

# **Chemical Information Necessary to Establish Laboratory Ventilation Control Bands**

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Environmental Health and Safety



# Outline

- Environmental Health and Safety Programs
- The Laboratory Ventilation Management Plan
- Chemical Hazards of Concern
- Where does this information come from? (**Information flow in EHS**)
- Ventilation Risk Assessment (Laboratory Layout, Engineering Options)
- Communications

# EHS Lab Safety Programs

- Expectation for ensuring health and safety of lab workers
  - provide guidance and oversight
- Leading indicators:
  - fewer health and safety questions
  - lessening of antagonistic relationships with stakeholders
- Lagging indicators:
  - lower number of corrective actions from lab inspections
  - lower frequency of common types of incidents

# The Laboratory Ventilation Management Plan (LVMP)

An LVMP outlines the decisions for what the goals are, parameters to work within, documentation and communications

- Roles and responsibilities of stakeholders
- Describes tasks (fume hood inspections) and Standard Operating Procedures
- Establishes acceptance criteria
- Indicators (leading and lagging) and where this information comes from
- Can establish general ventilation rates



# Ventilation Priorities

- Chemicals- Airborne, inhalation hazards and maintenance of proper oxygen levels
- Animal Health- Removal of airborne contaminants, such as ammonia, and odors
- Human Comfort- Removal of airborne contaminants and odors

# Risk Assessment Process- Chemical Risks

- Concentration- impacts toxicity, sensitization, and odor concerns
- Quantity- small quantities (100ml of volatile chemical) or large volumes (several liters on the bench)
- Location of use- in the fume hood or on the bench
  - Potential for airborne emissions in occupied areas of the laboratories
- Availability and proper use of local exhaust

# Control Banding Lab

## General Ventilation Rates

*Control banding* is a generic protection strategy that groups similar hazards

- then apply the same protection strategies



# Banding Chemicals Using Globally Harmonized System (GHS)

Design-to 8/4 ACH

| Hazard Code | Hazard Statement                             |
|-------------|----------------------------------------------|
| H224        | Extremely flammable liquid and vapor         |
| H225        | Highly flammable liquid and vapor            |
| H226        | Flammable liquid and vapor                   |
| H304        | May be fatal if swallowed and enters airways |
| H330        | Fatal if inhaled                             |
| H331        | Toxic if inhaled                             |
| H332        | Harmful if inhaled                           |





# Banding Chemicals Using Globally Harmonized System (GHS)

6/3 ACH

| Hazard Code | Hazard Statement                                                       |
|-------------|------------------------------------------------------------------------|
| H334        | May cause allergy or asthma symptoms or breathing difficulties inhaled |
| H335        | May cause respiratory irritation                                       |
|             |                                                                        |



