Defining the Role of the Chemical Hygiene Officer

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The Chemical Hygiene Plan (CHP)

- The CHP has eight elements.
  - Standard Operating Procedures
  - Control Measures
  - Fume Hoods and Other Protective Equipment
  - Employee information and training
The Chemical Hygiene Plan (CHP)

– Prior Approval for High Hazard Work
– Medical consultation and examination
– Designate persons responsible for the CHP
– Provide employee protection from particularly hazardous substances
Laboratory Compliance Regulations - Introduction
Laboratory Compliance Regulations

- Your manual serves as the Laboratory Safety Plan (LSP) for your company.
  - The (LSP) is designed to help any employee reduce occupational hazards while working inside the laboratory.
- After reading this plan any person should be able to identify, recognize, prevent, respond, and report any exposure to hazardous chemicals in a laboratory.
Objectives of the Laboratory Safety Plan

• To ensure that the physical and chemical hazards in your laboratories are evaluated, addressed, and conveyed to employees

• To provide guidance for preventing exposure to hazardous chemicals through safe work practices

• To ensure compliance with OSHA’s requirements for permissible exposure limits for all laboratory workers
  – (OSHA currently regulates exposure to approximately 400 substances)
Safety Checklist for a New Research Lab

Faculty and staff members at the __________________ hold key responsibilities for the health and safety of personnel working in their labs. This checklist is designed to assist you in establishing processes and procedures to get your lab up and running safely. Please note this checklist focuses on general and chemical safety. There may be additional items to consider if you are working with lasers, radiation, biological materials, nanomaterials, or research animals.

Lab Infrastructure

As you begin to set up your lab, it is important to ensure you have the health and safety items below:

- Fire Extinguisher in lab or corridor (Has it been inspected within the last year?)
- Eyewash and Safety Shower, if working with hazardous materials (Travel time must be within 10 seconds). The eyewash must be flushed weekly and logged on hang tag. Eyewashes and safety showers should be inspected annually by EHSO.
- First Aid Kit
- Spill Kit appropriate to the materials used in the lab
- Specific antidotes that may be needed (Example: calcium gluconate if working with Hydrofluoric Acid)
- Proper chemical storage areas, appropriate to the classes of chemicals you will be using (Examples: flammable cabinets, acid cabinets, flammable refrigerators, gas cylinder restraints, etc.) These should be labeled with the hazard labels in your “New PI Safety Welcome Kit.”
- Special equipment, if needed (Examples: BioSafety cabinet [must be certified annually], nanoenclosures, and toxic gas cabinets)
- Chemical Fume Hood(s) (Should have a sign stating it was checked with the last year)

Documentation for Your Lab Safety Binder

Labs at have certain required documents that should be kept in your Lab Safety Binder. You will receive a Lab Safety Binder in your “New PI Safety Welcome Kit.” All of these documents can be found on the ____________ webpage.

- Lab Safety Plan completed with name of Chemical Hygiene Officer. You may serve as your own Chemical Hygiene Officer or delegate this responsibility to an experienced lab worker.
- Completed Chemicals of Concern Form
- Completed Laboratory Hazard Assessment (must be signed by all lab workers)
- Standard Operating Procedures (if working with Particularly Hazardous Substances)
- Yearly Lab Safety Self-Inspection Checklist
- EHSO Safety Training Documentation (You should maintain the safety training records for yourself and those that work in your lab)
- Any additional safety procedures unique for your lab work

Lab Hazard Communication

- Lab Specific Emergency Response Plan completed and posted
- Lab I.D. Card and Hazard Placard posted on the outside of the lab
- Safety Data Sheets for all chemicals in the lab stored in an e-Binder in the SDS online database (Your CHO Lab Safety Advisor can assist you with this)
- Evacuation route maps posted in the corridor
Objectives of the Laboratory Safety Plan

• To serve as documentation of your laboratory “Right To Know Program and Chemical Hygiene Plan”, as required by OSHA.

• To help plan and create standard operating procedures (SOPs) to control the exposure to the physical and health hazards of chemicals.

• To improve safety in all laboratories.
Occupational Safety and Health Administration (OSHA)

• This Laboratory Safety Plan (LSP) is intended to safely limit laboratory workers' exposure to OSHA regulated substances.
  – Section 5a(1) of the Occupational Safety and Health Act of 1970, the General Duty Clause, requires that employers “shall furnish to each of its employees employment and a place of employment which are free from recognized hazards that are causing or likely to cause death or serious physical harm to his employees.”
Occupational Safety and Health Administration (OSHA)

- It’s important to note that the general duty clause allows the university to enforce best practices by non-regulatory agencies such as:
  - National Institute for Occupational Safety and Health (NIOSH)
  - Centers for Disease Control and Prevention (CDC)
  - National Research Council (NRC)
  - National Science Foundation (NSF)
  - National Institutes of Health (NIH)
  - National Fire Protection Association (NFPA-45)
Current OSHA Standards that should be addressed in your plan

