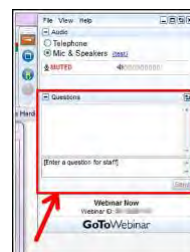
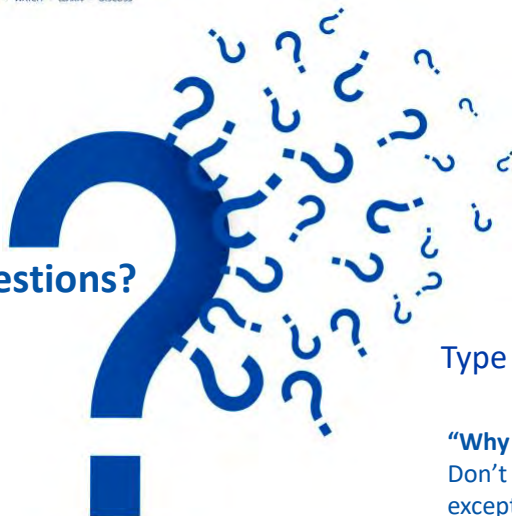




Have Questions?



Type them into questions box!

“Why am I muted?”

Don't worry. Everyone is muted except the presenter and host. Thank you and enjoy the show.

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1



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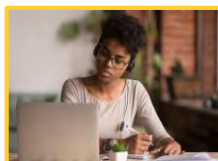
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SUN	MON	TUE	WED	THU	FRI	SAT
					1	2
3	4	5	6	7	8	9
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17	18	19	20	21	22	23
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31						

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Research, Skills, and The Great Beyond



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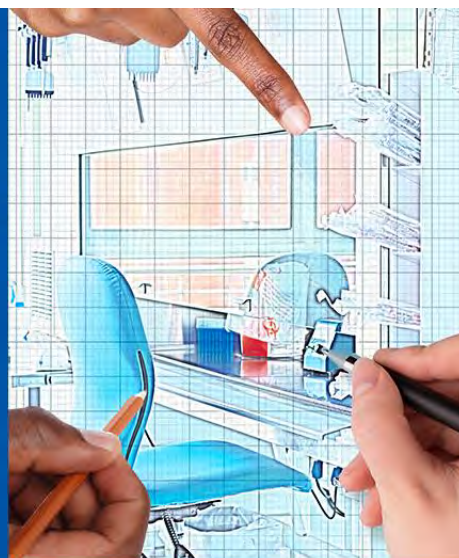
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Working Together to Design Safer Laboratories



MICHAEL R. LABOSKY, MS, CIH, CSP
Associate Director, OSCP, EHS Office,
Massachusetts Institute of Technology



ELLEN SWEET, MS
Laboratory Ventilation Specialist,
Cornell University



MELINDA BOX, MS
Organic Lab Supervisor, Department of
Chemistry, North Carolina State University



RALPH STUART, CIH, CCHO
Environmental Safety Manager, Keene
State College and Chair, ACS Committee
on Chemical Safety

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15



Safe Lab Design: A Call for Papers

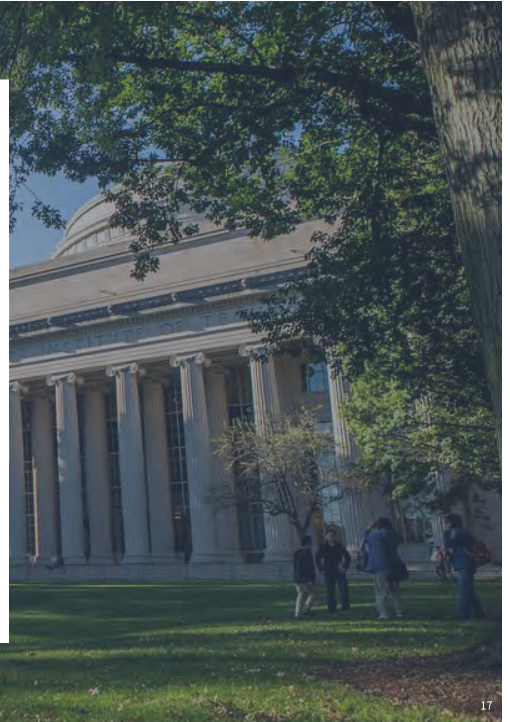
<https://pubs.acs.org/doi/10.1021/acs.chas.1c00034>

16



Working Together to Design Safer Laboratories

Michael R. Labosky, CIH, CSP



17

WHY SHOULD YOU PARTICIPATE?