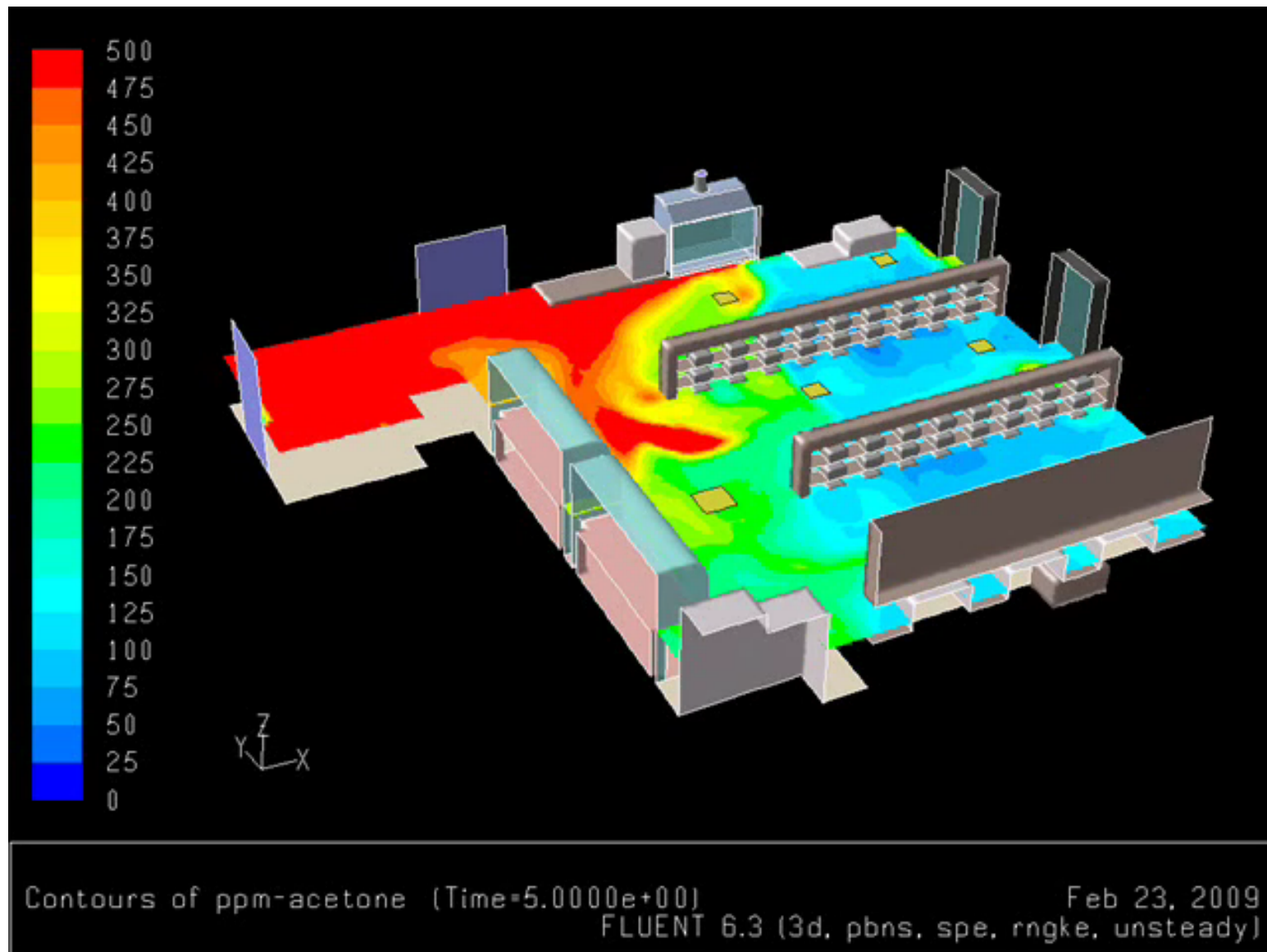
| General Ventilation<br>Control Band | Drivers for this Recommendation                                                                                                            |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Normal ventilation                  | High intensity laboratory chemical use                                                                                                     |
| Moderate ventilation                | Volatile or toxic chemical used that are restricted to local exhaust areas; no significant sources on bench top                            |
| Low ventilation                     | Instrument labs and other spaces with intermittent sources that require once through ventilation, but have no significant chemical sources |
| Lab-specific ventilation            | Based on biosafety considerations; make up air concerns; temperature concerns; clean rooms                                                 |

# Information Sources

- Chemical inventories (lab visit, request during renovations)
- Hood Housekeeping Score (HHS)
- Hazard Assessment Signage Program
- Lab Inspections
  - lab housekeeping
  - types of corrective actions
- Field Testing

