FACT SHEET

Laboratory-Specific Standard Operating Procedures

Overview

A Standard Operating Procedure (SOP) is a written set of instructions that document how to safely perform work involving hazardous materials or hazardous operations. SOPs are required by Occupational Safety and Health Administration (OSHA). There are no specific legal requirements regarding their content but when writing an SOP consider that the SOP is the first line of defense in any inspection, whether it be a regulatory agency as part of a compliance audit or part of an accident investigation. It is the most important document when it comes to showing that the Principal Investigator (PI)/Laboratory Supervisor has exercised appropriate due diligence for the work to occur in their lab, not only from a research deliverable standpoint but also from a safety standpoint. A well-written SOP will incorporate operational steps as well as steps to be taken to address safety, lower risk to the lowest level possible, anticipate potential emergencies, and address how those emergencies should resolved. A well-written SOP can also be used as the training document for laboratory staff who will be working on the procedure. SOPs aim to achieve efficiency, quality output and uniformity of performance, while reducing miscommunication and failure to comply with industry regulations.

Applicability

This FACT Sheet applies to all Tulane employees and students who work in a laboratory setting. SOPs may focus on any or all of the following:

- Process (e.g., peptide synthesis, distillation)
- Hazardous chemical (e.g., carbon monoxide, perchloric acid)
- Class of hazardous chemical (e.g., organic solvents, pyrophoric material)

Responsibilities

While the Office of Environmental Health and Safety (OEHS) offers general safety guidance and training, the responsibility for training workers on specific laboratory procedures rests solely with the PI/Laboratory Supervisor as the subject matter expert for the procedure, equipment, and materials used.

Procedures

When writing an SOP, OEHS recommends including the following sections:

Section 1 — Process

List the process or type of process involving hazardous chemicals - for example, "atomic absorption spectroscopy for heavy metals." Include any unique equipment used. If the term "process" does not apply, proceed to Section 2.

Section 2 —Hazardous Chemicals Involved

List the hazardous chemicals (or class of chemicals) involved, including any hazardous products or by-products. Safety Data Sheets (SDSs) for highly reactive or unstable chemicals should be on hand; SDSs for all chemicals should be readily accessible. SDSs for most chemicals are available through the chemical manufacturer.

Section 3—Potential Hazards

Describe the potential hazards for each hazardous chemical or each element of the hazardous process or procedure. Include physical, health, and environmental hazards. To find hazard information, look up the SDSs available from the manufacturer, technical bulletins, industry best practice(s), or look online for other sources such as Cameo Chemicals, a National Oceanic and Atmospheric Administration database that provides hazard information in a user-friendly format. In addition, the Sigma Aldrich website has technical bulletins that provide detailed information about various processes, equipment, and classes of chemicals.

Ensure that acceptable due diligence was performed regarding research worker safety begins with researching current, available information pertaining to the materials, equipment, and processes. For example, Sigma Aldrich Technical Information Bulletin No. AL-134 was consulted for developing the laboratory protocol for handling pyrophoric liquids.

Section 4—Approvals Required

List the circumstances under which a particular laboratory operation, procedure, or activity requires prior approval from the PI, Laboratory Supervisor, other personnel, or committee. Remember that the Tulane University Institutional Biosafety Committee, Institutional Animal Care and Use Committee, and Radiation Safety Committee, to name a few, require committee review of protocols applicable to their oversight responsibility.

Section 5—Designated Area

Consider establishing a designated area for this operation within the laboratory. A fume hood, portion of the laboratory, designated and shielded laser room, or the entire laboratory may be the designated area.

Section 6—Special Handling Procedures and Storage Requirements

Describe special handling procedures and storage requirements including, but not limited to: specific laboratory techniques, ventilation requirements, temperature controls, chemical incompatibilities, special containment devices, and access restrictions. Ensure

procedures include monitoring chemicals that become unstable when expired, without temperature control, or in wet/humid environments. If applicable, describe safe methods to transport the chemicals.