- First - Who is primarily researchers for our discussion, but also EHS professionals, Facilities, ...
- Good lab design is needed to safely perform research
- To work efficiently as well as effectively, spaces should reflect major needs
- Lab Design requires a balance between creating spaces that can be used by specific researchers and spaces that can be used for many years
- Sustainability of labs both in energy/resources use as well as utility of the space
- Financial – renovations and construction are large investments
- You will benefit from participation, and the Design Team will benefit from having you there



18

PARTICIPATION IN PROJECT IS CRITICAL

- To get the best spaces there needs to be a dialogue
- Never Assume the Project Team will know exactly what you need
- Participation is important from the development of the project scope to final project commissioning
- Frequency and time needed will change over the course of project
- Who – the PI or member(s) of lab group participating need to represent the whole group



19

DOORS AND OTHER FEATURES

- The lab door example in the editorial describes just one of many features, and aspects of design that require thought, code analysis, Facilities input, understanding of institutional culture and preferences
- Sometimes it's not as much about correct answers as answers that are correct for your building or spaces
- The best outcome may require some patience and getting several people, areas/depts and opinions sorted
- A new lab is an opportunity to do things you should do or always wanted to do
- When moving into a new bldg. or space – get to know features and the intent of design that was done

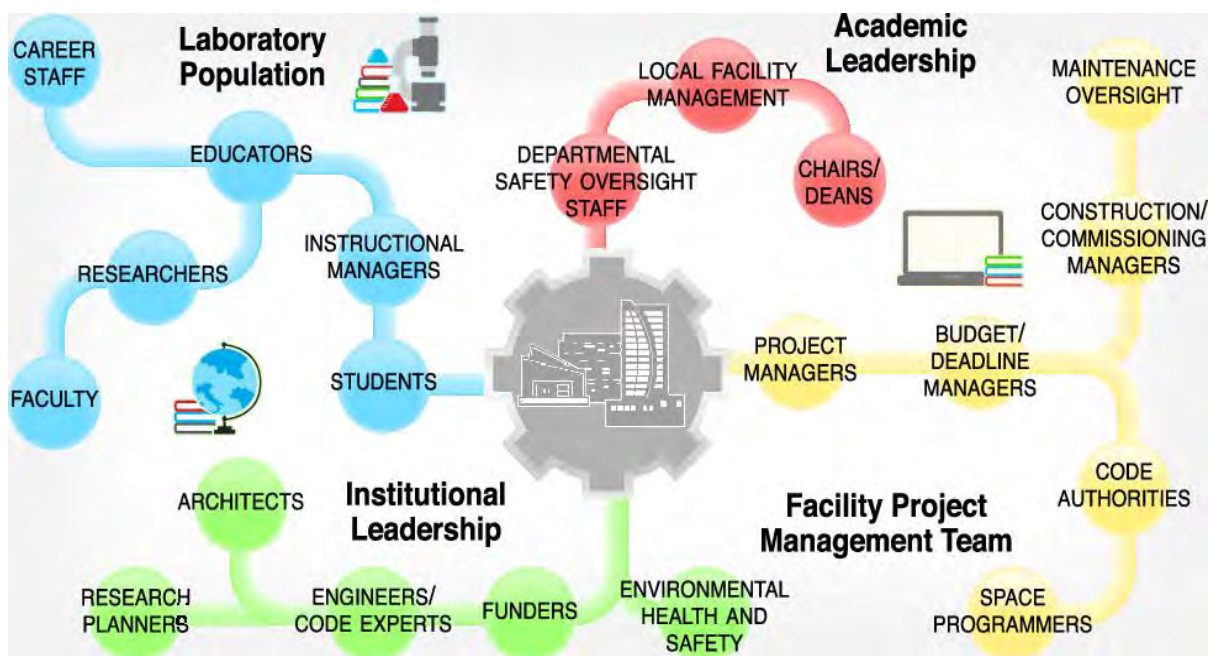


20

GOOD LAB DESIGN CAN ENHANCE SAFETY CULTURE

Spaces and features in lab can help with safety performance

- Space to don and doff lab coats and other PPE/public spaces separated
- Appropriate sized and ventilated storage areas and cabinets for chemicals
- Waste collection areas and enhancements can help prevent waste management problems – hazardous waste, bio-waste, other waste
- The correct size, number and well appointed fume hoods with utilities (also energy efficient)
