# Standard Operating Procedures template

Table 12-1

|  |
| --- |
| **(Columns 1–5)** |
| **Evaluate Each Step or Task** | **Hazard Identification(Known and potential hazards/Safety constraints and restrictions)** | **Specific Issues Identified** | **Risk Assessment (What is most likely to go wrong/what are the most severe consequences even if unlikely?)** | **Literature search and consultation with experienced supervisors for lessons learned** | **Strategies to Eliminate, Control, or Mitigate Hazard** |
| Regulatory Concerns | Understanding applicability, cost constraints, lack of options, delays, require assistance, permits |  |  |  | CHP, OSHA carcinogen regulations, controlled substances DEA regulations, permits for select agents and/or radioactive materials, etc. |
| Human Factors | Inexperienced worker, new experiment, work hours, follows directions, medical conditions, effect of errors, effect of cold or fatigue, language barrier |  |  |  | Reiterative training, enforce lab rules, supervision, ascertaining worker knowledge, ensure worker is well-informed, practice small, SOPs, buddy system |
| Facility | Lighting, hand wash sink, egress, electrical circuits, ventilation, emergency equip., code adherence, confined space, storage arrangements, sturdy shelves |  |  |  | Ensure proper environment and conditions**–can use checklist** |
| Materials | Biological, Radiological, Chemicals; for chemicals--flammability, toxicity, PEL, Physical data, reactivity, corrosivity, thermal & chemical stability, inadvertent mixing, routes of exposure |  |  |  | Eliminate, substitute or reduce amt.? Detection and warning methods? Use of administrative, engineering or PPE controls (expand) |
| Equipment and Labware | Materials integrity, maintenance, piping, electrical, relief systems, ventilation systems, safety mechanism |  |  |  | Integrity check, right tool for job, maintenance, correct use, troubleshoot, normal and emergency operations delineated |
| Process | Unsafe quantity or concentration, unsafe temp, pressure, flow or composition, deviations, potential for runaway reaction |  |  |  | Change process, small tests, test runs without hazard present, acquire expert assistance, secondary controls, emergency response actions |
| Effect of change in design or conditions | More energetic or toxic, increase potential for release, hazards of scale up |  |  |  | Assume and prepare for increased risks, identify these in order of potential, require review by experts, require continuous monitoring, install safeguards, warning systems, shutdown mechanisms and remote monitoring |
| Possibility for additive or synergistic effect or unknown effects | Lack of expertise or knowledge, newly synthesized materials, untested or unfamiliar equipment, materials or processes |  |  |  |
| Effluents and waste management | Challenges to proper disposal, potential for exposure or contamination, hazardous releases to air or water |  |  |  | Must be resolved before experiment, proper disposal containment and methods for experiment waste |
| Availability of PPE | Inadequate PPE or shielding for hazard, cost factors, worker compliance, lack of alternatives |  |  |  | Design experiment to reduce reliance on PPE, combine control methods, prohibit use of inadequate PPE |
| Emergency Response resources | Inadequate or unavailable, lack of knowledge about emergency procedures |  |  |  | Buddy system, alarms, ensure availability of equipment & personnel, emergency drills & training, spill kits, AED |
| Potential failure points or routine activities with high risk of harm | Weighing toxic materials on lab bench, opening an autoclave, hard to close caps, lack of "kill" switch |  |  |  | Review and change work practices, extensive training, instructions to address unexpected failures, breakage |

**(Columns 6–10)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Evaluate Each Step or Task** | **Strategies to Eliminate, Control, or Mitigate Hazard (Column 5 duplicated from previous page for ease of use)** | **Suggested strategies to address identified hazards** **(Plan A)** | **Ask again (What could go wrong? Consider atypical or less likely events/Identify possible failure points or known failures of prior strategies)** | **Plan B to Eliminate, Control or Mitigate** | **Will Standard Precautions be Adequate? (Develop written criteria)** |
| Regulatory Concerns | CHP, OSHA carcinogen regulations, controlled substances DEA regulations, permits for select agents and/or radioactive materials, etc. |   |   |   |   |
| Human Factors | Reiterative training, enforce lab rules, supervision, ascertaining worker knowledge, ensure worker is well-informed, practice small, SOPs, buddy system |   |   |   |   |
| Facility | Ensure proper environment and conditions**—can use checklist** |   |   |   |   |
| Materials | Eliminate, substitute or reduce amt.? Detection & warning methods? Use of administrative, engineering or PPE controls (expand) |   |   |   |   |
| Equipment and Labware | Integrity check, right tool for job, maintenance, correct use, troubleshoot, normal and emergency operations delineated |   |   |   |   |
| Process | Change process, small tests, test runs without hazard present, acquire expert assistance, secondary controls, emergency response actions |   |   |   |   |
| Effect of change in design or conditions | Assume and prepare for increased risks, identify these in order of potential, require review by experts, require continuous monitoring, install safeguards, warning systems, shutdown mechanisms and remote monitoring |   |   |   |    |
| Possibility for additive or synergistic effect or unknown effects |   |   |   |  |
| Effluents and waste management | Must be resolved before experiment, proper disposal containment and methods for experiment waste |   |   |   |   |
| Availability of PPE | Design experiment to reduce reliance on PPE, combine control methods, prohibit use of inadequate PPE |   |   |   |   |
| Emergency Response resources | Buddy system, alarms, ensure availability of equipment and personnel, emergency drills & training, spill kits, AED |   |   |   |   |
| Potential failure points or routine activities with high risk of harm | Review and change work practices, extensive training, instructions to address unexpected failures, breakage |   |   |   |   |

This file is excerpted from “Identifying and Evaluating Hazards in Research Laboratories: Guidelines developed by the Hazard Identification and Evaluation Task Force of the American Chemical Society’s Committee on Chemical Safety”.

© Copyright 2015 American Chemical Society