

Assessing Risks in Academic Labs: Uncertainties and Opportunities

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Scope: how to classify academic labs based on their chemical risk?

Abstract

The University of Calgary consists of more than 1000 laboratories with varying risks. The Environment, Health, and Safety (EHS) officers cannot audit every laboratory regularly due to limited personnel. Moreover, the academic setting presents unique challenges not encountered in the industrial setting, such as:

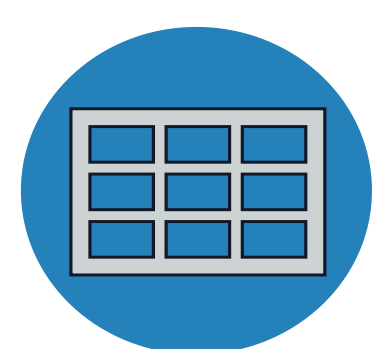
- Research activities are constantly progressing
- New hazards are introduced at a higher frequency
- Members with different experiences rotate through the laboratories.

This project proposes a methodology to assess and rank the various chemical hazards in the laboratories. A tool for analyzing the chemical risk levels present at each laboratory was developed, enabling the University to identify laboratories with higher levels of chemical hazards and prioritize them for audit. The CSLs and Hazard Codes matrix was created using an in-depth literature review, the Globally Harmonized System (GHS) of Classification and Labelling of Chemicals, and the support of the safety specialists working at the University.

Why do we need to classify risks at the labs at UCalgary?

- More than a 1000 labs
- Limited EHS Staff
- Unique challenges of academic settings

Risk Matrix



Matrix based on literature CSLs, WHMIS 2015, GHS system



Inventory from Chematix (Inventory Management Tool)



GHS classifications from PubChem Database

Hazard Regulations



Globally Harmonized System [1]

- Rules for classifying hazards, includes hazard and precautionary statements for most chemicals



WHMIS 2015 [2]

- Incorporated GHS requirements
- Comprehensive criteria for hazard classification

Chemical Safety Levels (CSLs)[3]

