



1791 Tullie Circle, N.E./Atlanta, GA 30329
404-636-8400

DRAFT

TC/TG/MTG/TRG MINUTES COVER SHEET

(Minutes of all Meetings are to be distributed to all persons listed below within 60 days following the meeting.)

TC/TG/MTG/TRG No. TC 9.10 DATE Jan 13, 2025

TC/TG/MTG/TRG TITLE Laboratory Systems

DATE OF MEETING June 25, 2024 LOCATION Indianapolis

VOTING MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	CORRESPONDING MEMBERS AND ADDITIONAL ATTENDANCE (INCLUDING VIRTUAL ATTENDEES)
Robert Weidner	2022	John Varley	2020	Roland Charneux (CM)
Kelley Cramm	2022	Danny Sanchez	2023	Mike Carl (PCM) (V)
Glenn Friedman (V)	2020	Wei Sun	2021	Justin Garner (CM)
Kishor Khankari	2020			Jason Atkisson (CM)
Ryan Parker	2023			Pierre-Luc Baril (CM) (V)
Rachel Romero	2022			Brendon Burley (CM)
Mark Malkin (V)	2023			Victoria Sozanski (PCM)
Guy Perreault	2022			Brad Cochran (CM)
Chris Kirchner	2022			Brendan Dingman (CM)
Jim Coogan	2023			Jake Edmondson (CM)
Anne Juran	2023			Duncan Green (CM) (V)
Ken Crooks	2021			Greg Gross (CM)
				Keith Hammelman (CM)
				Charlie Henck (CM)
				Scott MacMurray (CM) (V)
				Kurt Monteiro (CM)
				Victor Neuman (CM)
				Christine Reinders-Caron (CM)
				Kurt Rindoks (CM)
				Ali Salim Shirazi (CM)

			Gordon Sharp (CM)
			Tom Smith (CM)
			Ryan Soo (CM)
			Brooks Stout (CM) (V)
			Danny McGrail (PCM) (V)
			Vineet Nair (CM) (V)
			Rachel Peters (PCM) (V)
			Ryleigh Turner (PCM) (V)
			Luke Fresconi (PCM) (V)
			Kenneth Shifflett (PCM)
			Eric Ballachey (CM)
			Yuzhe Liu (PCM)
			Jerry Bogert (PCM) (V)
			Cary Simonson (G)
			Jason Hauska (G)
			Evan Connell (G)
			Ricardo Soto (G)
			Stan Lengerich (G)
			Vincent Tang (G)
			Bob Valbracht (G) (V)
			Kyle Nedlik (G) (V)
			Mark Richards (PCM)(V)
			Leonard LeGrand TGCE (PCM) (V)
			Ryleigh Turner (PCM) (V)
			Beth Mankameyer (PCM)(V)
			Traci Hanegan (CM)
			Wade Conlan (CM)
			Brent Fullerton (CM)
			Elizabeth Kolacki (CM)
			Vince Sakraida (CM)
			Rick Clemenzi (PCM) (V)
			Pat Carpenter (CM) (V)
			Syed Abdul Rashid (G) (V)
			Gene Naroditsky (G) (V)

				Elie Akiki (PCM) (V)
				Kevin Belusa (CM) (V)
				Vincent Tang (G) (V)
				Emily Ormsby (G) (V)
				John Carter (CM)
				George Gartzounis (PCM) (V)
DISTRIBUTION:				

All Committee Liaisons As Shown On TC/TG/MTG/TRG Rosters (Research, Standards, ALI, etc.)	
Manager Of Research & Technical Services	

CM = Corresponding Member
PCM = Provisional Corresponding Member
V = Attended on-line (virtual)
G = Guest

Note: These draft minutes have not been approved and are not the official, approved record until approved by the TC.

CALL TO ORDER

Bob Weidner called the meeting to order at 3:03 PM EDT.

Bob circulated a card for John Castelvechi. He is recovering slowly.

CODE OF ETHICS COMMITMENT

In this and all other ASHRAE meetings, we will act with honesty, fairness, courtesy, competence, inclusiveness and respect for others, which exemplify our core values of excellence, commitment, integrity, collaboration, volunteerism and diversity, and we shall avoid all real or perceived conflicts of interests.

(Code of Ethics: <https://www.ashrae.org/about/governance/code-of-ethics>)

(Core Values: <https://www.ashrae.org/about/ashrae-s-core-values>)

TITLE, PURPOSE, SCOPE for TC9.10

Bob W. read our Title, Purpose, and Scope:

TC 9.10 is concerned with HVAC components for laboratory systems and their use therein. These components include but are not limited to air intakes, supply air conditioning systems, air distribution methods, laboratory fume hoods, biological safety cabinets, exhaust systems and exhaust discharge. The technical committee will address the unique requirements of all types of laboratories. These laboratories include but are not limited to nuclear, pharmaceutical/medical, general chemistry, and teaching. Additional TC 9.10 concerns are; (1) the reduction of energy usage in laboratory systems, (2) the monitoring of government regulations affecting laboratory operation.

INTRODUCTIONS

The group did not do self-introductions in the interest of time.

WEBSITE

Jim Coogan reported that the website is up to date. If subcommittee chairs will provide reports and/or content Jim will post it. Rachel will provide program content.