Section 7—Personal Protective Equipment

List the personal protective equipment (PPE) required for each activity or chemical. PPE includes gloves, laboratory coats, safety glasses, goggles, face shields, and respirators. If applicable, indicate the type of PPE needed for each phase of a process. For help with PPE selection or to determine if respirator use may be necessary, contact OEHS at OEHS@tulane.edu.

Also included in PPE is appropriate laboratory clothing. OEHS recommends lab coats be used that are appropriate for the task (e.g. flame retardant lab coats for work with pyrophoric materials).

Tulane prohibits the following articles of clothing in laboratories under all circumstances: shorts, short skirts, mid-drift bearing shirts, and open-toed shoes. Any head covering worn for religious purposes must be tucked into a lab coat or shirt to keep the ends from getting caught in equipment or becoming contaminated.

Long skirts, pajama bottoms, high heels, blouses with long-flared sleeves, etc. can create additional risk with certain equipment and processes. Long skirts that drag on the ground are prohibited for risk reasons. If there is a chance of injury or exposure to arms, then short-sleeved shirts should also be prohibited or the use of lab coats should be required by the PI/Laboratory Supervisor. Any risk associated with specific articles of clothing (outside of the items listed in the first sentence) or jewelry should be identified based on the work to be done in the lab and addressed by the PI/Laboratory Supervisor and written into the SOP as a part of the protective measures to be taken.

Section 8—Engineering/Ventilation Controls

List any engineering controls used. An engineering hazard control is generally defined as equipment or physical infrastructure that reduces or removes hazards from the laboratory. It can include specifically selected and arranged experimental equipment. Common engineering controls include the fume hood, glove box, biosafety cabinet, and laser interlock.

Section 9—Spill and Accident Procedures

Describe procedures for handling potential emergencies related to this chemical or process such as accidental releases to the sanitary sewer, spills, fires, chemical burns to skin or eyes, shattered glassware, etc. Note the location of emergency equipment such as spill kits and ensure kits are stocked appropriately for the chemicals to be used. It is the responsibility of the lab to purchase the spill kit, inspect it periodically, and replenish

supplies when they have been utilized. Note the location of emergency eyewash/showers, fire extinguishers, etc. If specific fire extinguishing material is needed for specific materials outside of what is provided by the university, the PI/Laboratory Supervisor must request the appropriate extinguisher from the university and ensure laboratory workers are trained in its use.

Take care to describe any special procedures for dealing with personal exposures (e.g., calcium gluconate should be used for hydrofluoric acid exposures). Identify the location of emergency response phone numbers and emergency contact phone numbers. Emergency situations can affect the ability to think clearly. It is important that everyone feel confident in their understanding of proper emergency procedures, including nearby lab members whose work may not be related to this SOP but who may need to respond in an emergency.

Section 10 —Waste Disposal

Describe any unique waste disposal procedures (including labeling) for the chemicals to ensure waste generated in the lab is disposed as required by federal and state law.

Section 11—Decontamination

Discuss any appropriate decontamination procedures for equipment, glassware, and clothing. Where applicable, include controlled areas (e.g., fume hoods, glove boxes) in the text.

Section 12 — Process Steps

This section is useful for particularly complex or multi-step processes. List each step of the process or procedure chronologically and include precautionary safety measures to be taken, including the use of specific laboratory techniques and PPE.

If possible, describe indicators (visual or otherwise) which show whether the reaction, equipment, etc. is working safely as intended or that a hazardous situation may be developing. SOPs should be reviewed by the PI or at least one peer who is doing similar research.

Once an SOP is written, everyone performing work described by that SOP should read it carefully and sign the SOP to document they have read and understand it. It should be noted that the SOPs for each laboratory are part of Tulane's Chemical Hygiene Plan, and everyone in the lab needs to be familiar with their location.