• The Occupational Exposure to Hazardous Chemicals in Laboratories Standard (29 CFR 1910.1450)

• The Hazard Communication Standard (29 CFR 1910.1200)

• The Personal Protective Equipment (PPE) Standard (29 CFR 1910.132)
Current OSHA Standards that should be addressed in your plan

- The Eye and Face Protection Standard (29 CFR 1910.133)
- The Bloodborne Pathogens Standard (29 CFR 1910.1030)
29 CFR 1910, Subpart Z

• Laboratory workers must not be exposed to substances in excess of the permissible exposure limits (PEL) specified in OSHA rule 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances.
29 CFR 1910, Subpart Z

- NIOSH National Institute for Occupational Safety and Health
- ACGIH American Conference of Governmental Industrial Hygienists
  - TWA - Time-Weighted Average
  - PEL - Permissible Exposure Limit (OSHA)
  - TLV - Threshold Limit Value (ACGIH)
  - STEL - Short-Term Exposure Limit
  - C - Ceiling Limit
  - REL - Recommended Exposure Level
State of Hawaii Occupational Safety and Health

- They require employers to evaluate their workplaces for the presence of hazardous substances, harmful physical agents, and infectious agents and to provide training to employees concerning those substances or agents to which employees may be exposed.
State of Hawaii Occupational Safety and Health

• Written information on hazards must be readily accessible to employees or their representatives.

• Employees have a conditional right to refuse to work if assigned to work in an unsafe or unhealthy manner with a hazardous substance, harmful physical agent or infectious agent.
Any worker or researcher who would like to work with controlled substances must be registered with the Drug Enforcement Administration (DEA).

For a number of reasons pertaining to Federal and State law, there are many different research protocols that require different registration and license types.

In addition, one registration type may not cover two different research projects, such as research with controlled substances and dispensing of controlled substances. The required forms and detailed instructions are available on the DEA - website:

Toxic Substances Control Act (TSCA)

• The Toxic Substances Control Act (TSCA) requires that prudent laboratory practices be developed and documented for research involving new chemicals that have not had their health and environmental hazards fully characterized.
Toxic Substances Control Act (TSCA)

• Laboratories engaged in research must consider the applicability of the Toxic Substances Control Act (TSCA) on their operation. TSCA, administered by the U.S. Environmental Protection Agency (EPA) under the New Chemicals Program
  – is intended to ensure that the human health and environmental effects of chemical substances are identified and adequately addressed prior to commercial use or transport of those substances.
  – [http://www.epa.gov/oppt/newchems/](http://www.epa.gov/oppt/newchems/)
Department of Transportation (DOT) and International Air Transport Association (IATA)

- Hazardous materials packages are regulated through all stages of transport; from the time the package is taken from the shipper to the delivery of the package to the recipient.
For all domestic ground transport, the U.S. Department of Transportation (DOT) creates and enforces the regulations one must follow when shipping a hazardous material package.

Anyone who may ship or accept a package of hazardous materials is required to take the Introduction to Shipping and Receiving course.
Chemical Facility Anti-Terrorism Standards

• In 2007, the Department of Homeland Security (DHS) issued a list of “Chemicals of Interest.”

• These are chemicals which pose a risk to homeland security. Any facility which has one of these “Chemicals of Interest” above the specified thresholds determined by the Department of Homeland Security must complete a “Top Screen” which allows DHS to assess the chemical security threat the facility poses.
DHS - three security issues related to chemicals

- **Release**: Toxic, flammable, or explosive chemicals or materials that, if released from a facility, have the potential for significant adverse consequences for human life or health.

- **Theft or Diversion**: Chemicals or materials that, if stolen or diverted, have the potential to be misused as weapons or easily converted into weapons using simple chemistry, equipment or techniques, in order to create significant adverse consequences for human life or health.

- **Sabotage**: Chemicals or materials that, if mixed with readily available materials, have the potential to create significant adverse consequences for human life or health.
Chemicals of Concern

A chemical that falls into two or more of these high hazard categories requires the highest level of attention.

- Extremely Hazardous Substances
- Pose a Threat to Homeland Security – Select Agent
- Shock Sensitive
- Pyrophoric
- Class A Peroxides
- Class B Peroxides
- OSHA Carcinogens
- Toxic Substances Regulated by OSHA
- Toxic Gases
Emergency Planning and Community Right-to-Know Act (EPCRA)

• The Emergency Planning and Community Right-to-Know Act of 1986 is a U.S federal law concerned with emergency response preparedness.

• Its purpose is to encourage emergency planning efforts and to provide the public and local governments with information concerning potential chemical hazards present in their communities.

• EPCRA established a list of Extremely Hazardous Substances (EHS).

• EHS are chemicals considered extremely hazardous due to their acute toxicity.
Resource Conservation and Recovery Act (RCRA)

• Hazardous waste regulations in the U.S. began with the Resource Conservation and Recovery Act (RCRA) which was enacted in 1976.