MEMBERSHIP

Guy reported 11 voting members are present. Quorum achieved.

Quorum

Took roll call for voting members. 11 of 16 voting members are present. Quorum achieved.

MEETING MINUTES

Rachel moved and Guy seconded to approve the minutes from the last meeting as amended. The minutes were approved unanimously.

SECTION HEAD REPORT

Brad indicated that we need to use the current activity form. Do not use the old one. Brad presented Bob with a certificate of appreciation.

Joy Altweis will be the Section 9 Head going forward.

You can contact Joy Altweis at:

SH9@ashrae.net

[For general questions email:](#)

Askac@ashrae.net

TOM SMITH'S CORNER

Tom Smith gave a presentation on fume hood flow changes and lab supply/general exhaust response and the importance of fume hood minimum flow. See attached presentation.

ASHRAE MOU WITH AIHA

Rachel invited Stephanie Reiniche to attend our meeting to discuss how TC 9.10 can work together with AIHA on joint activities. Stephanie Reiniche, Director of Technology for ASHRAE, indicated that she is open to our ideas and she can connect us to AIHA. There are numerous opportunities to work together on publications, research, etc. Bill Bahnfleth is writing the work plan for the MOU. Send Stephanie ideas on how we would like to collaborate with AIHA and she will connect us with the right contact. Rachel proposed that the TC discuss this and assign a liaison to communicate with Stephanie.

Brendan Burley said Don Weeks approached him about this MOU. AIHA has agreed to provide IAQ articles for the ASHRAE Journal.

Jim Coogan indicated that a good start for collaboration would be the Lab Classification Guide.

Victor Neuman indicated he will be the liaison. Jim Coogan, Tom Smith, Ryley Turner, and Rachel Romero will be involved in liaison activities also.

GUIDELINE 36 UPDATE

Jim Coogan gave a presentation on the Guideline 36 Laboratory Airflow sequences. The committee decided to form a working group that includes people who are familiar with lab controls to meet outside of the main committee and come to consensus and report back to the Guideline Committee.

Brendan Burley and Traci Hanegan will liaise with TC 9.6 on this issue.

PROGRAM SUBCOMMITTEE REPORT

Rachel Romero provided a report. Met in early June. Had 2 programs on Sunday. They both went really well. Had 42 attendees at the forum and 50 at the Lab Code and Standard Seminar.

Have several programs proposed for Orlando. It will be competitive because they have a lot of paper submissions. Deadline for program submission is August 2nd.

Rachel requested that anyone interested in speaking at future conferences reach out to her or attend the next Program Subcommittee meeting in January.

See attached report for more information.

RESEARCH SUBCOMMITTEE REPORT

Bob W gave a report. See attached report for details.

RP1573 – “Determination of suitable replacement of SF6 when used as a tracer gas in accordance with ANSI/ASHRAE Standard 110”

RP1780 – “Test method to evaluate cross-contamination of gaseous contaminants within total energy recovery wheels”

RP1835 – “Characterizing the performance of induced flow stacks”. Brad gave a report. Test site is up and running. Working on test protocol. Should have this worked out in the next 2 months. There are some hiccups but are proceeding.

RTAR 1963; Survey of sources of contamination in existing labs was the initial title. RAC had some concerns and the title will be changed to: Develop a Methodology to Characterize and Quantify Emission Rates from Processes in Labs.

WS 1936; Ventilation Effectiveness for Labs. Jim C stated there will be physical measurements as part of this. Asking lab designers how they lay out diffusers in labs. What range of flows, how do they decide? Kelley, Bob,

Jim, Jason will be part of the discussion going forward. Proposed Research Project: "Evaluation of impact of air change rate (ACR) and airflow patterns on the ventilation performance of indoor spaces". Price Industries has committed to support this project financially. Elizabeth Kolacki would like to help with this WS.

RAC has new RTAR software they are testing. There has been a lot of effort put into technical work by people on the committee. These people should be recognized by RAC. The TC needs to insure this is done.

Wade Conlan reported TFED is disbanding and has created the Center of Excellence for Building Decarbonization. The intent is that each council will have a liaison that will report to the CEED. The liaisons will report to the TCs and ask if they have research projects that they would like to pursue around decarbonization. This is in the RAC strategic plan so they will get higher priority. TAC liaisons should reach out to solicit research proposals.

LAB CLASSIFICATION SUBCOMMITTEE

This committee met. Danny Sanchez was not present. Guy reported that Danny has agreed to chair until the committee appoints another chair since his workload has increased. If someone would like to be involved, please reach out to Guy. The committee will meet again in a month or so. See attached report.

STANDARDS SUBCOMMITTEE

Justin Garner said he will send a report. There was some confusion about Standard 170. TC9.10 will work with Brendan Burley to coordinate with TC9.6 on Standard 170.

STANDARD 110

Kurt Rindoks gave a report. They met but did not have quorum. Working on putting together a schedule to get this standard updated. Hope to complete public draft Jan 2025 to allow publication in April 2026. This is a lofty goal and may not be met because they have a lot to do.

SPC 129 VENTILATION EFFECTIVENESS

Kishor reported that they met yesterday. They have formed 4 working groups and hope to work on a new standard. They are scheduling a meeting for each working group.

