

Chemical Control Banding Methodology 1

The following table can be used to determine, in general terms, the hazard controls that are needed based on general laboratory operations. To use the following table, work across the 'Conceptual Hazard Level' and 'Chemicals Used' rows to match the chemicals, processes or hazards present in the lab space, then go down the column to identify the various safety measures appropriate for this Chemical Safety Level.

| DESCRIPTOR OR CONTROL | CHEMICAL SAFETY LEVEL 1 | CHEMICAL SAFETY LEVEL 2 | CHEMICAL SAFETY LEVEL 3 | CHEMICAL SAFETY LEVEL 4 |
|--|---|--|--|---|
| CONCEPTUAL HAZARD LEVEL | Laboratory hazards equivalent to typical household use of chemicals | Laboratory hazards equivalent to academic lab settings (restricted hazardous chemical inventory; well-established procedures in place) | Moderate or varying laboratory hazards within a narrow range (open hazardous chemical inventory; evolving procedures) | Novel hazards or severe established hazards (high hazard chemicals or processes without well-established procedures) |
| CHEMICALS USED | Consumer products in consumer packaging; may receive but not open chemical packages | Low concentration acids/bases, lower alcohols, solid salts, simple asphyxiant compressed gases | Typical chemical inventory for a research lab, such as flammable solvents, corrosives, inorganic salts, toxics, flammable gases. Limited amounts (mg quantities) of air or water reactive, pyrophoric materials | Air/water reactive, pyrophoric materials or gases. Explosives or potentially explosive compounds, highly toxic materials (in any state of matter) |
| TRAINING REQUIREMENTS <i>(prerequisite for people working in the lab)</i> | Observe label and warning signs | General lab safety training in addition to warning labels and signs | Laboratory hazards require laboratory-specific safety training | Laboratory access restricted to people accompanied by experienced personnel |
| SUPERVISION REQUIREMENTS <i>(safety responsibilities for lab leader(s); based on highest active lab hazard or process)</i> | Awareness of work being conducted | Constant supervision or working alone based on specific restrictions | Peer presence or working alone based on specific restrictions | Peer presence (no working alone) |
| OVERSIGHT REQUIREMENTS | ¹ Weekly self-inspections; ² self-audits three times per year | ¹ Weekly self-inspections; ² self-audits three times per year | ¹ Weekly self-inspections; ² self-audits three times per year; ³ monthly drop byes; ⁴ risk-based institutional review schedule | ¹ Daily self-inspections; ² self-audits three times per year; ³ monthly drop byes; ⁴ risk-based institutional review schedule |
| PLANNING REQUIREMENTS <i>(based on highest rated chemical involved)</i> | Process-specific plans written and the presence of other chemicals prohibited | Written procedures including safety protocols | Written procedures including safety protocols must be peer reviewed | Written procedures including safety protocols approved by supervisor |
| GENERAL PPE REQUIREMENTS (EYE AND SKIN EXPOSURE) | Coverage of legs and feet; other PPE as determined by PPE hazard assessment | CL1 PPE plus eye protection | CL2 PPE plus lab coat | CSL3 plus flame resistant lab coat |
| SPECIFIC PPE REQUIREMENTS (HAND AND RESPIRATORY PROTECTION) <i>(Process specific)</i> | No gloves or gloves as recommended in the manufacturers' instructions | Activity-specific gloves, such as nitrile, vinyl or latex disposable gloves would be typical | Activity-specific gloves, such as nitrile, vinyl or latex disposable gloves would be acceptable for an incidental small quantity splash. Neoprene or butyl rubber may be needed for immersion in solvents, or similar situations | Activity-specific gloves, such as flame resistant if using pyrophoric liquids, neoprene if using large quantities |

| DESCRIPTOR OR CONTROL | CHEMICAL SAFETY LEVEL 1 | CHEMICAL SAFETY LEVEL 2 | CHEMICAL SAFETY LEVEL 3 | CHEMICAL SAFETY LEVEL 4 |
|---|---|---|--|--|
| GENERAL VENTILATION REQUIREMENTS/ ENGINEERING CONTROLS | None or low ventilation specifications | Moderate ventilation/ local exhaust ventilation (snorkels) or other source control | Fume hoods, local exhaust ventilation (snorkels), limited glove box use | Fume hood, local exhaust ventilation (snorkels), glove/dry box, enclosed reactor |
| EMERGENCY RESPONSE PROTOCOLS | Institutional-specific response protocols | Institutional-specific response protocols; people with knowledge of incident have responsibility to provide information to responders; trained personnel can contain and remediate small spills | Institutional-specific response protocols; may have advanced lab response protocol to make the situation safe while evacuating | Institutional-specific response protocols; specific pre-planning is required |