• RCRA created a "cradle to grave" system of management for hazardous wastes. This means you are responsible for any hazardous waste generated even after it leaves the campus for disposal.

• Hazardous wastes must be tracked from the time they are generated until their final disposition.
Laboratory Safety Training

• Laboratory safety training is required by federal law for all laboratory employees before they work inside a laboratory.
Responsibilities

The following individuals have responsibility for implementing the Laboratory Safety Plan:
Chemical Hygiene Officer (CHO)

• The Chemical Hygiene Officer (CHO) has primary responsibility for ensuring the implementation of 29 CFR 1910.1450 Occupational Exposure to Hazardous Chemicals in Laboratories is responsible for:
  – Informing PIs/Laboratory Supervisors of chemical-related health and safety requirements and assisting with the selection of:
  – Appropriate safety controls, including engineering controls, laboratory and other workplace practices and procedures, training, and personal protective equipment
Breaker!
The ventilation needs for any specific laboratory must be evaluated on the needs of the laboratory!
Yes, labs are different. Dilution is not the solution.
Laboratory Room Ventilation - 101

Negative Room Pressurization

Inward Airflow

EXHAUST

SUPPLY
OSHA (Occupational Safety and Health Administration)

- 4. Ventilation
  - (a) General laboratory ventilation. This system should:
    - Provide a source of air for breathing and for input to local ventilation devices (199);
    - It should not be relied on for protection from toxic substances released into the laboratory (198);
    - Ensure that laboratory air is continually replaced, preventing increase of air concentrations of toxic substances during the working day
Normal operating system

Typical Constant Volume Laboratory Ventilation System
Without the hood exhaust
How many air changes per hour?
ACGIH Industrial Ventilation Manual

- “‘Air changes per hour’ or ‘air changes per minute’ is a poor basis for ventilation criteria where environmental control of hazards, heat, and/or odors is required.
- The required ventilation depends on the problem, not on the size of the room in which it occurs.”
Chemical Hygiene Officer

• Remind fellow lab workers to complete annual lab safety refresher training
• Schedule services for hazardous waste disposal.
• Write or assist laboratory supervisors in writing standard operating procedures
• Maintains the Safety Data Sheets for hazardous materials used in the lab group
Chemical Hygiene Officer (CHO)

• Helping to develop and implement appropriate chemical hygiene policies and practices
• Working with Departments and lab groups to develop and review SOPs for processes using hazardous chemicals
Chemical Hygiene Officer (CHO)

- Conducting periodic inspections and immediately taking steps to abate hazards that may pose a risk to life or safety upon discovery of such hazards
- Performing hazard assessments, upon request; and
- At least annually, reviewing and evaluating the effectiveness of the Laboratory Safety Manual and making updates as appropriate
Door 1 - Laboratory Inspections

- are conducted annually to ensure safety and compliance with all applicable lab safety regulations and guidelines.
  - These inspections are also intended to provide a formal opportunity for laboratory personnel to ask questions regarding any aspect of lab safety in order to improve overall compliance.
  - AKA the checklist
Door 2 - Laboratory Inspections

• The laboratory inspection is the safety audit of the conditions and operations that occur on a daily basis in a specific laboratory.
Laboratory Setup - distillation

1: A source of heat
2: Still pot
3: Still head
4: Thermometer/Boiling point temperature
5: Condenser
6: Cooling water in
7: Cooling water out
8: Distillate/receiving flask
9: Vacuum/gas inlet
10: Still receiver
11: Heat control
12: Stirrer speed control
13: Stirrer/heat plate
14: Heating (Oil/sand) bath
15: Stirring means e.g. (shown), boiling chips or mechanical stirrer
16: Cooling bath.
Deans, Directors and Department Heads

- **Deans, Directors and Department Heads:**
  - Have the primary responsibility for ensuring that this document is followed by all of their employees who have access to laboratories, work in laboratories, or assign people to work in laboratories.
  - Their responsibilities are as follows:
    - Actively supporting this Plan to ensure the health and safety of all laboratory employees and students, while collaborating with faculty and staff to implement this plan.
Deans, Directors and Department Heads

• **Deans, Directors and Department Heads:**
  – Budgeting for health and safety needs
  – Actively supporting compliance with EHSO safety audit findings, recommendations and regulatory agency requirements
  – Ensuring all PIs and lab workers complete all required training e.g. “Introduction to Laboratory Safety Training” before beginning any work inside a laboratory
  – Ensuring all employees complete all required laboratory safety training and annual refresher
Environmental Health and Safety Office (EHSO)

• EHSO provides help with environmental compliance, laboratory safety, fire safety, health and safety, radiation safety and hazardous waste disposal programs and services. EHSO responsibilities are as follows:
  – Revising and distributing the master LSP and related policies and procedures
  – Providing expertise and resources on environmental health and safety issues
Environmental Health and Safety Office (EHSO)