DESIGN GUIDE

Ann Juran is the chair of this subcommittee. The table of contents is set. The committee is moving forward. The chapters have been updated with the new numbers and people who are working on each. Need volunteers to help with the editing on Chapter 6, Load Calculations. Danny McGrail and Ann will be working on it but she needs reviewers. Jason A, Glenn Friedman and Curt Monterio agreed to help with this. See attached minutes.

HANDBOOK SUBCOMMITTEE

Mark Malkin reported He listened in on the Handbook training on Sunday. Looking at a two year timeframe for our chapters. April/July of 2026 to have our chapters revised. Need the full TC to vote on the chapters when they've been revised. Chapters have not been added to the author's portal yet but will be early next year. Plan to wait on the chapter until the design guide has been published so we can incorporate things from the guide. If anyone has ideas on items to add to the chapter, please let Mark know. Six people have volunteered to help with the chapter. Tom's presentation today should be incorporated into the handbook. See attached report.

Bob noted that the handbook should coordinate with the design guide since timing will be different between the two.

ASHRAE JOURNAL

Roland Charneux reported there is an article in the June issue by Kishor: "CFD Analysis of Fixture Output Impact on Upper room Germicidal Ultraviolet Light System Performance"

Kelley indicated she is planning an article on Maker Spaces. Keith Hammelman indicated the Education TC would like to collaborate.

ALI COURSES

Laboratory Design Course – The Basics and Beyond – Danny McGrail reported he attended the course last time. He's working on reorganizing some content and is looking at adding some additional content. ASHRAE intends to offer this course at both Winter and Summer conferences going forward.

Laboratory Exhaust Course – Safe and Energy Efficient Design – Brad said this course was not held in Chicago. It's on hold until he rolls off TAC. It should be ready by Orlando or Phoenix.

Laboratory Controls Course – Jim said Karen Murray responded but he thinks she might have been thinking about the wrong course because she indicated she didn't have the proposal. Christine said she will follow up with Karen to be sure she's looking for the right course.

LIAISON REPORTS

TC 1.4 Control Theory and Application – Jim Coogan reported that the biggest issue is Guideline 36. He will also let them know we are working on a controls class for ASHRAE.

TC2.2 Plant and Animal Environment- Anne Juran reported that they are looking at doing a tech program submission for Phoenix.

TC 4.3 Ryan Parker reported they have 3 RTARs they've submitted. Will be submitted several programs for Orlando.

TC5.1 Fans – No report

TC5.3 Room Air Distribution–Kishor reported. See above.

TC7.6 Building Energy Performance – Ali Shirazi reported that there was no conversation related to TC 9.10. Christine will be the liaison going forward.

TC7.9 Building Commissioning –Justin Garner reported SSPC 300 and Guideline 36 are coordinating to develop standard testing procedures in the Guideline. SSPC 300 needs to coordinate with DOE.

TC9.2 Industrial Air Conditioning and Ventilation. Brad indicated they are working on a ventilation guide and future programs.

TC9.6 Healthcare Facilities – Traci Hanegan reported they have been busy with RP1965(?) which entails anterooms. Don't have criteria now on what is the best approach to anterooms. There was a presentation in the infectious disease subcommittee where they did research in an operating room looking at relative humidity and how it affects contamination. Looked at 20, 35 and 50% RH and sampled airflow. They found a statistical significant difference between 20 and 35% RH in contamination levels. Didn't see the same difference between 35% and 50%. They are getting ready to publish the results.

TC9.7 Educational Facilities – Keith Hammelman reported they had a long discussion on early childhood education centers and whether these should be brought under the TCs purview. They are highly interested in the potential Maker Space article. They are also interested in the lab classification document since education facilities have labs.

Maybe we should form an MTG for Maker Spaces since there are many entities inside ASHRAE working on this.

Wade indicated that the Environmental Health Committee has considered an emerging brief on this issue. Need to also reach out to them. Marwa Zahtari is the incoming chair.

TC9.11 Clean Spaces – Roland Charneux reported. They are starting review of the Design Guide for Cleanrooms. Since ISO removed air change rates for different ISO class, there remains the question of how to decide what air change rates should be used. Gowning is a major factor that can significantly affect the particulate count and need for higher airflows.

MTG ACR –Jim Coogan said the forum on Sunday was a big success. Kishor chaired this forum. TC 9.10 needs to help with the work statement.

62.1 Ventilation for Acceptable IAQ – Brendon Burley reported. Density calculations are now mandatory. Have been handling cleanup to the standard. Have issued the new updated IAQ procedure.

90.1 – Jason said he has nothing specific to report.

SMACNA – No report

NFPA 45 – Ken Crooks published the liaison report. Ken spoke in the Seminar held on Sunday and presented on NFPA 45.

NSF 49 – Justin said he was asked to help evaluating language on dedicated exhaust systems for B2 biosafety cabinets. See the standards report for more information.

ISPE – Jason did not attend so he can't report. He does not regularly attend ISPE.

AIHA Lab Health & Safety – Tom Smith reported that the Lab Health and Safety committee had a conference recently. Tom and Rachel presented on Smart Labs. Have some initiatives similar to TC 9.10.