- Type, location and designation of emergency eyewashes, safety showers and other safety equipment
- Safe and convenient locations to eat
- Appropriate and specific signage



CALL FOR PAPER

VIRTUAL SPECIAL ISSUE

Laboratory Design to Enable Safe, Secure, and Sustainable Research

ACS CHEMICAL HEALTH & SAFETY

QUESTIONS?
EMAIL MANAGING.EDITOR@SAFETY.ACS.ORG

Lab Design - Virtual Special Issue (VSI)

- We want many voices representing many aspects of the lab design process
- Ideas, concepts and discussion of how we can all contribute to creating better, safer, more efficient spaces are requested
- Please share

<https://pubs.acs.org/doi/10.1021/acs.chas.1c00034>

23

Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



What has been your experience in moving your science into a new laboratory?

- It went smoothly
- There were some hiccups that were addressed promptly
- We have ongoing issues which we have to work around
- Moving into our current lab is a never-ending challenge
- Other (Tell us more in the chat!)



24

Part 2: Laboratory Operations: Commissioning Ventilation Systems

Ellen Sweet, MS, CCHO



Cornell University
Environmental Health and Safety

25

Commissioning Ventilation Systems

Verifies that systems are operating as designed

- Air Exchange Rates (speed and volume of ventilation)
- Temperature and Relative Humidity
- Room Pressurizations (direction of air movement between spaces)



Test & Result Conditions	As Installed	Compliance Code	Title
Material Safety Data Sheet (MSDS)	Yes	Permitted By	CHE
Event Identification	EN-100		

AIRFLOW VELOCITY TEST					
	Design	Actual	%	Design	Actual
Test Setup Mode	Active	0.04	100%	MSD	MSD
Test Configuration	0.04	0.04	100%	High/Low Velocity (PPH)	0.04
Test Opening (mm)	10.00	10.00	100%	Top Horizontal	40.00
PM	0.00	0.00	0%	Atmosphere Critical	Pass

LOCAL AIRFLOW VISUALIZATION TEST					
Test Setup Mode	Standard	Flow (High Concentration)	Pass		
Test Configuration	Standard	Flow of Fluid	Pass		
Test Opening (mm)	10.00	Flow/Fluid	Pass		
Challenge Medium Used	Smoke/Fluid	Atmosphere Critical	Pass		
Warning Response Test	Pass				

