Hazardous Materials and Waste Standards (add plumbing emergencies)

<https://www.osha.gov/Publications/OSHA3514.html>

<https://www.msdsonline.com/>

Hazardous Chemical

Occupational Safety & Health Act (OSHA) term that denotes any chemical that would be a risk to employees if exposed in the work place

* Hazardous, or toxic, waste threatens human health or the environment because it is poisonous, dangerously chemically reactive, corrosive, or flammable. Examples include:
	+ Industrial solvents.
	+ Hospital medical waste.
	+ Car batteries.
	+ Household pesticide products.
	+ Dry-cell batteries.
	+ Ash from incinerators and coal-burning power plants.

Workplace Hazards

Common workplace hazardous chemicals and materials can include:

* Cleaning products
* Glues, adhesives and epoxies
* Paints and paint thinners
* Pesticides
* Gas and fuels
* Alcohol
* Antifreeze
* Salts
* Oils

Classes of hazardous wastes are:

* + Organic compounds
		- Various solvents, pesticides, PCBs, and dioxins.
	+ Nondegradable toxic heavy metals
		- Lead, mercury, and arsenic.
	+ Highly radioactive waste produced by nuclear power plants and nuclear weapons facilities.

Aerosol

Aerosol shall mean a material which is dispensed from its container as a mist, spray, or foam by a propellant under pressure

Combustible

Combustible liquid means any liquid having a flash point at above 100°F (37.8 °C).

Flash Point

Flash point means the minimum temperature at which a liquid gives off vapor within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid. The flash point is normally an indication of susceptibility to ignition.

The two primary hazards associated with flammable and combustible liquids are *explosion* and *fire*

Safe handling and storage of flammable liquids requires the use of approved equipment and practices per OSHA standards

A good plan for safe use of flammable and combustible liquids contains at least these components:

* Control of ignition sources
* Proper storage
* Fire control
* Safe handling

Must take adequate precautions to prevent ignition of flammable vapors. Some sources of ignition include:

* Open flames
* Smoking
* Static electricity
* Cutting and welding
* Hot surfaces
* Electrical and mechanical sparks
* Lightning
* Space Heaters
* Oil Vats

*Ventilation*

Always provide adequate ventilation to reduce the potential for ignition of flammable vapors.

*Storage Fundamentals*

* Identify incompatible chemicals – check the Material Safety Data Sheet
* Isolate and separate incompatible materials
	+ Isolate by storing in another area or room
	+ Degree of isolation depends on quantities, chemical properties and packaging
	+ Separate by storing in same area or room, but apart from each other

*Storage of Flammable and Combustible Liquids*

* Storage must not limit the use of exits, stairways, or areas normally used for the safe egress of people
* In office occupancies:
	+ Storage prohibited except that which is required for maintenance and operation of equipment
	+ Storage must be in:
		- closed metal containers inside a storage cabinet, or
		- safety cans, or
		- an inside storage room

*Safety Cans for Storage and Transfer*

* Approved container of not more than 5 gallons capacity
* Spring-closing lid and spout cover
* Safely relieves internal pressure when exposed to fire

*Flame Arrester Screen*

* Prevents fire flashback into can contents
* Double wire-mesh construction
* Large surface area provides rapid dissipation of heat from fire so that vapor temperature inside can remains below ignition point

*Storage Cabinets*

* Not more than 60 gal of Class I and/or Class II liquids, or not more than 120 gal of Class III liquids permitted in a cabinet
* Must be conspicuously labeled, “Flammable - Keep Fire Away”
* Doors on metal cabinets must have a three-point lock (top, side, and bottom), and the door sill must be raised at least 2 inches above the bottom of the cabinet

*Fire Control*

* Suitable fire control devices, such as small hose or portable fire extinguishers must be available where flammable or combustible liquids are stored
* Open flames and smoking must not be permitted in these storage areas
* Materials which react with water must not be stored in the same room with flammable or combustible liquids