Jim said he would like to involve AIHA in the effort to deal with what happens when the supply fan is lost in a lab. Need a procedure to insure spaces don't go so negative that the users can't get out of the lab.

ASTM Z9.5 – Jim Coogan stated there is nothing currently happening.

I2SL – Gordon reported on Labs2Zero updates. See attached slides.

Title 24 – California Energy Code - Glen gave a short presentation on updates. There are five new requirements related to labs. See attached presentation.

NEW BUSINESS

None

CLOSING THOUGHTS

New officers (starting July 1, 2024):

Chair – Kelley Cramm; Vice Chair – David Rausch; Secretary – Christine Reinders-Caron

Next Meeting – Orlando – Feb. 11, 2025

ADJOURN

It was moved and seconded to adjourn at 5:33 PM EDT

New Methods For Specifying and Validating Fume Hood Performance

Thomas C. Smith
President/CEO
tcsmith@3flow.com
www.3flow.com



1

Fume hoods are installed to protect people

Contain, Capture and Remove Airborne Hazards



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2

Fume hood systems must be tested properly to verify and ensure proper performance during commissioning and routine tests

Operational Tests

1. Inspect Fume Hood System
2. Lab Environment Tests
3. Cross Draft Velocity
4. Face Velocity
5. VAV Response and Stability

Performance Tests

1. Airflow Visualization
2. Tracer Gas Containment Tests



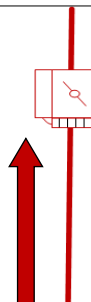
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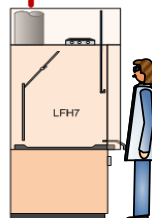
3

Fume hoods must operate properly to provide the required safety performance

- Design Sash Opening
- Max Exhaust Flow
- Average Face Velocity



- Sash Closed
- Minimum Exhaust Flow

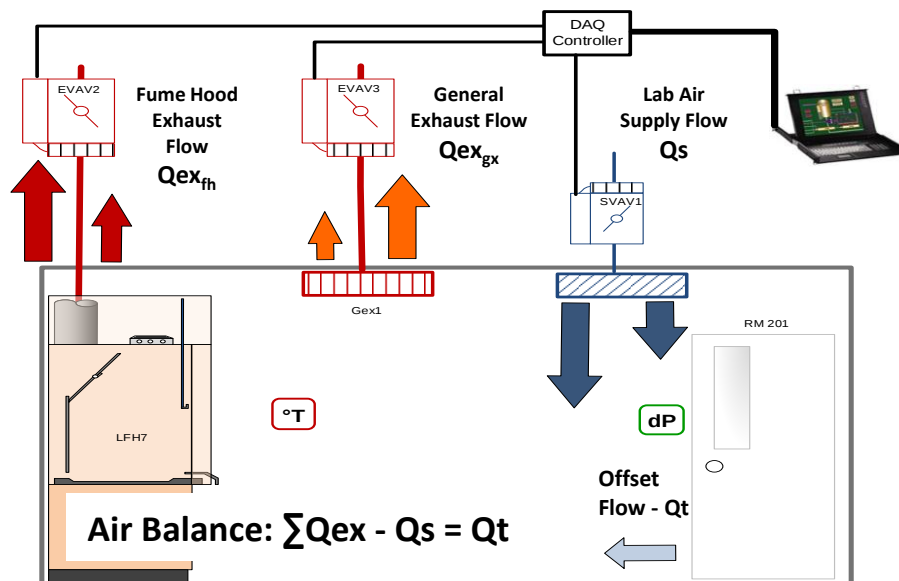


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The operation of the fume hood affects lab safety and air balance



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5

Proper control of fume hood minimum flow is critical to safety and energy efficiency

- Containment
- Dilution
- Removal

1990s - EPA – 50 cfm / Ft. of hood width

2004 - NFPA 45 – cfm / ft² Work Surface Area

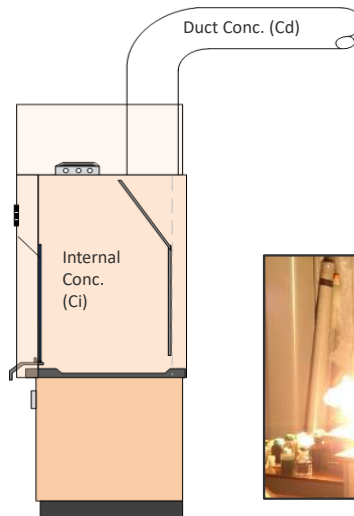
- 25 cfm / sq. ft. ws

2012 - ANSI Z9.5 (must be appropriate)

- Internal Air Change Rate
- 150 ACH ~ 10 cfm / sq. ft. ws
- 375 ACH ~ 25 cfm / sq. ft. ws

Caution

Caution: Exhaust Flow depends on Hood Design, the System and the Application (i.e. Risk)



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Appropriate specifications are essential to Proper Performance



Acid Rain due to insufficient exhaust flow

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Improper flow can lead to devastating results



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A Lab Ventilation Risk Assessment (LVRA) helps establish performance criteria and operational specifications

Risk Control Band	Description	Fire Hazard Classification
0	Negligible	Class D
1	Low	Class C
2	Moderate	Class B
3	High	Class A
4	Special Extreme	Class A