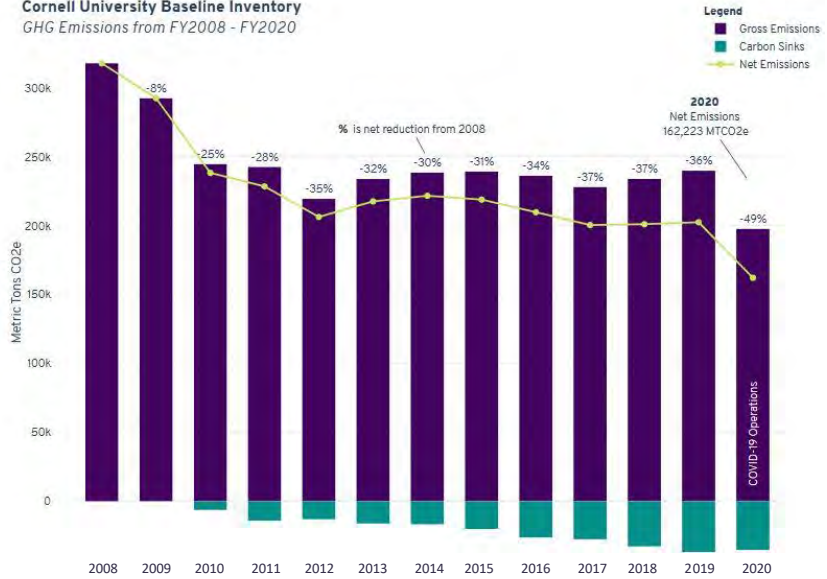
LARGE AIRFLOW VISUALIZATION TEST					
Test Setup Mode	Standard	Flow/Fluid	Pass		



Cornell University
Environmental Health and Safety

26

Cornell University Baseline Inventory
GHG Emissions from FY2008 - FY2020



Notes: Carbon sinks or reductions include retired renewable energy certificates, offsets from composting food waste on campus, and emissions associated with exported electricity.

Retro-commissioning

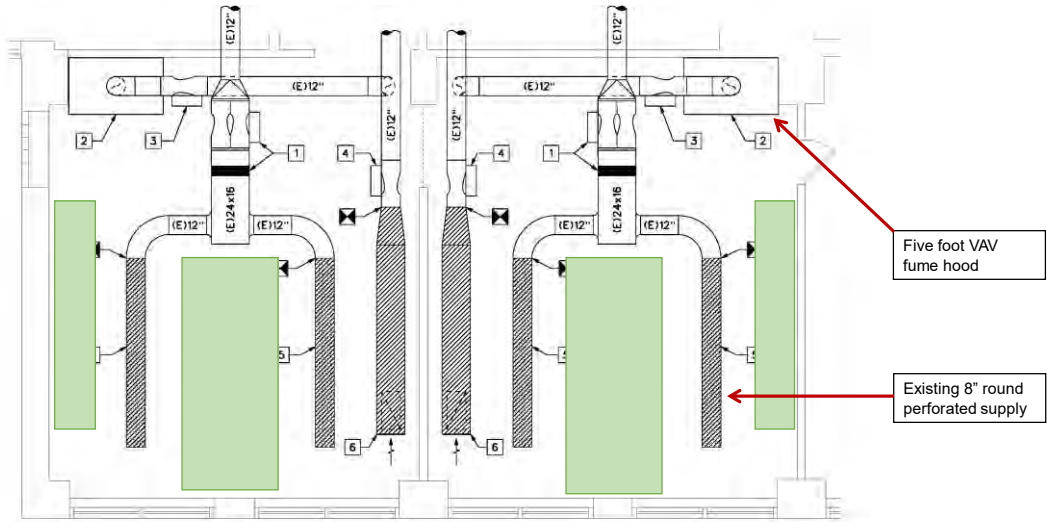
Value added;

Opportunity to optimize safety and operating costs;

