Developing an SOP by evaluating each of twelve potentially hazardous areas or conditions*

A. First, consider these questions:
   1. Specific issues identified?
   2. Risk Assessment -What is most likely to go wrong – what are the most severe consequences even if unlikely?
   3. Has there been sufficient literature search and consultation with experienced supervisors for lessons learned?
   4. Will standard precautions be adequate?

B. Then, prepare strategies to eliminate, control or mitigate hazard, (for each twelve potentially hazardous area or condition):
   1. **Regulatory concerns?** OSHA carcinogen regulations, EPA labeling, controlled substances DEA regulations, permits for select agents and/or radioactive materials, etc.
   2. **Human factors?** Reiterative training, enforce lab rules, supervision, ascertaining worker knowledge, ensure worker is well-informed, practice small, SOP's, buddy system
   3. **Availability of PPE?** Design experiment to reduce reliance on PPE, combine control methods, prohibit use of inadequate PPE
   4. **Emergency response?** Buddy system, alarms, ensure availability of equipment & personnel, emergency drills & training, spill kits, AED
   5. **Facility?** Ensure proper environment and conditions - **can use checklist**
   6. **Materials?** Eliminate, substitute or reduce amt.? Detection & warning methods? Use of administrative, engineering or PPE controls (expand)
   7. **Equipment and labware?** Integrity check, right tool for job, maintenance, correct use, troubleshoot, normal and emergency operations delineated
   8. **Process?** Change process, small tests, test runs without hazard present, acquire expert assistance, secondary controls, emergency response actions
   9. **Effects of change? & 10. Additive effects?** Assume and prepare for increased risks, identify these in order of potential, require review by experts, require continuous monitoring, install safeguards, warning systems, shut-down mechanisms and remote monitoring
   11. **Waste management?** Must be resolved before experiment, proper disposal containment and methods for experiment waste
   12. **Other high risks – potential failure points or routine activities?** Review and change work practices, extensive training, instructions to address unexpected - failures, breakage

* Adapted from guidelines developed by the Hazards Identification and Evaluation Task Force of the American Chemical Society's Committee on Chemical Safety, *Identifying and Evaluating Hazards in Research Laboratories,* Table 12-1a Structured Development of SOPs. http://cenm.ag/hazard

Identifying and Evaluating Hazards in Research Laboratories **(http://cenm.ag/hazard)**

SOP or no SOP?

PRIORITY SOPs

If you answered YES To more than six potential hazards...

ADDITIONAL SOPs

If you answered YES To any one and up to six potential hazards...

Column A

1. Regulatory concerns?
Are there concerns for... Understanding applicability: cost constraints, lack of options, delays, permits, require assistance?
Yes / No

2. Human factors?
Inexperienced worker, new experiment, after hours follows directions, medical conditions, effect of errors, cold, heat effect of fatigue, language barrier?
Yes / No

3. Availability of PPE?
Inadequate PPE or shielding for hazard, cost factors, worker compliance, lack of alternatives?
Yes / No

4. Emergency response?
Inadequate or unavailable, lack of knowledge about emergency procedures?
Yes / No

5. Facility?
Lighting, egress, electrical circuits, ventilation, emergency equip., storage arrangements, sturdy shelves?
Yes / No

6. Materials?
Biological, radiological, chemicals (flammability, toxicity, PEL, physical data, reactivity, corrosivity, thermal/chem. stability, inadvertent mixing), routes of exposure?
Yes / No, go to Col. B

Column B

7. Equipment labware?
Are there concerns for... Materials integrity, maintenance, piping, relief systems, ventilation systems, safety mechanism?
Yes / No

8. Process?
Unsafe quantity or concentration, unsafe temp., pressure, flow or composition, deviations, potential for runaway reaction?
Yes / No

9. Effect of change?
More energetic or toxic, increase potential for release, hazards of scale-up?
Yes / No

10. Additive effects?
Lack of expertise or knowledge, newly synthesized materials, untested or unfamiliar equipment, materials or processes?
Yes / No

11. Waste mgmt.?
Challenges to proper disposal, potential for exposure or contamination, hazardous releases to air or water?
Yes / No

12. Other high risks?
Weighing toxic materials on the lab bench, opening an autoclave, hard to close caps, lack of "kill" switch?
Yes / No, SOP or not?

Identifying and Evaluating Hazards in Research Laboratories
Adapted from Table 12-1a Structured Development of SOPs by WMB, January 2015