– Providing current information on regulatory applicable requirements
– Help in the planning for supplying waste management services
– Conducting routine industrial hygiene exposure assessments and laboratory safety audits
– Testing and inspecting chemical fume hoods and coordinating ventilation system maintenance
Environmental Health and Safety Office (EHSO)

- Evaluating complaints of odors and possible chemical overexposures
- Providing seminars, web-based training, and training resources
- Providing support services during incidents and other emergencies in laboratories
- Reviewing new construction and renovation projects for health and safety concerns
Principal Investigators (PIs) and Laboratory Directors

- Academic and professional staffs, which are assigned laboratory spaces, shall be referred to as Principal Investigators (PIs) throughout this LSP. PI and Lab Director Responsibilities are as follows:
  - **Provide and document training**
    - All employees, as well as volunteers and contractors that work inside a “wet” lab, must be trained by their Principal Investigator (PI) on the dangers of chemical hazards, biological toxins, and occupational hazards associated with their lab.
    - Laboratory Specific Training must be provided by the PI who is most familiar with the potentially hazardous materials, their operations, and their safe use.
Principal Investigators

• (PIs) are directly responsible for the safety of workers in their assigned labs.
  – Recently a UCLA Professor was criminally charged with willful violations of OSHA standards in a death stemming from a lab accident
Principal Investigators (PIs) and Laboratory Directors

• Complete the laboratory hazard assessment & provide personal protective equipment (PPE)
• It is the responsibility of the PI to ensure employees have the appropriate PPE for the research they conduct. PIs must complete the laboratory Hazard assessment for their lab.

Thanks Ron
Permission per BYU
Principal Investigators (PIs) and Laboratory Directors

• The completed document acts as a training guide

• Each employee must be trained by the PI on the proper use of PPE with this document

• By Federal and state Law, the employer needs to provide any PPE that is required for the job at no cost to the employee
Principal Investigators (PIs) and Laboratory Directors

- Provide access to Safety Data Sheets (SDS)
- Develop lab emergency procedures and SOPs for particularly hazardous substances
- Report and investigate all injuries
Principal Investigators (PIs) and Laboratory Directors

- Post updated lab id card and hazard placard
- Provide and maintain required engineering controls
- Correct hazards in a timely fashion
- Hold employees accountable for complying with safety procedures
Laboratory Employees

- All people who work inside a laboratory regardless of title are considered laboratory employees.
- When assistance is required to evaluate issues of chemical hygiene, they are to consult with the CHO or PI and EHSO. Laboratory employees' responsibilities are as follows:
Laboratory Employees

• Must complete all required Lab Safety training before working in the laboratory and at least annually thereafter
• Please review all available SOPs and SDS documents while planning and conducting laboratory activities
• Performing work with volatile, corrosive, or toxic chemicals in a chemical fume hood and not on the bench
• Wearing appropriate personal protective equipment, i.e. gloves, eye protection and protective clothing. See your lab’s hazard assessment for the proper PPE
Laboratory Employees

- Obtaining information and training when unfamiliar with the hazards of a chemical or procedure before proceeding
- Consulting with the PI or CHO before altering an experiment or substituting a chemical
- Refraining from operating equipment or instrumentation without proper instruction and authorization
Laboratory Employees

- Reporting potentially unsafe practices or conditions promptly to the lab supervisor, CHO or EHSO
- Reporting incidents and near misses
- Recognizing emergency conditions and understanding the appropriate actions to take
Contractor Safety: Are You Responsible When They Are on Site?
Facilities Management and Outside Contractors

- Non-laboratory personnel such as Facilities Management employees and outside contractors shall be referred to as non-lab personnel in this LSP.

- Non-lab personnel should try to minimize their presence in the lab areas.
Laboratory Safety Training

• Laboratory safety training is required by federal and state for all laboratory employees before they work inside a laboratory.

• It is extremely important that laboratory personnel familiarize themselves with OSHA’s laboratory standard, and the EPA’s RCRA regulations, along with pertinent state and local fire codes. All of these topics should be covered in your training courses.
Beaker
What is the difference between A Chemical Hygiene Plan and A Laboratory Safety Plan.
Mee mee mee meeo meep
Laboratory Safety Binder

• Every lab on should create a lab safety binder that contains important documents for lab safety. The binder should contain the following:
Laboratory Safety Binder

1.) Lab Safety Plan (LSP)
2.) Biological Safety Manual
3.) PPE Hazard Assessment
4.) Your Chemicals of Concern Form
5.) Standard Operating Procedures (SOP) Templates
6.) Lab-Specific Training Documents
7.) Chemical Fact Sheets
8.) Lab Safety Training Matrix
9.) Training Records
10.) Emergency Preparedness Plan
Laboratory Compliance

Regulations - Training
# Laboratory Training Matrix

**What?** This document outlines minimum Laboratory Safety Training Requirements for anyone working in a laboratory. In addition, it is the responsibility of each Principal Investigator to ensure that his or her lab group conducts and documents lab-specific training to instruct staff on each lab’s procedures and hazards.