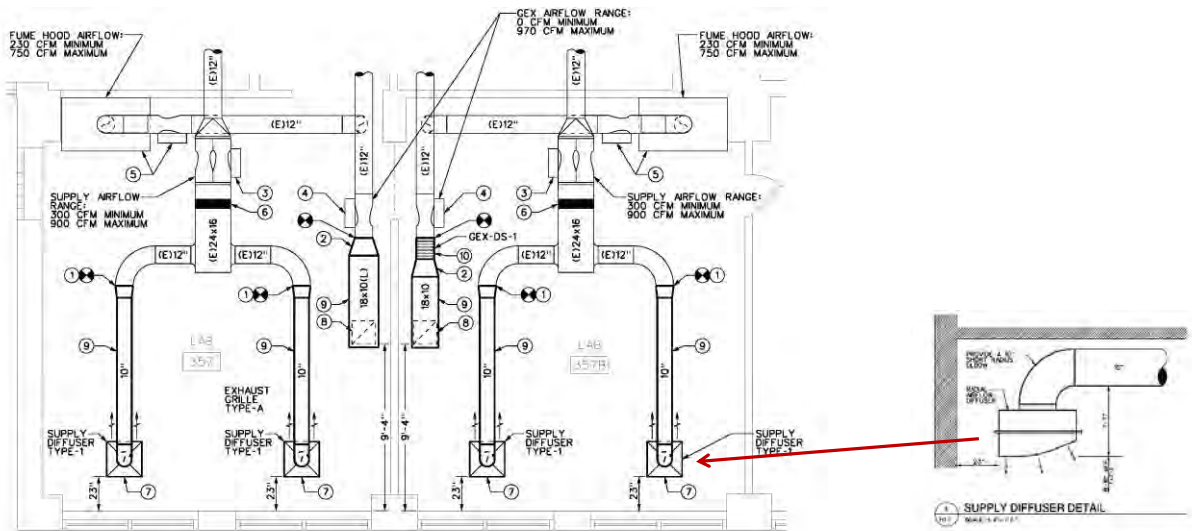
Continuously changing research operations requires ongoing oversight of ventilation systems.



Lab Design that Reduces Potential Exposure

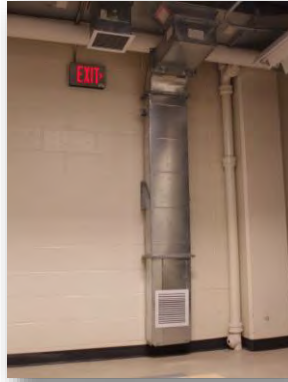


Lab Design that Reduces Potential Exposure



Air Quality Considerations

- Single-pass ventilation in labs
- What types of filtration is cost effective?
 - Pre-filters with MERV ratings 1-8
 - MERV 9-15



Communicating about Ventilation

Properly functioning mechanical systems support safe lab work.

I'm helping to save energy



DO NOT USE
This fume hood is temporarily not in use

If you need assistance:
Contact your building coordinator

More Information:
Environment, Health, & Safety | the.ehs@cornell.edu
Energy & Sustainability | energy@cornell.edu | 607-255-8200



Environment, Health and Safety
(607) 255-8200

Date: _____

Hood I.D.: _____

100 fpm 80 fpm

MEASURED FACE VELOCITY

_____ fpm at 18"

Inspector: _____

REMEMBER TO SHUT THE GASH

Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



How engaged are the PI's or lab managers at your organization with lab design or facility operations?

- We routinely work with facilities staff to maintain good working conditions for our science and our scientists
- We work well with facilities staff when problems arise
- We have comfort problems that tend to persist over time but they do not interfere with our work
- We have ongoing problems that interfere with our scientific productivity
- Other (Tell us more in the chat!)



33

Importance of Understanding Ventilation Systems to Successfully Solve Problems

Melinda Box, Chem Dept Safety Officer, North Carolina State University

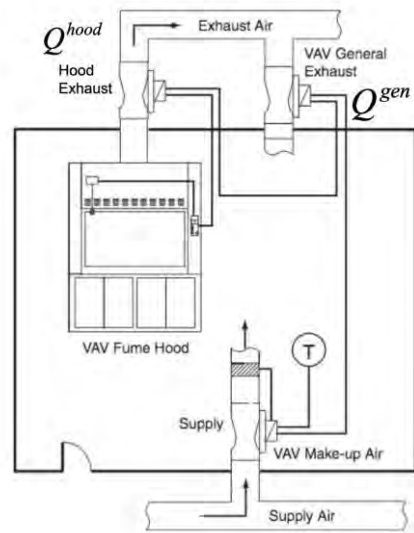
Bill Garfield, Technical Sales, BlueHat Mechanical