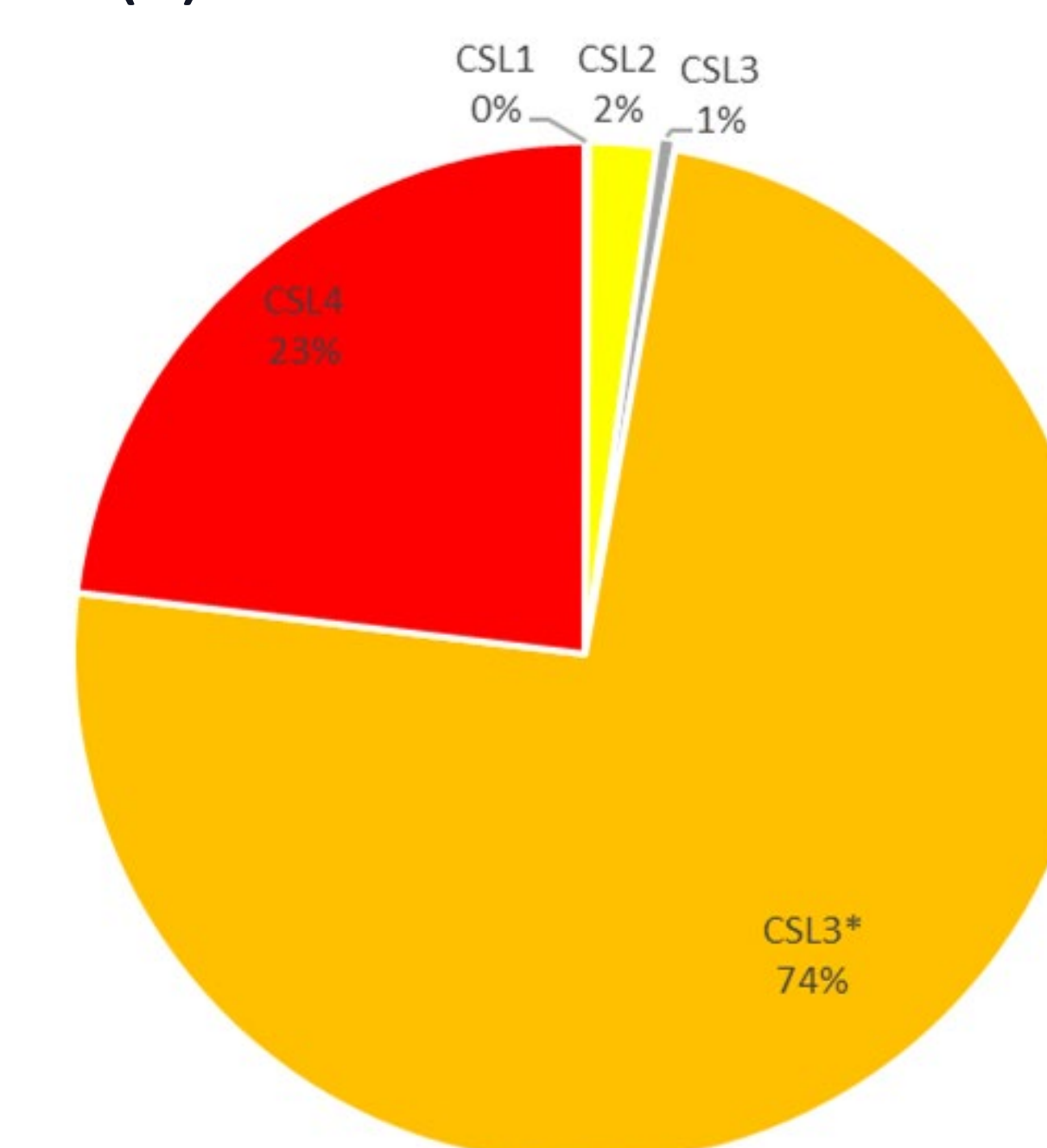
CSL1	CSL2	CSL3	CSL4
<ul style="list-style-type: none">• Minimal health or physical hazard from chemicals	<ul style="list-style-type: none">• Low health or physical hazard from chemicals	<ul style="list-style-type: none">• Moderate Hazards• Larger volume of flammable	<ul style="list-style-type: none">• High chemical or physical hazard• Work with explosives, pyrophoric, high toxic chemicals

Opportunity

- Laboratories consume about 1/3 of electricity in the buildings.
- Ventilations systems are usually designed for worst case scenarios [4].
- Laboratory classification can facilitate choosing the right candidates for ventilation adjustments.