<table>
<thead>
<tr>
<th>Lab employees who ..........</th>
<th>Take this Safety Training Course (See Key Below)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Laboratory Safety</td>
<td>A B C D E F G H I J K L M N</td>
</tr>
<tr>
<td>Are a Principal Investigator</td>
<td></td>
</tr>
<tr>
<td>Use chemicals (or work in a wet lab)</td>
<td></td>
</tr>
<tr>
<td>Use a respirator</td>
<td></td>
</tr>
<tr>
<td>Use controlled substances (not in animals)</td>
<td></td>
</tr>
<tr>
<td>Shipping and Receiving</td>
<td></td>
</tr>
<tr>
<td>Sign for (receive) chemicals or infectious substances</td>
<td></td>
</tr>
<tr>
<td>Ship infectious substances, flammables, corrosives, gases, or toxic substances</td>
<td></td>
</tr>
<tr>
<td>Radiation Safety</td>
<td></td>
</tr>
<tr>
<td>Use lasers</td>
<td></td>
</tr>
<tr>
<td>Use radioactive materials</td>
<td></td>
</tr>
<tr>
<td>Biosafety</td>
<td></td>
</tr>
<tr>
<td>Use human materials (e.g. blood, specimens or cells)</td>
<td></td>
</tr>
<tr>
<td>Use biohazardous materials</td>
<td></td>
</tr>
<tr>
<td>Use animals in research</td>
<td></td>
</tr>
</tbody>
</table>

**Key to Safety Training Courses Responsibilities**

- **A.** Lab Safety Responsibilities for Principal Investigators
- **B.** Introduction to Laboratory Safety
- **C.** Laboratory Safety Refresher Training
- **D.** Respirator Training
- **E.** Shipping Hazardous Materials Training
- **F.** Introduction to Hazardous Materials Receiving
- **G.** Basic Laser Safety Training
- **H.** Initial Radiation Safety Training
- **I.** Radiation Safety Refresher Training
- **J.** Initial Bloodborne Pathogen Training
- **K.** Bloodborne Pathogen and Needle Stick Prevention Refresher Training
- **L.** Biological Safety Cabinet Training (optional)
- **M.** Animal Care Training
- **N.** Controlled Substance Training

**Class Format**

- **A.** Classroom
- **B.** Classroom
- **C.** Online
- **D.** Online
- **E.** Classroom
- **F.** Online
- **G.** Online
- **H.** Classroom
- **I.** Online
- **J.** Classroom
- **K.** Online
- **L.** Online
- **M.** Online

**Frequency**

- **A.** Once
- **B.** Once (does not apply if taken A)
- **C.** Annual (after completing A or B)
- **D.** Annual
- **E.** Every two years
- **F.** Every three years
- **G.** Once
- **H.** Once
- **I.** Annual (after completing H)
- **J.** Once
- **K.** Annual (after completing J)
- **L.** Once
- **M.** Once
- **N.** Once
Laboratory Safety Training

• **Initial training:**
  – New employees must be fully informed of potential chemical, electrical and equipment hazards in the lab spaces
  – The lab group must be informed when the hazard changes or a new hazard is introduced into the work area
Laboratory Safety Training

• **Introduction to Laboratory Safety:**
  – For new lab workers and to those who have not yet received laboratory safety training.

Thanks Ron
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Laboratory Safety Training

• Lab Safety Responsibilities for Principal Investigators:
  – This training is a mandatory one-time requirement for all principal investigators (PIs) working in a research laboratory on campus
Laboratory Safety Training

• **Laboratory Specific Training**
  – must be provided by the PI or other personnel familiar with the potentially hazardous materials, and their safe use
  – the PI should review your lab’s hazard assessment, SOPs, and lab emergency response procedures
True - False

• Mixtures containing greater than 23% oxygen must be handled with all the precautions and care of pure oxygen as they start to change fire chemistry and enhance combustion.
True - False

• Mixtures containing greater than 23% oxygen must be handled with all the precautions and care of pure oxygen as they start to change fire chemistry and enhance combustion.
Cylinders valves and connections:

- Any device that is to be used on Oxygen service must be certified clean and safe for oxygen use.
  - Never permit oil, grease, or other readily combustible substances to come in contact with cylinders, valves, or other equipment in oxidizer service.

The CGA defines oxygen-enriched mixtures or atmospheres as any mixture or atmosphere containing greater than 23% oxygen, since above this concentration, the reactivity of oxygen significantly increases the risk of ignition and fire.
No laboratory work is Routine

• The lab in which the explosion happened was operated by HNEI and focuses on renewable energy and degradable bioplastics.