Case Study #1 – Fumes in the Hallway

• VAV (Variable Air Volume) Hood Components

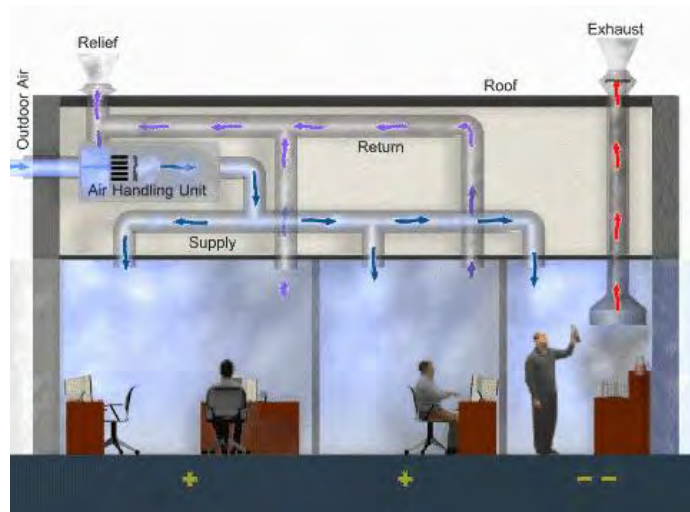
- Sash position sensor
- hood damper
- General exhaust damper
- Supply air control

- **Air Changes per Hour (ACH)** - measure of the air volume added to or removed from a space in one hour, divided by the volume of the space



Case Study #1 – Fumes in the Hallway

- Exhaust vs. Return Air
- Supply Air vs. Makeup Air
- Air pressure balance
 - Positive vs negative

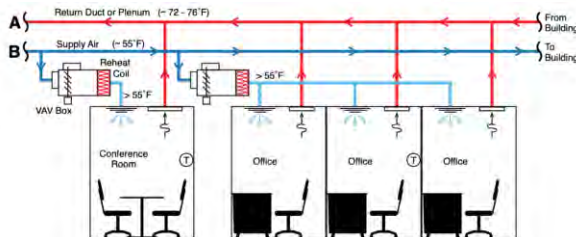
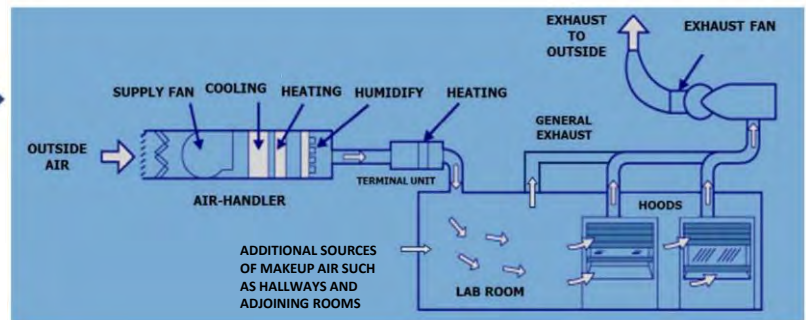
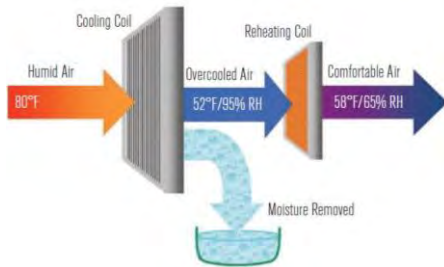


https://19january2017snapshot.epa.gov/indoor-air-quality-iaq/animation-series-visual-reference-modules-indoor-air-quality-building_.html

