

Appendix E

Standard Operating Procedures Guide

Labs that have common or specific practices and procedures with hazardous chemicals or high-risk procedures should have written Standard Operating Procedures (SOPs). Note that SOPs are **NOT** a replacement for training. SOPs are to supplement training and can be used as a reference later on prior to performing the process or procedure. All lab personnel **MUST** be trained on the process or procedure by the PI or designated senior lab personnel. For more information on training, see Ch 5.

SOPs are only useful if they are used. Reference and review an SOP any time you perform that procedure or process or use an uncommon chemical.

Many SOPs can be found online – however, it is best to add the laboratory specific practices to that SOP and make sure that the information that is within the SOP fits for the lab. Please see Resources at the end for some SOP libraries to reference.

SOPs are generally developed for high-risk chemical processes and procedures. These should be able to guide a student through a detailed series of steps to safely achieve a desired result and should eliminate guesswork involved in safety decisions including type of solvents, temperature control, PPE, engineering controls, waste management, and possible emergency scenarios. A risk assessment should be performed on the procedure or process prior to writing an SOP and the risk assessment should be included within the SOP.

SOPs can help standardize best practices for the laboratory. SOPs can also help capture knowledge that generally gets passed down within a research group. This ensures that the group will retain the correct knowledge relating to common processes and procedures despite having a high turnover rate. SOPs also help keep procedures and processes consistent which can help improve research.

SOPs can be designed for both classes of chemicals and specific chemicals involved in procedures or processes. Banded SOPs specify a common set of precautions that apply to chemicals with a specific hazard, or combination of hazards, associated with them. Below is a list of Banded SOPs:

- Flammables / Highly Flammables
- Corrosives and Strong Corrosive Chemicals
- Irritants and Sensitizers
- Gases Under Pressure
- Toxic Chemicals
- Acutely Toxic Chemicals
- Explosive and Potentially Explosive Compounds
- Peroxide Forming Chemicals
- Organic Peroxides and Self-Reactive Chemicals
- Pyrophorics
- Strong Oxidizers
- Toxic Gases
- Water Reactive Chemicals
- Reproductive Toxins
- Sensitizers

The chemicals that fall under these classes also require their own individualized SOPs:

- highly toxic,

- sensitizers,
- carcinogens,
- water reactive,
- pyrophoric,
- or explosive chemicals.

Some specific chemicals that need their own SOP but do not fall into those classes are:

- hydrofluoric acid
- picric acid
- perchloric acid
- osmium tetroxide
- hydrazine

Process SOPs are written for specific procedures and processes performed within the lab. Some examples are:

- Use of Cryogenic Liquids
- Using a Vacuum Pump
- Using a Glovebox
- Using a Schlenk Line
- High Performance Liquid Chromatography
- Quenching Reactive Organometallic Reagents
- Using a Rotary Evaporator
- Use of Pyrophoric Reagents
- Using a Centrifuge
- Using Nanomaterials

Sections of an SOP:

- Title and Information
 - The first section should include title, PI name and signature, who wrote the SOP, and the date it was written. If the SOP was updated, the date it was updated should be included here.
- Type of SOP
 - The type of SOP – is it a banded SOP, specific SOP, or Process SOP.
- Purpose
 - Describe the purpose of the SOP. If it is a banded SOP, the purpose might just be to inform lab personnel about the general hazards and handling. If it is a specific chemical or process SOP, then the purpose would potentially be to guide lab personnel through a specific process used in the lab.
- Properties and Hazards
 - Describe properties of the chemical(s) or process and any hazards associated with the chemical(s) or process. Describe both general and specific hazards.
- PPE
 - Describe the proper type of PPE that should be worn when handling the chemical or performing the procedure. This should include information on glove break through time and if safety goggles should be worn instead of safety glasses.
 - Think about skin and body protection, hand protection, eye protection, and additional hygiene measures (e.g., washing hands after, changing clothes if it is a sensitizer)
- Administrative controls

- Describe any administrative controls that are in place to help minimize the risk associated with this chemical(s) or process.
- Engineering controls
 - Describe any engineering controls that are utilized to help minimize the risk (i.e., fume hoods, gloveboxes, etc.)
- Special Storage and Handling Requirements
 - Describe any special storage and handling requirements (i.e., handle under inert gas, store under inert gas, incompatible storage with acids, etc.)
- Spill, Incident, and First Aid Procedures
 - Describe emergency procedures for potential spills, incidents (injuries, exposures, fires, etc.), and the first aid procedures to take in the event of exposure.
- Waste Disposal Procedures
 - Describe all waste disposal procedures for the chemical(s) or process. Include incompatible chemicals in this section and if specific or unique waste disposal is required.
- Appendix A: Lab Specific Use Procedures
 - Describe any specific use procedures that is unique to your lab associated with the chemical(s) or processes.
- Signage
 - A section for all lab personnel that when they are trained to use the chemical(s) or perform the process to sign and date certifying that they have read and understand the SOP, and will review it when needed.

Resources to use for SOPs:

- Please see [Generating Standard Operating Procedures for the Manipulation of Hazardous Chemicals in Academic Laboratories](#) for more information.
- [UC Center for Laboratory Safety SOP library](#)
- [UMN SOP library](#)