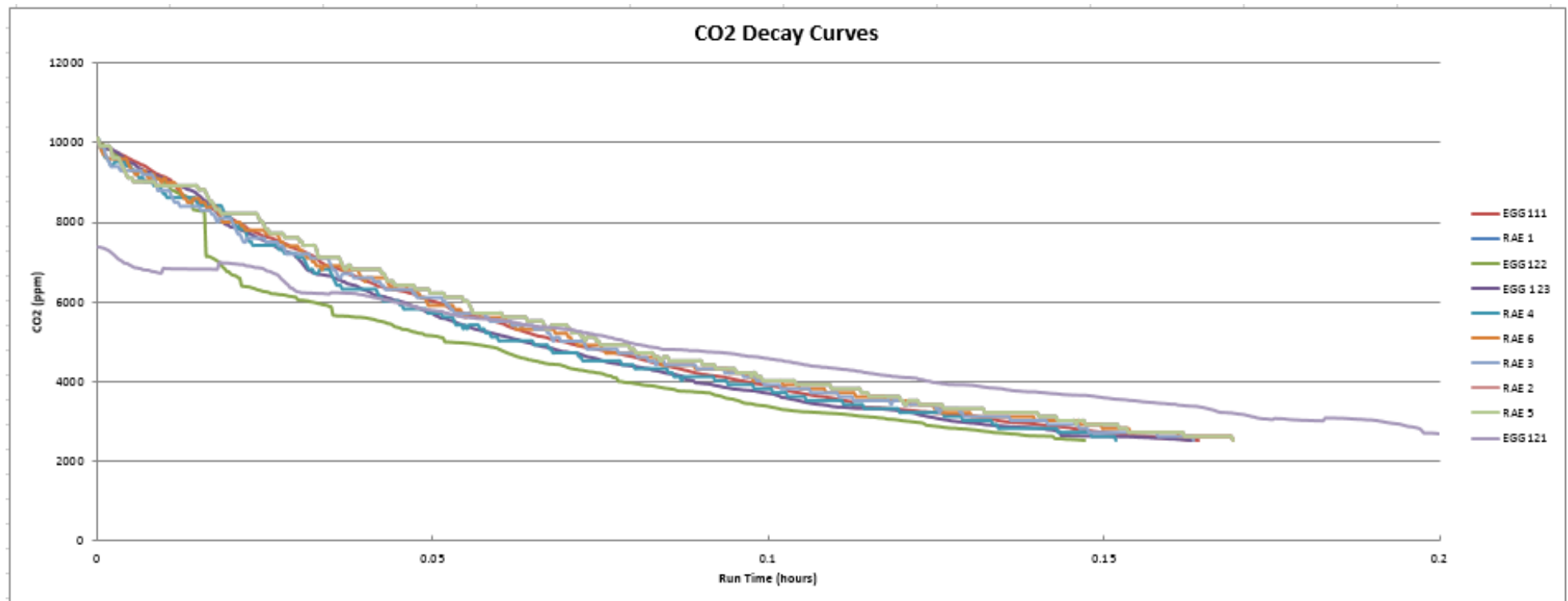


# Laboratory Layout and Modeling Airflow Patterns



# Testing Airflow Patterns

| Location of sensor      | EGG111 | RAE 1 | EGG122 | EGG 123 | RAE 4 | RAE 6 | RAE 3 | RAE 2 | RAE 5 | EGG121 |          |
|-------------------------|--------|-------|--------|---------|-------|-------|-------|-------|-------|--------|----------|
| Number of data points   | 595    | 592   | 534    | 591     | 551   | 613   | 592   | 613   | 613   | 803    |          |
| Observed                | 8.53   | 8.13  | 8.83   | 8.67    | 8.70  | 8.05  | 8.20  | 8.06  | 8.06  | 4.93   | per hour |
| r-squared               | 0.99   | 0.99  | 0.97   | 0.98    | 0.99  | 0.99  | 0.99  | 0.99  | 0.99  | 1.00   |          |
| Concentration half life | 4.87   | 5.11  | 4.71   | 4.80    | 4.78  | 5.17  | 5.07  | 5.16  | 5.16  | 8.43   | minutes  |