*Transferring Flammable Liquids*

Since there is a sizeable risk whenever flammable liquids are handled, OSHA allows only four methods for transferring these materials:

1. Through a closed piping system
2. From safety cans
3. By gravity through an approved self-closing safety faucet
4. By means of a safety pump

*Self-Closing Safety Faucet*

* Bonding wire between drum and container
* Grounding wire between drum and ground
* Safety vent in drum

*Safety Pump*

* Faster and safer than using a faucet
* Spills less likely
* No separate safety vents in drum required
* Installed directly in drum bung opening
* Some pump hoses have integral bonding wires

Waste and Residue

Combustible waste and residue must be kept to a minimum, stored in covered metal receptacles and disposed of daily.

* Waste drum with disposal funnel
* Safety disposal can
* Oil stained waste can with self-closing lid

*Handling Liquids*

* Flammable liquids shall be kept in covered containers when not actually in use.
* Combustible waste and residue shall be kept to a minimum, stored in covered metal receptacles, and disposed of daily
* Carefully read the manufacturer’s label on the flammable liquid container before storing or using it
* Practice good housekeeping in flammable liquid storage areas
* Clean up spills immediately, then place the cleanup rags in a covered metal container
* Only use approved metal safety containers or original manufacturer’s container to store flammable liquids
* Keep the containers closed when not in use and store away from exits or passageways
* Use flammable liquids only where there is plenty of ventilation

Summary

* The two primary hazards associated with flammable and combustible liquids are explosion and fire
* Safe handling and storage of flammable liquids requires the use of approved equipment and practices per OSHA standards
* An excellent reference on this topic is National Fire Protection Association Standard No. 30, *Flammable and Combustible Liquids Code*

SDS

Chemical manufacturer, distributor, or importer provide Safety Data Sheets (SDSs) (formerly MSDSs or Material Safety Data Sheets) for each hazardous chemical used in the workplace.

The SDS includes information such as the properties of each chemical:

* physical hazards
* health hazards
* environmental hazards
* protective measures
* safety precautions for handling, storage, and transport
* emergency control measures

ISO 7010

ISO 7010 is an International Organization for Standardization that has standardized graphical hazard symbols on hazard and safety signs, including those indicating emergency exits.

*Insert image*

Chemical Spills

* OSHA 1910.120 - Hazardous Waste Operations and Emergency Response (1991)
* very specific training and procedures are mandatory for reporting of and response to chemical spills that are considered HazMat incidents.
* A HazMat spill is one where there is an immediate danger to life and health
* most lab spills are not HazMat incidents
* Numerous EPA regulations control hazardous waste

Responsibilities

* Employees are responsible for:
	+ Ensuring spills are reported or cleaned up in a timely manner
	+ Cleaning up nuisance spills of materials in their area, even if someone else spills them(janitors, service people)
	+ knowing the properties of the materials they are working with
	+ taking reasonable steps to prevent spills
* HazMat team will:
	+ Assist researchers who are not comfortable cleaning up spills in their areas (even nuisance spills)
	+ Clean-up serious (HazMat) spills

Nuisance Spills

* Spills of

less than 4L of material that you know the

hazards of and are comfortable cleaning up that

you have the ability to clean up

* + - assess the hazard
		- wear appropriate PPE

If you are unsure of the hazard of a spill or need assistance with PPE selection,

call Safety

Hazardous Spills

* Spills of
	+ greater than 4L
	+ smaller spills of materials of
		- low LD50
		- carcinogens
		- flammable liquids or metals
		- compounds of unknown toxicity

Preventing Spills

* Eliminate clutter
* Know proper work practices for biological, chemical materials you use
* Use unbreakable secondary containers
* Store chemicals properly
* Dispose of waste and excess chemicals in a timely manner

Preparations

* What are the physical and toxicological properties of the biological and chemical materials you use?
* What is the worst thing that could happen if you dropped/spilled a bottle of each chemical you use?
	+ inconvenience
	+ skin burns
	+ fire
	+ chemical exposure ( fatality? permanent injury?)