Hazard Emission Scenario

- Type of Hazard
- Exposure Limit
- Quantity
- Potential Generation Rate
- Concentration Profile

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Assign Risk Control Bands to Fume Hoods and ECDs

Risk Factor Ratings Determine RCBs

Total Score	Control Band	Description
< 9	0	Negligible
10-23	1	Low
24-36	2	Moderate
37-69	3	High
70-92	4	Special Extreme



Negligible



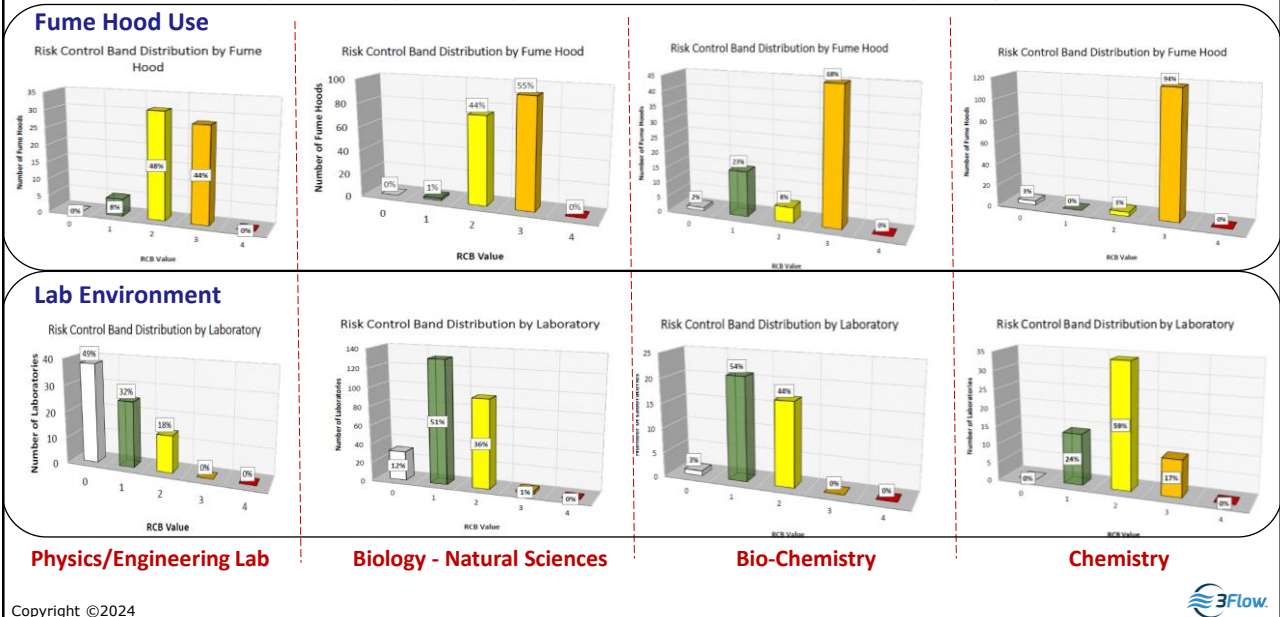
Extreme

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The range of RCBs for different buildings indicate that prescriptive specifications are not appropriate



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Proper Response and Stability are Important

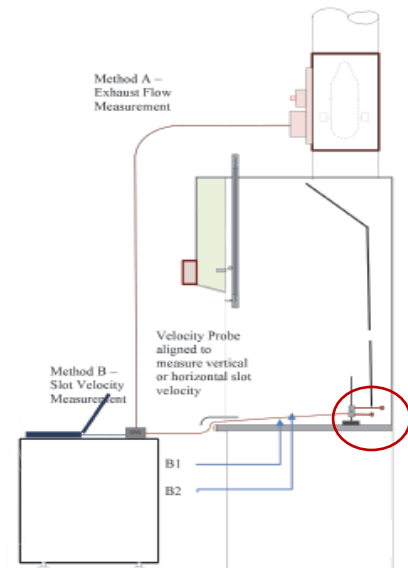
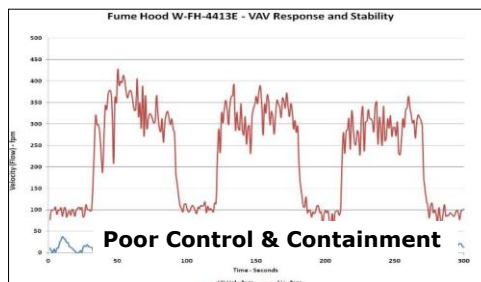
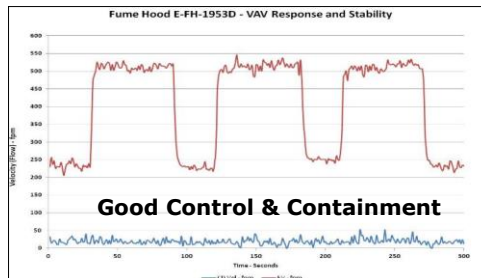


FIGURE 6.2 Sash movement effect flow test.