• At the time of the incident, the researcher who was injured was combining hydrogen, carbon dioxide, and oxygen gases from high-pressure cylinders into a lower pressure container.

• The mixture was to be used as a feedstock to grow cells. “Since 2008, when the project began, the process has been used almost daily and without incident,”
Laboratory Safety Training

• **Documentation**
  – Training documentation must be saved and readily accessible by the PI. It can be stored electronically or with a hard copy.
  – A certificate is issued when a passing test score is achieved in the web based training.

**Without documentation training did not take place.**
Other Laboratory Safety Training

• Initial Radiation Safety Training
• Annual Radiation Safety Refresher Training
• Basic Laser Safety Training Course
• Biological Safety Cabinet Training
• Initial Bloodborne Pathogen Training
• Bloodborne Pathogen and Needle Stick Prevention Refresher Training
• Respiratory Protection Training
• Other required by standards
Emergency Planning for Laboratories
Emergency Preparedness Plan

• Every laboratory on campus must have an emergency preparedness plan for their specific laboratory.

• There are many emergencies that can happen from power outages to floods, and even chemical spills. It is important that each lab group assess and identify their laboratory vulnerabilities.

• In emergencies, laboratory staff should be able to understand how to exit the building, pull the fire alarm, find the eyewash and safety shower.
Lab Specific Emergency Response Plan

**Emergency Equipment Locations**

Fire Extinguishers:

Fire Alarms:

Emergency Exits:

Eye Wash Stations:

Emergency Showers:

Electrical Control Panel/Shut-Offs/Breaker Panels:

Chemical Spill Kits:
Emergency Preparedness Plan

1. START
   - Identify Threats and Hazards of Concern
   - Qualitatively Assess the Potential Impacts (Hazard Survey)
   - Identify Core Capabilities Required to Address Hazard Impacts

2. Identify Plans, Procedures, Resources and Training Required to Build Capabilities
   - Assess Current Capabilities
   - Identify Gaps in Existing Plans, Procedures, Resources and Training
   - Set Program Goals to Address Identified Gaps

3. Develop and Implement Plan to Build Capabilities
   - Use Drills & Exercises to Test Capabilities
   - Identify Improvement Items or New Gaps
Emergency Preparedness Plan

• Laboratory Hazard Signs and Lab ID Cards
  – All laboratory doors need to have a hazard sign and Lab ID card posted on each entrance to a laboratory.
  
• This information is critical in determining emergency response procedures for fires, power outages, and evacuations.
Emergency Preparedness Plan

• Exit/Entrance Routes
  – All exit routes to laboratories need to be clear from debris and obstructions. Do not block aisles or exits in laboratories with furniture, desks, cabinets, and refrigerators.
  – Emergency personnel must be able to access all areas in a laboratory.
Emergency Preparedness Plan

• Exit/Entrance Routes
  – All exit routes to laboratories need to be clear from debris and obstructions. Do not block aisles or exits in laboratories with furniture, desks, cabinets, and refrigerators.
  – Emergency personnel must be able to access all areas in a laboratory.
Emergency Preparedness Plan

• Emergency Safety Equipment
  – Safety Showers and Eyewashes
  – Shall be located within a 10 second travel time (approx. 100 ft.), away from obstructions or chemical hazards
  – Maintain a 36-inch circumference area free and clear of obstructions.
  – Do not house electrical equipment where it may be splashed by the shower
Emergency Preparedness Plan

• Emergency Safety Equipment
  – When the system does not include a drain, have a means for collecting the water
  – Must be separately plumbed with tepid and potable water
  – Must be tested at least annually for proper flow and operation
  – A tag displays the date of the test
Emergency Preparedness Plan

- ANSI Z358.1 -
Emergency Preparedness Plan

• Fire Protection:

  – Laboratory Corridor Doors
    • Keep closed at all times for fire protection and to maintain negative pressure.
    • Two exits within labs are required when: highly toxic gases, pyrophoric materials, large quantities of flammable liquids or gases are stored in the lab area that is over 1000 square feet, or if the travel distance to the exit door exceeds 50 feet
    • Doors shall swing in the direction of egress.
Emergency Preparedness Plan

• Fire extinguishers
  – There should be a fire extinguisher within 50 feet (travel distance) of the exit door or inside the laboratory.
  – they must be hung near and never be obstructed
Emergency Preparedness Plan

• Types of Fire Extinguishers

- Class A extinguishers put out fires in ordinary combustible materials such as cloth, wood, rubber, paper, and many plastics.

- Class B extinguishers are used on fires involving flammable liquids, such as grease, gasoline, oil, and oil-based paints.

- Class C extinguishers are suitable for use on fires involving appliances, tools, or other equipment that is electrically energized or plugged in.

- Class D extinguishers are designed for use on flammable metals and are often specific for the type of metal in question. These are typically found only in factories working with these metals.

