



1. **Accurate and updated chemical inventory** is critical for EHS compliance. Frequently the inventory is out of date, incomplete, handwritten and unorganized.
 - a. Handwritten or inventories in Word are not as useful as Excel. Excel allows for the application of filters, macros, sorting, etc.
 - b. Recommend minimum chemical inventory contents:
 - i. Chemical name
 - ii. CAS number
 - iii. Manufacturer/product number (if a product as opposed to pure chemical)
 - iv. Location
 - v. Hazard class(es)
 - vi. Amount of material (assume full container)
2. **Identify High Hazard Chemicals**
 - a. Flammable liquids
 - b. Compressed gases
 - c. Reactives
 - d. Peroxide formers
 - e. Dirty Dozen
 - i. Organic azides
 - ii. Perchlorate salts of organic, organometallic, and inorganic complexes
 - iii. Diethyl ethers
 - iv. Lithium aluminum hydride
 - v. Sodium, potassium
 - vi. Potassium metal
 - vii. Sodium-benzophenone ketyl still pots
 - viii. Palladium on carbon
 - ix. Heat generated from exothermic reactions
 - x. Ethers with alpha hydrogen atoms
 - xi. Carbon monoxide
 - xii. Organic peroxides
 - f. Particularly Hazardous Substances
 - i. Acutely toxic compounds
 1. LD50 < 200 mg / kg
 - a. Arsenic compounds (phenylarsine oxide, sodium arsenite),
 - b. Mercury, lead, cadmium salts
 - c. Cyanides (potassium cyanide)
 - ii. Carcinogens
 1. Report of Use
 - a. ≥ 0.1% by weight or volume (1,000 ppm)
 - b. Methylene chloride

- c. Formaldehyde
 - d. Chromium
 - e. Cadmium
 - f. Benzene
 - iii. Reproductive and developmental toxins
 - 1. Arsenic, beryllium, benzene, lead, toluene, N,N-Dimethylformamide (DMF)
 - iv. Comply with additional reporting requirements
 - 1. Precursors and controlled substances
 - a. Barbiturate standards
 - 2. Hazardous Materials Business Plan / CERS
- 3. Chemical storage**
 - a. Self-closing flammable cabinets
 - b. Seismic securing of chemical storage cabinets and lips on shelves
 - c. Separation of incompatibles
 - d. Spill kits specific for the chemicals / hazard class
 - i. Formaldehyde
 - ii. Hydrofluoric acid
- 4. Chemical labeling** and Globally Harmonized System (GHS) transition.
 - a. Gradually replace MSDS sheets with SDS sheets
 - b. Update hazard communication labels throughout the lab.
 - i. Label stations or drawers, small stickers and pre-printed labels help to lower the activation energy to compliance.
- 5. Hazardous Waste Management**
 - a. Waste accumulation areas
 - i. Inspected weekly
 - 1. Closed containers
 - 2. Separation of incompatibles
 - 3. Labeled
 - a. Composition (no abbreviations or general terminology i.e. "Organic waste", "Lab waste", "buffer waste")
 - i. Use a waste log if necessary
 - b. Accumulation start date (90 days or possibly 6 months)
 - c. Physical state (solid, liquid, gas)
 - d. Hazard(s) (e.g., Flammable or Toxic)
 - e. EPA ID number
 - f. Name, Address, phone number

6. No-Fly zones

- a. Do not block:
 - i. Fire extinguishers
 - ii. Eyewash stations
 - iii. Safety showers
 - iv. Fire alarm pull stations
 - v. Exit paths
 - vi. Electrical panels
- b. Fumehoods - obstructing the airflow with apparatus causes eddy currents where no airflow enters the fumehood.
 - i. Prevent storage inside the fumehood
 - ii. Raise apparatus off the bottom of the fumehood
- c. Safety showers / eyewash stations must be accessible
 - i. Clutter, additional tables, chairs, etc. can cause a violation (10 seconds)

7. Self-inspection program for laboratories

- a. Component of the Injury and Illness Prevention Program (IIPP)
- b. Comprehensive inspections are performed quarterly
- c. Best practices:
 - i. Periodic documented safety inspection –at least quarterly
 - 1. Promptly type up and assign action items with dates
 - 2. Verify finding was corrected by next quarterly inspection at the latest
 - ii. Make sure everyone on the team is wearing proper PPE
 - 1. Minimal safety glasses and closed toed shoes and possibly lab coat. Gloves if anyone touches anything
 - iii. Include a team of preferably at least three people
 - iv. It is okay to include a non-lab person on the team -they often see things that you may miss.

8. Annual reviews

- a. Chemical hygiene plan must be reviewed annually
 - i. Training to include any new process or hazards identified in the review
- b. Fume hoods need to be certified annually, alarms calibrated
- c. Hazardous Materials Business Plan
 - i. Update hazardous materials inventory - applies to the entire plant including laboratories and waste
 - ii. Update site maps including laboratory maps