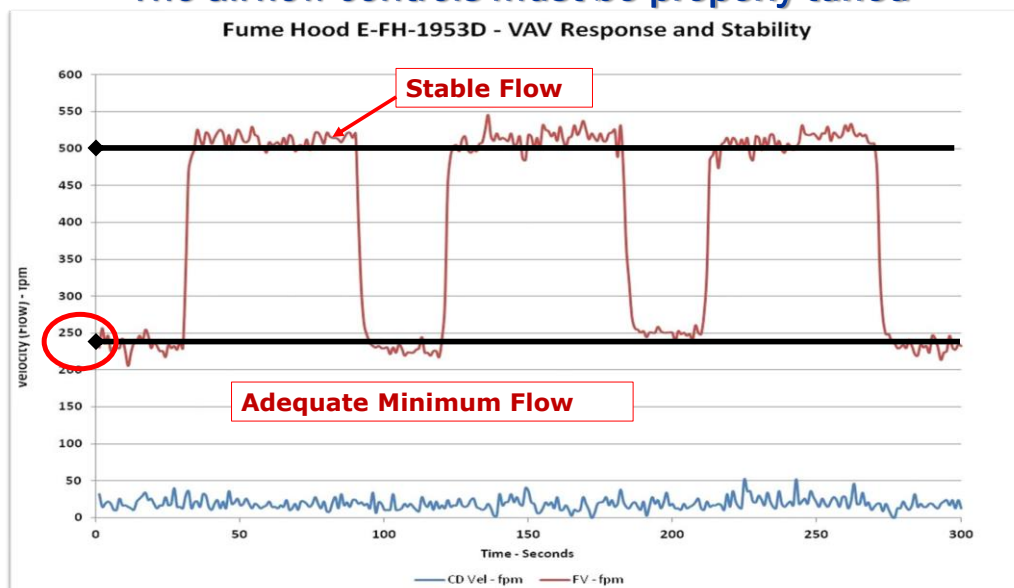


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The airflow controls must be properly tuned

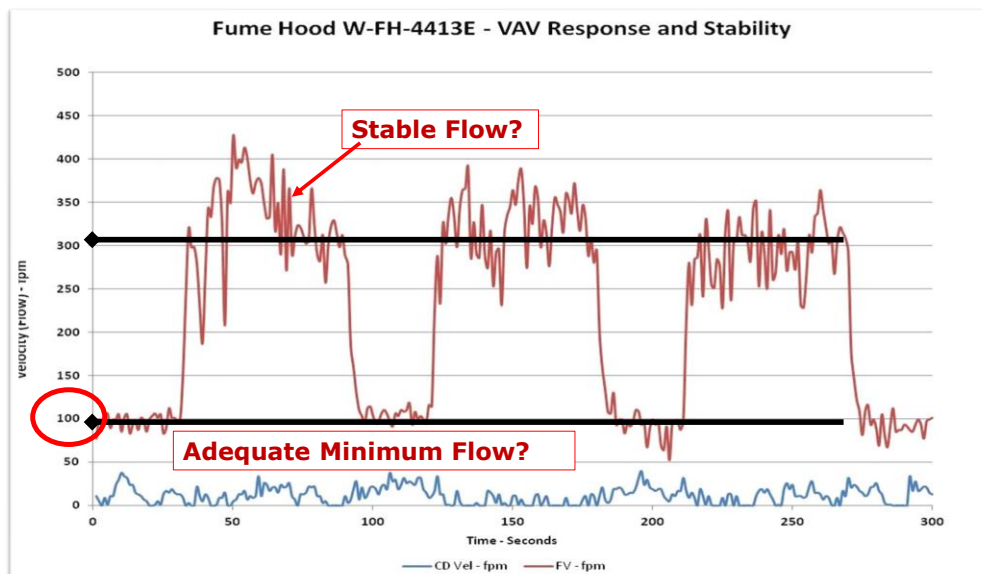


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Inadequate flow and improper response can affect safety

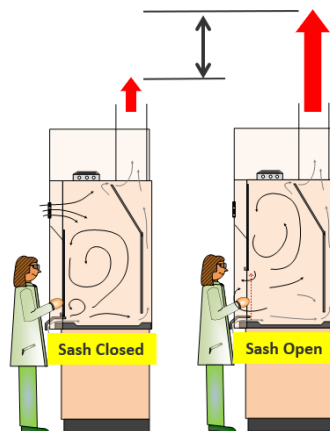


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Samples of Fume Hood VAV Operation

VAV Fume Hood
Minimum Flow Tests

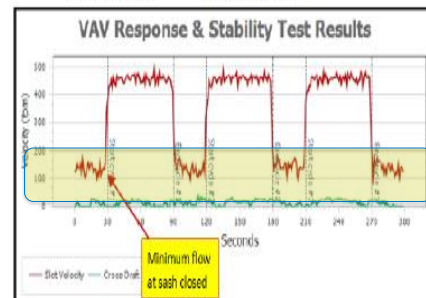
Fume Hood – 129-1

Datasheet - Fume Hood Performance Test Results

Owner: Owner Technician: AP
Building Name: New Chemistry Building
Laboratory: NCB-127/129 Test Date: 10/02/2023
Hood: NCB-129-1 Test Cycle: 1