¹ Self-inspection: quick review of physical surroundings; may or may not use a formal checklist

² Self –audit: more comprehensive review of the CSL and other documentations; uses a checklist

³ Drop by: informal review, consult, check-in by institutional representative

⁴ Risk-based institutional review: formal review by lab by an institutional representative; uses a checklist, document issues for correction, escalate issues to upper management as necessary

Chemical Control Banding Methodology 2

The following tables can be used to evaluate the hazards and hazard controls for chemicals. The first table is used to determine the chemical safety level (CSL) based on the physical characteristics of the chemical. This information can be found on the Safety Data Sheet. The second table is used to determine the general protection guidelines for the chemicals. Note that this methodology is not appropriate for addressing hazards that may arise from *processes* or *equipment*, such as use of pressure vessels, hot plates, ovens, compressed gas cylinders, etc.

| Hazard | General Description of Hazards | Fire | Reactivity | Acute Toxicity | Chronic Toxicity |
|--------------|--|---|---|---|--|
| CSL 1 | Laboratory hazards equivalent to typical household use of chemicals | Flashpoint above 140 F | No chemical changes expected in the process | All chemicals have no or low toxicity and occupational exposure limits (OEL) > 500 ppm; not an irritant or sensitizer | None known |
| CSL 2 | Laboratory hazards equivalent to academic lab settings (restricted hazardous chemical inventory; well-established procedures in place) | Flashpoint above ambient (73 F), expected concentration <10% of the lower explosive limit | No known incompatibilities between chemicals being used | All chemicals have known toxicities and 10 ppm < OEL < 500 ppm | Specific target organs or irreversible effects suspected |
| CSL 3 | Moderate or varying laboratory hazards within a narrow range (open hazardous chemical inventory; evolving procedures) | Flashpoint at or below ambient. Expected concentration >10% of the lower explosive limit | Chemicals with known reactions or contamination hazards present | Unknown toxicities or OEL < 10 ppm; severely irritating or corrosive; sensitizers | Specific target organs or irreversible effects probable |
| CSL 4 | Novel hazards or severe established hazards (high hazard chemicals or processes without well-established procedures) | Pyrophorics, air or water reactives, etc. | High hazard reactions in use; potential deflagration or detonation hazard | OEL < 1 ppm; very toxic on single exposure; reproductive hazard; carcinogens | Irreversible toxicities require use of designated areas |

| | Facility | Training | Oversight | PPE | Response Protocol |
|--------------|--|--|--|--|---|
| CSL 1 | Any room, general ventilation | Read the label or manufacturer's instructions | Generic self-inspection guidelines | Covered legs and feet; other PPE as determined by PPE hazard assessment | No unusual hazmat concerns |
| CSL 2 | Ventilated lab room; local exhaust (snorkels) for source control | General lab safety training in addition to training on warning signs and labels and lab safety protocols | Constant supervision or working alone based on specific restrictions | Activity-specific gloves, such as nitrile, vinyl or latex disposable gloves would be typical, eye protection, other PPE as determined by PPE hazard assessment | Respond as to general alarm; people with knowledge of incident have responsibility to provide information to responders; trained personnel can contain and remediate small spills |
| CSL 3 | Lab room with exhaust ventilation (fume hood, glove boxes, etc.) | CSL 2 lab-specific safety training. Generic training for unexpected events. | Process training and external audits | Activity-specific gloves, such as nitrile, vinyl or latex disposable gloves would be typical, eye protection, other PPE as determined by PPE hazard assessment | Institutional-specific response protocols; may have advanced lab response protocol to make the situation safe while evacuating |
| CSL 4 | Specifically designed lab | CSL3 plus practice before working with live materials | CSL3 plus written standard operating procedures and specific oversight processes | CSL3 plus process-specific PPE | CSL3 plus specific pre-planning is required; coordination with first responders |

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