# Testing Engineering Options



Sampling for xylene following complaint of headaches

| Sample Location                    | Agent  | Result   | Type              | OEL    | Reference |
|------------------------------------|--------|----------|-------------------|--------|-----------|
| Thermoscientific Clearvue          | Xylene | 1.4 ppm  | TWA               | 100ppm | OSHA      |
| Varistain Gemini                   | Xylene | 0.47 ppm | TWA               | 100ppm | OSHA      |
| Personal Air Sample                | Xylene | BDL*     | STEL (15 minutes) | 150ppm | ACGIH     |
| Cover Slipping Station +           | Xylene | 2.1 ppm  | TWA               | 100ppm | OSHA      |
| Personal Sample – Technician +     | Xylene | 0.72 ppm | TWA               | 100ppm | OSHA      |
| H&E Stain +                        | Xylene | 0.86 ppm | TWA               | 100ppm | OSHA      |
| Personal Sample – Student/Intern + | Xylene | 1.6 ppm  | TWA               | 100ppm | OSHA      |
| Personal Sample – Technician +     | Xylene | 0.75 ppm | TWA               | 100ppm | OSHA      |
| Solvent Recycler +                 | Xylene | 0.92 ppm | TWA               | 100ppm | OSHA      |
| Automated Slip Cover +             | Xylene | 7.1 ppm  | TWA               | 100ppm | OSHA      |

# Testing Engineering Options





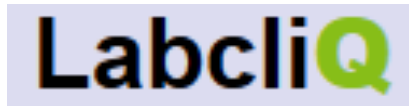
# Testing Engineering Options





# EHS Communication Methods

Certified Green Labs →



**Environmental Health & Safety (2101) Room 113**

| Contact       | Name                         | Campus Address                          | Day Phone         | Night Phone    |
|---------------|------------------------------|-----------------------------------------|-------------------|----------------|
| PI/Supervisor | Edward Evans (eev22)         | 377 Pine Tree Road                      | +1 (607) 882-3736 | (607) 555-0082 |
| Secondary     | Alan Ritar (aph33)           | 395 Pine Tree Road, suite 210           | +1 (607) 592-8103 | (607) 555-0081 |
| DSR           | Brenda Coolbaugh (bcl32)     | Suite 210, East Hill Office Building    | +1 (607) 254-5885 | (607) 555-0080 |
| Rdg Coord     | Krista D. Tagliavento (KDT1) | Environmental Health & Safety, Room 101 | 607/254-1631      |                |

**Access Limitations**  
Escorted Visitors  
Operators and Staff Only

**Area Hazards**

|  |  |  |  |  |  |
|--|--|--|--|--|--|
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