Hazards

* Toxic
* Flammable
* Caustic
* Reactive/Explosive
* Radioactive
* Biological

You need to be the experton the hazards of materials in your possession

* know properties of biologicals/chemicals you use before you handle them
* Know what appropriate work practices are & use them
* know what the worst case scenario is for a spill of the chemicals you use
* Think about how you will react to a spill of the materials you use
* know what appropriate clean-up procedures are for the materials you use

**Toxic Materials**Assessing the risks due to the toxic effects of biologicals/chemicals

* Route of exposure
* Acute Toxicants
* Corrosive Substances, Irritants and Allergens
* Carcinogens
* Infectious materials

Flammability Hazards

* Location, location, location
* Ignition sources
* Ventilation
* Other fuels in the area
	+ Don’t store more than 10 gallons of flammable liquids outside of flammable liquid storage cabinets per laboratory

Caustic Chemical Hazards

Acids & Bases

* skin burns
* permanent eye damage
* inhalation hazards

Know the differences in hazards between concentrated vs. dilute solutions

Biological Materials

BSL1- defined & well characterized strains of viable microorganism NOT known to cause disease in healthy adults. **Examples**: *Bacillus subtilis* and infectious *Canine hepatitis.*

BSL2 - a broad spectrum of indigenous moderate -risk agents present in the community and associated with human diseases of varying severity. With good technique, these agents can be used safely on open benchtop when potential for aerosolization or splashing is low. **Examples**: Hepatitis B virus, *Salmonellae spp*, and *Toxoplasma spp*. **Hazards** are mainly due to the potential for needlestick (autoinnoculation) or ingestion exposure.

**BSL3** - Indigenous or exotic agents with a potential for respiratory transmission, and which may cause serious and potentially lethal infection.

**Examples**: *Mycobacterium tuberculosis*, *Coxiella burnetii.*

**Hazards** include autoinnoculation, ingestion, and exposure to infectious aerosols.

Chemical Spill Response
Nuisance Spill

* Alert people in immediate area of spill
* Wear appropriate protective gloves, goggles, long sleeve labcoat
* Avoid breathing vapors from the spill
* Confine spill to small area& absorb on absorbent pads &/or kitty litter
* Clean spill area with soap & water
* Collect all contaminated absorbent, gloves & residues in plastic bag lined garbage can
* Label and dispose of properly (call Environmental)

Chemical Spill Response
 Potentially Hazardous Spill

* Attend to injured or contaminated persons and remove them from the exposure if you can do so without endangering yourself
* Alert persons in the immediate area to evacuate the lab
* If spilled material is flammable, turn off heat and ignition sources
* Call Spill Emergency
* Close doors to affected area
* Have a person knowledgeable of incident and laboratory assist HazMat personnel.

Biological Spill Response

BSL1 Spill

* Wear disposable gloves
* Soak paper towels in disinfectant and place over spill area
* Place towels in Biohazard bag for disposal
* Clean spill area with fresh towels soaked in disinfectant.

BSL 2 Spill

* Alert people in the immediate area of the spill
* Put on appropriate protective equipment
* Cover spill with paper towels soaked in absorbent materials
* Pour a freshly prepared 1:10 bleach solution around the edges of the spill, then into center area
* Allow a 20 minute contact period
* Dispose of as in BSL 1 procedure

Radioactive Spill Response

The person who *uses or purchases* radioactive material

 is responsible for cleaning it up if it spills.

**Nuisance Spills** -Nuisance spills contain less than 1,000mCi of less than 100mCi of other isotopes can be cleaned up, decontaminated and monitored under your own supervision.

**Large Spills** - Larger spills than those above must be cleaned up in the following manner:

*Materials of high vapor pressure* -leave the area, post “Do not enter” signs on all doors, seal entry ways leading into affected areas and call emergency.

**Do not resume activities in the contaminated area until approved by the RSO.**

*Non-Volatile materials -* may be cleaned up and decontaminated on your own. You must report the spill and swipe test results to the Authorized User and the RSO.