VAV Response & Stability Test Results

Speed of Response (seconds): 5 VAV Stability Cycle 1: 0%
Speed of Response Rating: Pass VAV Stability Cycle 2: 0%
Stability Rating: Pass VAV Stability Cycle 3: 0%



Adequate Minimum Flow

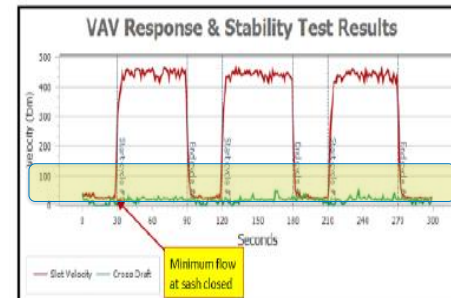
Fume Hood – 129-2

Datasheet - Fume Hood Performance Test Results

Owner: Owner Technician: AP
Building Name: New Chemistry Building
Laboratory: NCB-127/129 Test Date: 10/02/2023
Hood: NCB-129-2 Test Cycle: 1

VAV Response & Stability Test Results

Speed of Response (seconds): 5 VAV Stability Cycle 1: 0%
Speed of Response Rating: Pass VAV Stability Cycle 2: 7%
Stability Rating: Pass VAV Stability Cycle 3: 7%



Insufficient Minimum Flow

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Visualization of Airflow Showing the Importance of Minimum Fume Hood Flow



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Fume Hood Specs by Risk Control Band

Laboratory Fume Hood Specifications	Risk Control Band				
	0	1	2	3	4
ASHRAE 110 Tracer Gas Control Level	N/A	4 lpm AU < 0.1 ppm	4 lpm AU < 0.1 ppm	6 lpm AU < 0.05 ppm	8 lpm AU < 0.01 ppm
Fume Hood Face Velocity	N/A	60 fpm ⁽¹⁾ 100 fpm (CA)	60 fpm ⁽¹⁾ 100 fpm (CA)	80 fpm ⁽¹⁾ 100 fpm (CA)	>80 fpm
Cross Draft Velocity	N/A	< 30 fpm	< 30 fpm	< 30 fpm	< 30 fpm
Minimum Fume Hood Exhaust Flow with Sash Closed	Turn off or Hibernate	> 150 ACH _{FH}	> 250 ACH _{FH}	> 375 ACH _{FH}	CAV
VAV Response Time	N/A	< 5 Secs.	< 5 Secs.	< 5 Secs.	< 5 Secs.
VAV Stability (% Variation)	N/A	< 20%	< 20%	< 20%	< 20%
Fume Hood Duct Velocity	N/A	>300 fpm	>500 fpm	>1,000 fpm	>2,000 fpm
Monitor	N/A	Yes	Yes	Yes	Yes

Minimum flow affects duct transport velocity

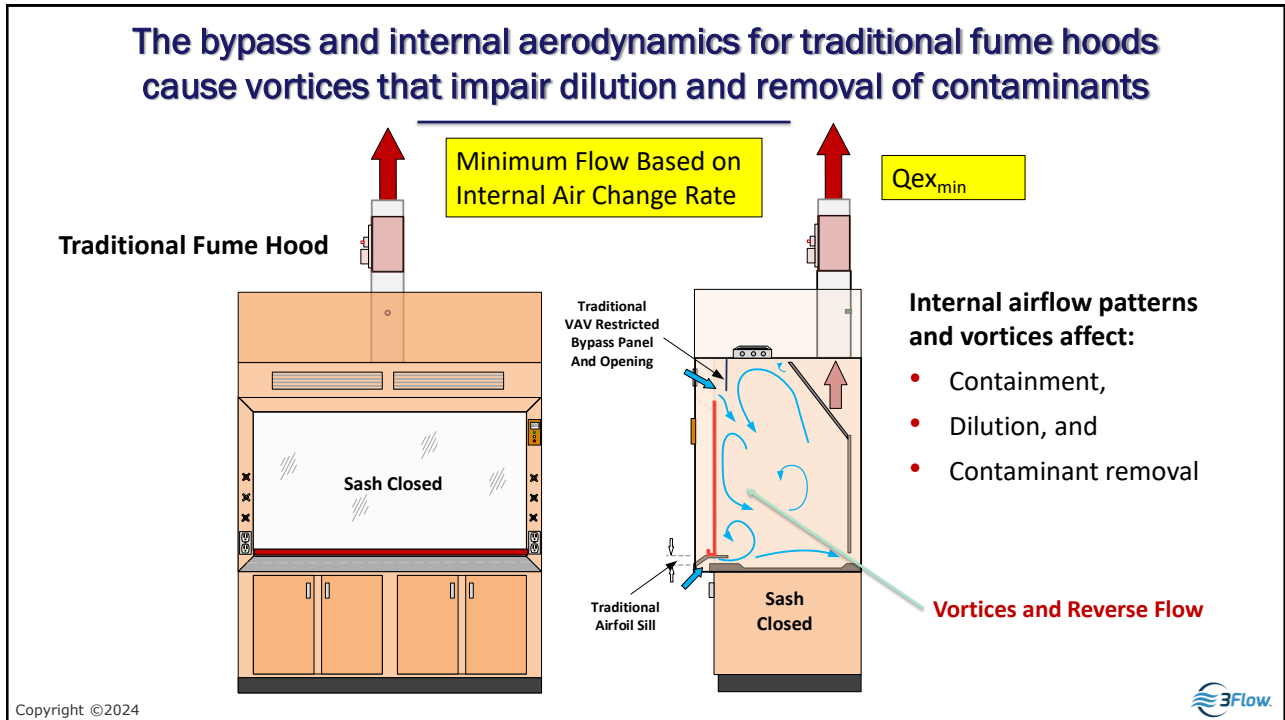
Fume Hood Tests are necessary to validate performance