- Class K fire extinguishers are intended for use on fires that involve vegetable oils, animal oils, or fats in cooking appliances. These extinguishers are generally found in commercial kitchens, such as those found in restaurants, cafeterias, and caterers. Class K extinguishers are now finding their way into the residential market for use in kitchens.
Emergency Preparedness Plan

• Overhead Sprinkler Systems
  – In buildings with a sprinkler system, an 18” clearance from the ceiling must be maintained to allow full water coverage from the sprinklers.
Laboratory Fire Damage
Emergency Preparedness Plan

• Procedures in Case of Fire
Emergency Preparedness Plan

• Procedures in Case of Fire
  – **In case of fire**, follow the acronym **RACE**
  – **RESCUE** anyone in immediate danger of the fire.
  – **ACTIVATE** your alarm or call 911.
  – **CONFINE** the fire by closing windows and doors to the fire.
  – **EVACUATE** to an area of refuge or **EXTINGUISH** fire only if you have been trained and the fire is small. If you choose to extinguish the fire, be sure you have a safe escape route, with your back to the exit, in case you are unsuccessful in fighting the fire.
Emergency Preparedness Plan

• Procedures on how to use a fire extinguishers (PASS) - follow the acronym
  – PULL the safety pin out, release a lock latch or press a puncture lever.
  – AIM the extinguisher nozzle, horn or hose low at the base of the fire's leading edge.
  – SQUEEZE or press the extinguisher's handle to release the extinguishing agent.
  – SWEEP the extinguisher from side to side, progressing from the leading edge of the fire toward the center, until the fire is extinguished. Extinguishing techniques may vary; read the directions on the extinguisher.
Emergency Preparedness Plan

• Procedures for Clothing on Fire (Do not use a fire blanket as they retain the heat):

• **STOP** moving and call for help.

• **DROP** to the ground.

• **ROLL** to smother the flames and to keep flames from the face and hair.
Emergency Preparedness Plan

• Responding to Simple Chemical Spills
  – Follow OSHA – Standards 29 CFR 1910.120 – HAZWOPER
  – Before a spill occurs, you should evaluate the potential hazards in advance of using the chemicals e.g. flammable, acid, base etc..
  – The first source of information to consult would be your Safety Data Sheets (SDSs).
  – Appropriate Personal Protective Equipment for Spill Response (Gloves, Respirators, Etc.)
  – Types Of Fire Suppression Equipment
  – Appropriate Clean Up Materials
  – First Aid Procedures
Emergency Preparedness Plan

• WHAT TO DO IN CASE OF A SPILL

• Only trained employees can clean up spills
  – Tell someone else in the lab and get their help
  – Call your emergency number)
Emergency Preparedness Plan

• WHAT TO DO IN CASE OF A SPILL

• If the spill is not producing hazardous vapors:
  – Put on all Personal Protective equipment (nitrile e.g. gloves, lab coat or apron, goggles)
  – Remove any broken glass pieces
  – Dike with an absorbent sock and cover spill with sorbent material
Emergency Preparedness Plan

– The prepackaged kits tend to be expensive, so you can make your own kits. To make your own spill kit, include the following items at a minimum:

• Disposable nitrile gloves (1 box)
• Chemical specific gloves
• Safety goggles
• Hand broom
• Plastic dustpan
• 4-mil plastic zippered bags
• Appropriate absorbent material (such as spill pads, spill pillows or loose sorbents)
Emergency Preparedness Plan

• Recommended Spill Kits:
  – Prepackaged spill kits are available from various vendors.
Emergency Preparedness Plan

SPILL CLEANUP PROCEDURES

Absorbent Pad Spill Kit

PLACE A BARRIER AROUND THE SPILL

COVER COMPLETELY WITH APPROPRIATE MATERIAL

CLEAN UP

BAG AND TAG FOR EH&S WASTE REMOVAL

Floor Dry Spill Kit

BAG AND TAG FOR EH&S WASTE REMOVAL
Loss of Power

• To prevent a dangerous situation in laboratory buildings when a power outage occurs, before leaving the area, scan the laboratory making sure that experiments are brought to a safe mode.

• Three types of procedures
  – Before the power fails
  – While the power is off
  – When the power returns
Preplanning for Power Failure

• Designate an emergency contact person for your lab.
• Post emergency contact phone numbers on the lab safety sign in the hallway outside your lab
• Equip your emergency/spill kit with a battery powered flashlight
• Do not leave open chemicals in the fume hood when the fume hood is unattended
• Always safely store chemicals after use
• Have an emergency plan for your research animals
Preplanning for Power Failure

• Put essential equipment on emergency power circuits. These circuits have red cover plates and are powered by an emergency generator at each lab building.
  – Install appropriately-sized surge protection devices for all sensitive or expensive electronics.

• Make a list of equipment that must be reset, reprogrammed, restarted, or recalibrated once power returns.
  – Post the list in a conspicuous place.
  – Program equipment that operates unattended to shut down safely during a power failure and not restart automatically when power returns.

