for the proper storage and disposal of chemical waste. Safety and environmental responsibility are paramount in our operations.

Storage of Hazardous Chemicals in Laboratories

In the laboratory, hazardous chemicals can be divided into four general hazard categories – corrosives, flammables, reactives, and toxics. In most cases, the immediate or obvious hazard determines which category a particular chemical is classified.



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Below are some general principles to follow when handling and storing chemicals

General Principles for Managing Laboratory Chemicals

- Less is better. Purchase small amounts that you will use up within a year. Whereas the per-unit cost may be greater—significant savings are realized in reduced disposal costs and safer storage.
- Buy pre-made molar and normal solutions, reducing the likelihood of generating concentrated waste.
- Obtain access to an SDS for each chemical and consult the SDS before using a chemical.
- Read labels. Handling and storage information is on the manufacturer's label.
- Purchase chemicals in plastic containers to minimize potential breakage. If this is not possible, purchase shatter-resistant plastic-coated bottles.
- Manage first in, first out! Indicate the date received and the date opened.
- Dispose of open, partially used or expired date chemicals.
- Keep all chemical containers off floors, carts and electrical equipment.
- Physically segregate chemicals according to compatibility.
- Label the secondary storage containers or areas where particularly hazardous chemicals may be used. These substances must be kept in a Designated Area.
- Store hazardous chemicals below eye level. This simple task reduces the likelihood of something falling from above and breaking.
- Cabinets with doors are safer locations than open shelves for hazardous chemicals.
- Safely transport any hazardous chemical. Place in secondary containment such as a bottle carrier.
- Avoid placing any chemical container in direct sunlight, underneath a sink or near heat sources.
- Place volatile or flammable chemicals only in specially designed refrigerators.
- DO NOT STORE HAZARDOUS CHEMICALS AND FLAMMABLES IN COLD ROOMS.
- Be especially careful with reactive chemicals. Obtain and read the SDS for each reactive chemical you may have or work near.
- Label all containers in the laboratory with the following information (this includes any stock or working solutions):
 - Name of chemical or stock solution
 - Date Started
 - Your initials
 - Hazard warning (i.e., flammable, toxic, corrosive, reactive)
- Use and manage your chemical fume hood, wisely. Too many chemical containers or equipment block the air slots and compromise the containment performance.
- Follow all waste disposal guidelines.



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Storage of Gas Cylinders

- Generally, only keep cylinders in your lab that are currently used or waiting for immediate use.
- Large toxic gas cylinders must be in an approved gas cylinder cabinet.
- There are defined maximum allowable storage quantities for cylinders.
- All cylinders not attached to a regulator must have a valve protection cap.
- For vertical storage, cylinders must be secured (at a minimum) in their upper third by a tight-fitting chain or belt secured to the wall or non-movable casework. This applies to all cylinders.
- One cylinder per chain or web belt.
- Horizontal storage of cylinders is only allowed in racks designed for the purpose. Cylinders must be secured to the rack.

Disposal Procedures for Specific Waste Streams

Refer to the following list for specific disposal information:

Acids and Bases

1. Collect concentrated acids and bases in original containers whenever required. These include propionic, nitric, sulfuric, glacial acetic, hydrochloric and sodium hydroxide. Be aware that some acids are incompatible (for example nitric acid and glacial acetic waste). Never mix oxidizing acids with organic chemicals.
2. Acids and bases may be treated as the last step of a reaction. Neutralized solutions send to NED works and service department on weekly basis where they drain off safely in the NED wastewater treatment plant.
3. Slowly stir acid in a large amount of an ice-water-to dilute to about 5% by volume.
4. Prepare a base solution of one of the following: sodium carbonate (soda ash), or sodium hydroxide. The base concentration should be 5 to 10 % for nitric and perchloric acid neutralization. A one-molar solution is about 4% (4 grams per 100 ml).
5. Slowly stir diluted acid into the base solution until the pH is at least 5 but not greater than 10.
6. After dilution, solution is sent safely to works and services department of the NED university where they safely dispose solution in the NED wastewater treatment plant.



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Benzene and its compounds

The disposal of aromatic compounds from a laboratory should be done with care to ensure the safety of both people and the environment. Aromatic compounds often contain hazardous chemicals that can be harmful if not handled properly. Here are some general guidelines for disposing of aromatic compounds: Firstly, it is segregated and stored in the designated container and NED works and service department pick these chemicals on weekly basis where they dispose of safely.

Alcohols

In the applied chemistry, following alcohols are used, Ethanol, Butanol and polyvinyl alcohols. Ethanol (Ethyl Alcohol): If the alcohols are pure and free from contaminants, you can consider reusing it or returning it to a designated collection point. If it's contaminated or can't be reused, you can typically send to the NED works and services department where they safely dispose off as per EPA regulations.

Salts

The disposal of the salts including sodium, potassium, calcium, magnesium and aluminum are stored in the designated area where NED works and service department pick the salts on the weekly basis where further they dispose of safely as per EPA guidelines.

Contaminated Glassware

Chemically contaminated glassware, pipette tips, needles, blades and sharps are collected in a puncture-proof container.

Broken glassware not contaminated with hazardous chemicals can be put in a cardboard container, sealed and picked up as trash.

Drain Disposal

The range of substances that can be potentially hazardous is enormous. Almost any substance can be a hazardous waste if it is disposed of in large quantities or in high concentrations. Federal and state hazardous waste laws permit laboratories to dispose of small amounts of some chemicals in quantities that do not pose a hazard to human health or the environment. It is NED University's policy to prohibit the drain disposal of all potentially hazardous chemicals and take a more conservative approach when confronted with a less defined disposal situation.



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Information

Any queries or issues about compliance ought to be brought to the Safety Convener and Departmental Head attention, or to the relevant member of the environmental, health, and safety committee.

Concerns may also be expressed by phone at +922199261261 (ext. 2286, 2275) or by email at

shahzadshaikh@neduet.edu.pk



Head of Department
Chemical Engineering Department



Safety Convener
Chemical Engineering Department