Contamination of areas beyond the spill can easily occur if you walk through or spread the radioactive materials during cleanup. Don’t leave the spill area without monitoring your shoes, body and hands. Remove all contamination or contaminated items before leaving the area.

Radioactive Spill Clean-up Procedures

Protect people and contain the spill:

* Alert people in the immediate area of the spill
* Ask for help and confine the spill immediately
* Step away from the spill- remove contaminated clothing(gloves last)
* Have someone cover the spill with absorbent mats or paper towels while you decontaminate yourself &fellow workers
* Wash off contaminated skin for three to five minutes with soap and water. Call the nurse
* Report all incidents of personal contamination to the RSO

Radioactive spill clean-up

Wear appropriate gloves, splash goggles or safety glasses and a lab coat.

Soak up the spill with paper towels or spill pillows.

Use tongs top to place all clean-up materials into a radioactive waste plastic bag. Put broken glass into a properly labeled steel can.

Apply cleaning solution, wipe area from edge to center, dispose of as above.

Monitor the area with a 100cm2 swipe for each ft2 of spill. Repeat the cleaning process if >200dpm is found in any swipe. Repeat monitoring.

Many spills will need to be cleaned 5-7 times to achieve adequate decontamination.

Dispose of gloves, wash your hands.

Label waste bag accurately and put into a radioactive waste pail.

Estimating Potential Hazards

* Research hazards before you use a new biological agent or chemical
* Consider the toxicity, flammability, physical state and the amount of the material involved.
* Consider the location of the spill
* Consider your knowledge and skills
* Ask for help in estimating hazards call Safety

Summary

* Know the properties of all the hazardous materials you handle
* Prevent spills
* If a potentially hazardous spill occurs, protect people first, evacuate & ask for help
* Call Engineering for EMERGENCY spill/fire assistance
* Call Safety for information and **non-emergency** assistance
* You are responsible for reporting or cleaning up spills of materials you use

Waste Standards

Waste Management

* Waste management in which we attempt to manage wastes in ways that reduce their environmental harm without seriously trying to reduce the amount of waste produced.
* Waste reduction (produce much less waste and pollution), and the wastes we do produce are considered to be potential resources that can be reused, recycled, or composted.
* Integrated waste management—a variety of strategies for both waste reduction and waste management.

Hazardous waste must follow specific OSHA and EPA disposal procedures.

Hazardous Wastes are managed in 3 major ways:

1. Incineration
2. Detoxification
3. Burial

General workplace waste such as every day trash should be placed in designated receptacles.

Special items such as needles or chemicals should be placed in appropriately designed and labeled containers.

Waste Reduction

* Waste reduction is based on three Rs:
	+ Reduce: consume less and live a simpler lifestyle.
	+ Reuse: rely more on items that can be used repeatedly instead of on throwaway items, and buy necessary items secondhand or borrow or rent them.
	+ Recycle: separate and recycle paper, glass, cans, plastics, metal, and other items, and buy products made from recycled materials.

Waste Reduction

* Strategies that industries and communities have used to reduce resource use, waste, and pollution.
	+ Redesign manufacturing processes and products to use less material and energy.
	+ Develop products that are easy to repair, reuse, remanufacture, compost, or recycle.
	+ Eliminate or reduce unnecessary packaging.
	+ Charge consumers by amount of waste they throw away but provide free pickup of recyclable and reusable items.
	+ Establish cradle-to-grave responsibility laws that require companies to take back various discarded consumer products, such as electronic equipment, appliances, and motor vehicles.

If the workplace has a recycling program, those items should be placed in appropriate receptacles. Recyclable items may include:

* Paper
* Metals
* Glass
* Batteries
* Electronic parts

Never leave trash on the floor, it creates a hazard for slips and falls, as well as leaving the workplace unclean.

Don’t allow a trash receptacle to overflow. If the trash level has reached the top, change the trash bag and replace the receptacle with a new bag.

Never push down trash to make more room. You never know what could be in the trash that could cause an injury.