Results

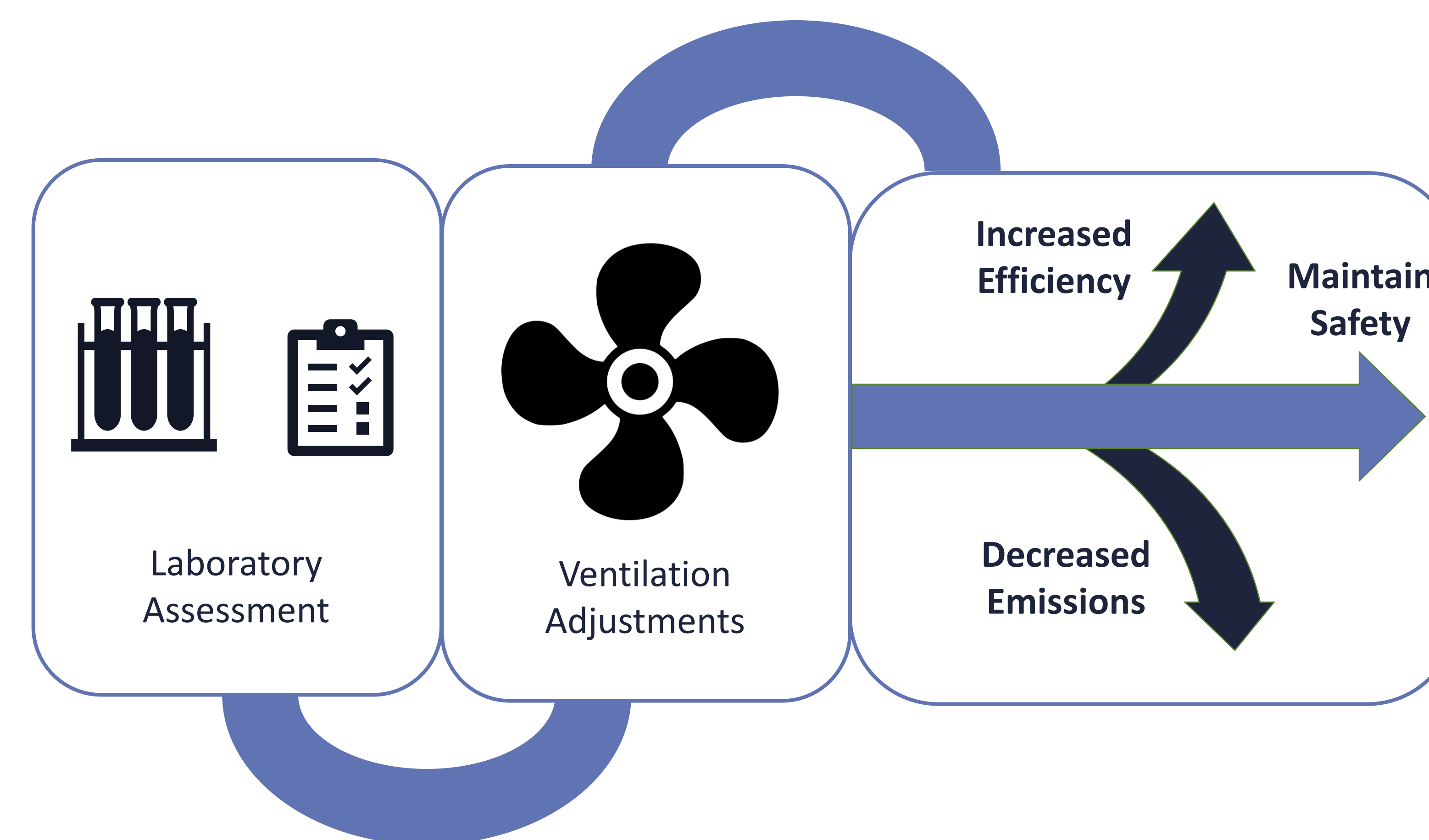
% CSLs – Volume (L) of Hazardous Chemicals



Note: Laboratories currently classified as CSL3* can become a CSL2 if volumes are considered, or inventories are reduced.

Conclusions

- ✓ The proposed CSLs classification is based on the GHS, a reliable and recognized system for classifying chemical hazards.
- ✓ It is a simple but efficient tool that allows a review of the quantity of chemical hazards present in each laboratory and facilitates an audit inspection program to be implemented, prioritizing laboratories with a higher volume of CSL4 chemicals.



Note: Adapted from [4].

References

- [1] United Nations Economic Commission for Europe, "About the GHS | UNECE," <https://unece.org/about-ghs> (accessed Jul. 07, 2022).
- [2] Government of Canada, "Workplace Hazardous Materials Information System (WHMIS)," 2022. <https://www.canada.ca/en/health-canada/services/environmental-workplace-health/occupational-health-safety/workplace-hazardous-materials-information-system.html> (accessed Jul. 03, 2022).
- [3] American Chemical Society, "Identifying and Evaluating Hazards in Research Laboratories," 2015, Accessed: Feb. 16, 2022. [Online]. Available: <https://www.acs.org/content/dam/acsorg/about/governance/committees/chemicalsafety/publications/identifying-and-evaluating-hazards-in-research-laboratories.pdf>.
- [4] J. F. McCarthy, M. A. Fragala, and B. J. Baker, "Analyzing the Risk: Balancing Safety and Efficiency in Laboratory Ventilation," 2021, doi: 10.1021/acs.chas.1c00095.

Acknowledgments

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