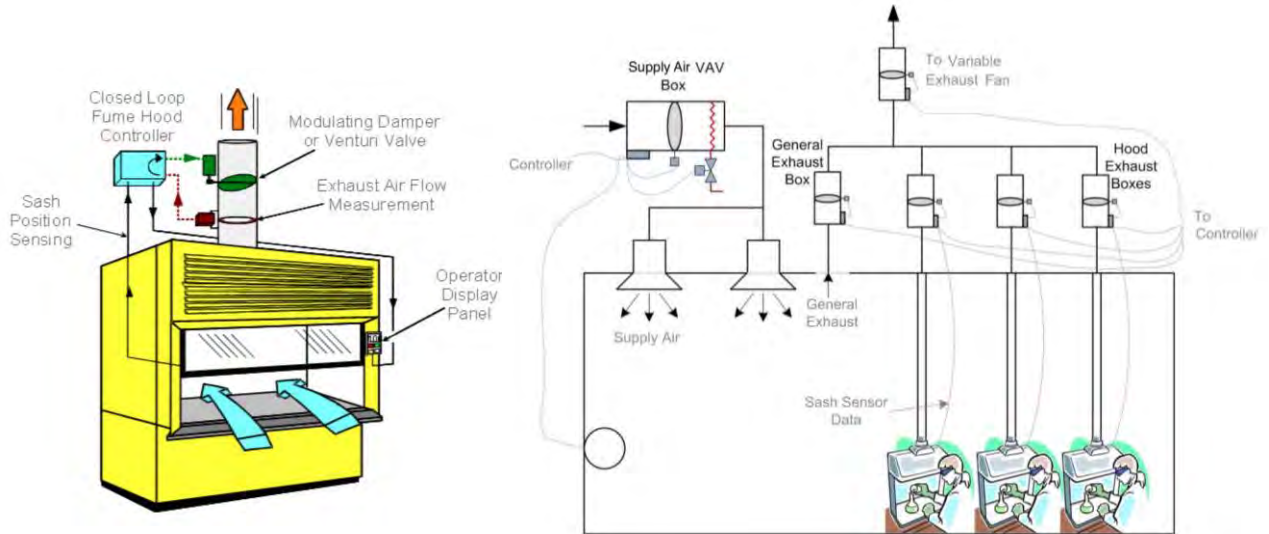
Case Study #2 – A Perfect Storm

- Humidity condensing on ceiling fixtures in multiple locations and dripping down in a lab space
- Extreme hot and extreme cold in adjacent locations
- All hoods alarming at once at irregular intervals in different locations on the same floor (locations not in synch)
 - High flow alarms
 - Raising sashes fixes this







Dehumidification and Duct Heating



Variable Air Volume (VAV) Hoods



Understanding how ventilation worked meant:

RATHER THAN REPORTING ...	REPORT INSTEAD ...
that fumes are detected in a hallway 	That a specific room has a pressurization issue 
that a room or lab has extreme temps or high humidity 	If applicable, that an adjacent room is experiencing the other extreme 
large scale issues now and then 	As regularly as possible, because design issues are difficult to identify and potentially even more challenging to remedy 

IMPORTANCE OF
RESPONSIVENESS

PREVENT THE
SAFETY ISSUE

of

LEARNED

HELPLESSNESS



41



It takes a village ...

Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



In your experience, what has been the GREATEST FACILITY INFRASTRUCTURE CHALLENGE you have faced in the laboratory you have worked in?

- Lab ventilation challenges
- Temperature and relative humidity control
- Inconsistent power supply or electrical services
- Uncomfortable office and classroom conditions
- Other (Tell us more in the chat!)



43

Empowering Academic Researchers to Strengthen Safety Culture



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Workshop goals are to:

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Working Together to Design Safer Laboratories



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ASK YOUR QUESTIONS AND MAKE YOUR COMMENTS IN THE QUESTIONS PANEL NOW! 45



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MICHAEL R. LABOSKY, MS, CIH, CSP
Associate Director, OSCP, EHS Office,
Massachusetts Institute of Technology



ELLEN SWEET, MS
Laboratory Ventilation Specialist,
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MELINDA BOX, MS
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