

Employer's Safety Awareness Expectations for New Hires

Certain skills are expected from new hires as a result of their education in chemistry. In addition to the traditional areas of analytical, physical, organic and inorganic chemistry, employers expect a variety of skills related to day-to-day laboratory activity. Safety awareness is among these. Employers expect safety awareness to increase with the level of education of the chemist and chemical engineer. The Safe Practices Subcommittee has identified the basic skill set necessary for chemists at the Bachelor's, Masters and Doctoral level of education. While the employer will need to educate a new hire about site-specific procedures, these basic skills are expected to be part of a recent graduate's capabilities.

UNDERGRADUATE LEVEL – BS/BA or equivalent

Recognize chemical/laboratory hazards.

- Be able to identify basic hazards: flammability, corrosivity, toxicity, etc.
- Be able to obtain safety information from Safety Data Sheets and labels.
- Have a basic understanding of hazardous waste characterization.
- Understand chemical compatibility needs during waste consolidation.

Assess risks of assigned tasks.

- Possess a fundamental understanding of the difference between hazard and risk.
- Be able to determine basic risk levels (for example, low, moderate or high) of chemical handling assigned to a task.
- Be able to determine basic risk levels (for example, low, moderate or high) of equipment set-up assigned to a task.
- Determine if YOU are adequately prepared to perform the assigned task.
- Be able to recognize out-of-ordinary conditions which require immediate action.

Mitigate recognized risks.

- Be able to:
 - Handle flammable liquids using recognized best practices of laboratory safety.
 - Handle corrosive liquids and solids using recognized best practices of laboratory safety.
 - Handle toxic materials using recognized best practices of laboratory safety.
 - Handle low-level radioactive material using recognized best practices.
 - Handle biological material using recognized best practices.
 - Properly use a laboratory chemical hood. Recognize when the hood is malfunctioning.
 - Properly use required ballistic shielding.
 - Properly use required personal protective equipment (minimum: lab coat, eye/face protection). Properly determine the correct glove for the task as necessary.

Prepare to deal with unexpected, but reasonably foreseeable, situations.

Know how to safely clean-up small spills incidental to assigned tasks.

Know how to determine when a chemical release is too large for you to handle safely.

Know what to do if a chemical splashes on you.

Know what to do in the event of a laboratory fire, including using an appropriate extinguisher.

MASTERS LEVEL

All of the above-listed skills and:

Recognize chemical/laboratory hazards.

Recognize the complete set of GHS chemical hazards.

Recognize and understand standard hazard classification systems, such as, GHS, HMIS and NFPA.⁽¹⁾

Recognize and understand standard exposure and toxicology terminology and parameters, such as, PEL, TLV, LC₅₀, LD₅₀, IDLH, etc.⁽¹⁾

Recognize normal operating condition of basic and advanced laboratory equipment.

Recognize the safe operation limits of basic and advanced laboratory equipment.

Recognize unique hazards associated with mixtures and reactive chemistry.

If assigned a leadership role, recognize occupational as well as chemical hazards.

Assess risks of assigned tasks.

Be able to perform hazard analysis on routine lab procedures.

Be able to perform risk assessments on routine lab procedures.

Be able to assist others in the work team in risk assessment of routine procedures.

Be able to recognize out-of-ordinary conditions which may require more detailed assessment.

Be able to recognize when Management of Change (MoC) is necessary.

Mitigate recognized risks.

Be able to implement equipment-related risk control measures such as temperature, pressure, flow-rate controls, etc.

Be able to inspect equipment for defects and implement corrective actions.

Be able to prepare standard operating procedures which clearly identify hazards and cite required risk-mitigation procedures.

Be able to implement appropriate spill prevention and control measures.

Be able to manage chemical storage properly, by inventory control and hazard segregation.

Prepare to deal with unexpected, but reasonably foreseeable, situations.

Be able to prepare spill response procedures for routine and non-routine laboratory tasks.

Be able to inspect lab safety equipment (for example, spill kits, fire extinguishers, eye wash-safety shower stations, etc.)

Be able to recognize and correct improper electrical set-ups (for example, the use of extension cords and power strips, Variacs, etc.)

Ph.D. LEVEL

All of the above-listed skills, and:

Be able to provide safety leadership to lab/research team.

Recognize chemical/laboratory hazards.

Be able to recognize occupational hazards as well as chemical hazards.

Have familiarity with one or more hazard and risk assessment tools (for example, “What-if;” HAZOP; PHA, etc.)⁽¹⁾

Be able to use safety information resources.⁽²⁾

Be able to interpret exposure and toxicology information from sources outside of SDSs.

Assess risks of assigned tasks.

Be able to lead risk assessment teams while exploring risks of new/changed project.

Understand the facility’s MoC procedures, including implementing MoC when necessary.

Be able to perform basic thermodynamic estimations of heat of reaction for scale-up operations.

Be able to assist others in risk assessments.

Mitigate recognized risks.

Be able to modify experimental design via chemistry changes, equipment set-up and operations to reduce recognized risks.

Be able to prepare a risk management plan for a specific experimental task.

Be able to lead a team to reduce recognized risks.

Prepare to deal with unexpected, but reasonably foreseeable situations.

Be able to assist a HAZMAT team to clean up non-incidentals spills.

Notes:

(1) Useful resources for terminology used in this document:

- OSHA’s Safety & Health Management Systems eTool:
<https://www.osha.gov/SLTC/etools/safetyhealth/index.html>
- IUPAC Glossary of Terms Used in Toxicology:
<http://sis.nlm.nih.gov/enviro/iupacglossary/frontmatter.html>
- A Guide to the Globally Harmonized Classification and Labelling of Chemicals:
<https://www.osha.gov/dsg/hazcom/ghs.html>

(2) Sample List of Safety Information Resources:

- Sittig’s Toxicology
- Patty’s Toxicology
- Bretherick’s Handbook of Reactive Chemical Hazards
- CCPS: American Institute of Chemical Engineers Committee on Chemical Process Safety.