**Warnings**  
Eye protection required when using hazardous chemicals  
Eating and drinking prohibited

**Emergency Response**  
In case of emergency, call for assistance by dialing 911  
Storage Room for Gas Cylinders

**Audit Info**  
HASP last updated (Source): 08/14/2015

ACH Rates  
and EHS  
contact  
information



# Fume Hood Communication Methods

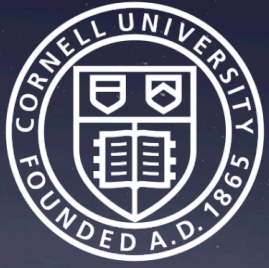
## Hood Hibernation Poster



## Shut the Sash Smiley ... coming soon



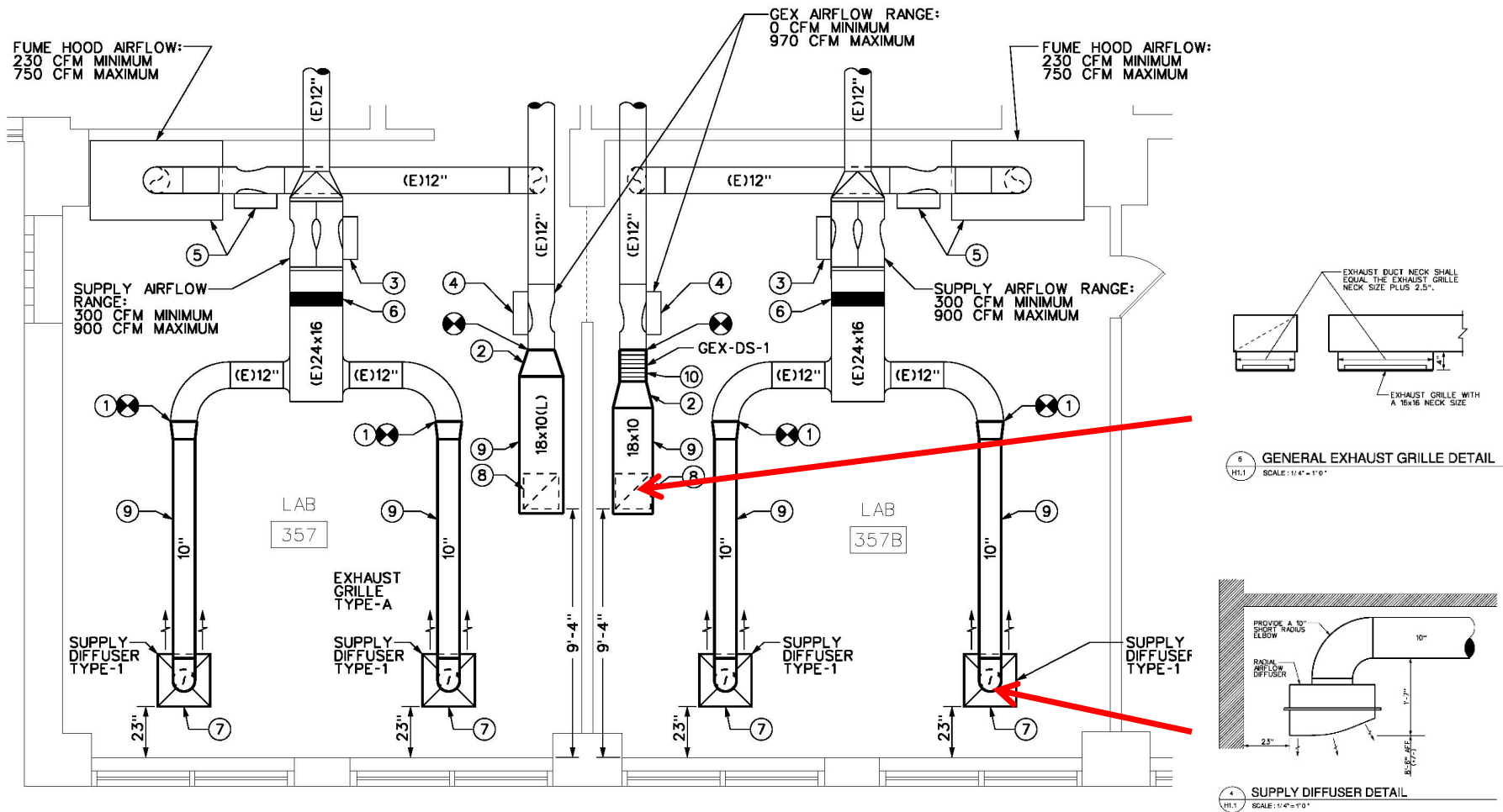




# Questions?



# Biotechnology New Ductwork Design



# Lowering ventilation

- Capital project to redesign layout and achieve better laminar flow
- Chemical cleanout
- Green chemistry principles- substitution
- Green labs
- Connection to ventilation



# Information Flow in EHS

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- When conducting an assessment of a laboratory in order to identify hazards to be controlled by dilution or local ventilation, there are multiple sources of information. The chemicals of concern, obtained from an inventory, and the general layout of the laboratory can be described in the Laboratory Ventilation Management Plan. Other sources that inform the assessment process require a visit to the lab, a look into the research the group is conducting which may require a conversation with someone responsible for the lab, and the management of the lab and occupants. This is similar to the manner that laboratory inspections are conducted. In this presentation, I will discuss the types and sources of chemical information that can be used and the methodology behind establishing ventilation control bands based on this information.