• Identify an emergency source of dry ice, if you have items that must be kept cold
Preplanning for Power Failure

– Note: Refrigerators and freezers will maintain their temperature for several hours if they are not opened.
– Do not use dry ice in walk-in refrigerators or other confined areas.
While the Power is Off

- Shut down experiments that involve hazardous materials.
  - Make sure experiments are stable and won't create uncontrolled hazards.
- Check fume hoods and biosafety cabinets and take the following precautions, if applicable:
  - Stop any operations that may be emitting hazardous vapors, fumes, or infectious agents.
  - Securely cap any open containers.
  - Close fume hood and biosafety cabinet sashes.
While the Power is Off

• Check equipment on emergency power to ensure it's running properly.
  – Note: It may take 20 to 30 seconds for emergency power to activate after a power failure.
• Reduce electrical use and risk of power surges by:
  – Disconnecting from emergency outlets equipment that runs unattended, and
  – Turning off unnecessary lights and equipment.
• Transfer vulnerable items from cold rooms and refrigerators that have lost power to equipment served by emergency power.
The Power is Restored

• Check equipment.
  – Reset and restart equipment.
  – Confirm air flow in your fume hood is restored.
  – Recalibrate and reprogram equipment as necessary.

• Keep doors closed on refrigerators and freezers that failed until they have been repaired and returned to safe working temperature.
  – Some refrigerators and freezers require a manual restart.
Emergency Preparedness Plan

• Water Outages:
  – During water outages experiments and chemical manipulations that require water should be shut down.
  – Since safety showers and eyewashes will not function, chemical process with hazardous materials should be shut down.
  – All laboratories must stop all wet lab research until notified by the building’s engineering group.
General Guidelines for Laboratory Room Signage
Hazard Signage and Entrances

• Posting hazard signs is an important first step all researchers must complete when starting up laboratory work.
  – You should follow all local codes.

• All entrances into laboratories should all required signage
Hazard Signage and Entrances

• Second is hazard placard identifying chemical, biological and radioactive hazards.
  – In addition, all laboratories must be closed at the entrance way when conducting laboratory work.

• Signage at doorways to laboratory spaces must be posted and updated each year or when information changes.
Other applicable Fire Code and NFPA regulations (continued)

- NFPA 45 does not recommend the use of NFPA 704 diamond signs for entrances to lab units or storage rooms, preferring a "lettered" sign instead.

As such, the existing "Laboratory - Potentially Hazardous Substances" sign or the sign required by the new R 2706-01 lab rule sign requirement, "Laboratory - Caution: Hazardous Materials" in addition to the basic "Radioactive", "Biohazard" and "Water Reactive" signage shall be maintained. "No Smoking" signs shall be required even in institutions that totally prohibit smoking.
Safety Data Sheets (SDS)
Safety Data Sheets (SDS)

- Safety Data Sheets (SDS), formally known as Material Safety Data Sheets (MSDS) must be readily available in all laboratories on campus.
  - The OSHA Hazard Communication standard (29 CFR 1910.1200) requires manufacturers to provide MSDSs at no cost to users.
  - All SDS are broken down into ten sections that provide details on the manufacturer of the chemical, physical properties, disposal requirements, PPE requirements, known health hazards, and etc.
    - Review the MSDS when working with a chemical for the first time or when training staff.
OSHA Required Sections of a Safety Data Sheets (SDS)

- Section 1, Identification
- Section 2, Hazard(s)
- Section 3, Composition/information on ingredients
- Section 4, First-aid measures
- Section 5, Fire-fighting measures
- Section 6, Accidental release measures.
- Section 7, Handling and storage
- Section 8, Exposure controls/personal protection
- Section 9, Physical and chemical properties.
- Section 10, Stability and reactivity
- Section 11, Toxicological information
- Section 12, Ecological information
- Section 13, Disposal considerations
- Section 14, Transport information
- Section 15, Regulatory information
- Section 16, Other information, includes the date of preparation or last revision
Safety Data Sheets (SDS)

• *Note: Since other Agencies regulate this information, OSHA will not be enforcing Sections 12 through 15(29 CFR 1910.1200(g)(2)).

• Employers must ensure that SDSs are readily accessible to employees. See Appendix D of 1910.1200 for a detailed description of SDS contents.”
Medical Program and Exposure Control Measures
Medical Program and Exposure Control Measures

• Employee Hazardous Exposure Determination

• Hazardous exposure to chemicals can be measured through industrial hygiene monitoring.

• Monitoring assesses the effectiveness of procedures and equipment used to prevent chemical exposures.
Medical Program and Exposure Control Measures

• A workplace monitoring program is conducted by an Industrial Hygienist to provide objective data on potential hazardous exposure or the degree of contamination in the laboratory area.

• Monitoring may be performed when there is a possibility personal exposure levels exceed the relevant health standards or in cases where employees exhibit signs or symptoms of overexposure to a chemical.