1. California Law Requires 100-fpm average face velocity

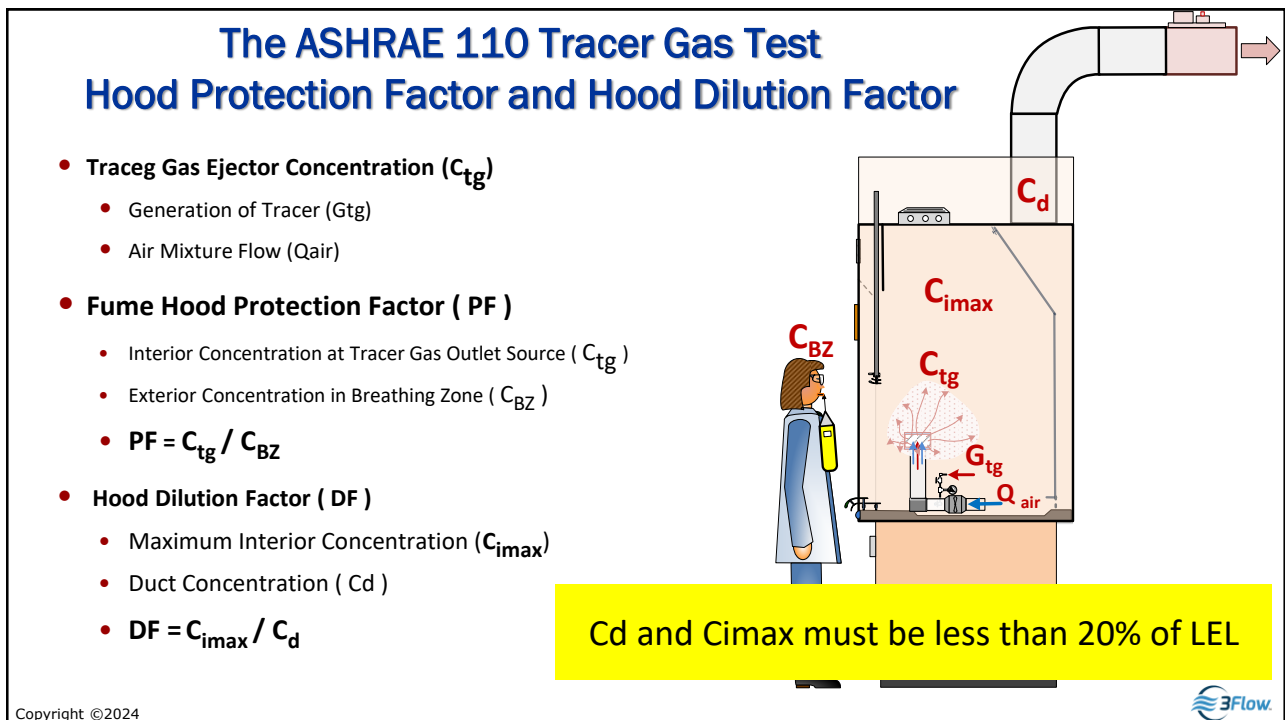
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Minimum Flow Fume Hood VEFF Test

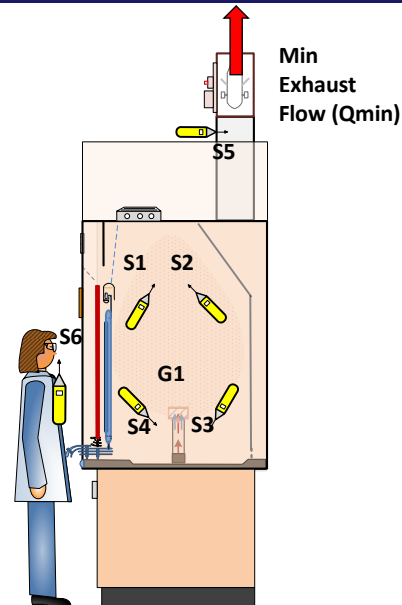
- Sash Closed – Minimum Flow
- Tracer Generation (G1)
- Concentration Samples
 - Internal Concentrations (S1 – S4)
 - Duct Concentration (S5)
 - Breathing Zone Concentration (S6)

$$\text{Dilution Factor (DF)} = \text{Max (S1, S2, S3, S4)} / \text{S5}$$

$$\text{Hood Protection Factor} = \text{Max (S1, S2, S3, S4)} / \text{S6}$$

$$Q'_{\min} = G / C_{\text{LEL}} * 1\text{E}6$$

$$Q_{\min} = Q'_{\min} * \text{DF}$$



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Configuration of Minimum Flow Test Equipment

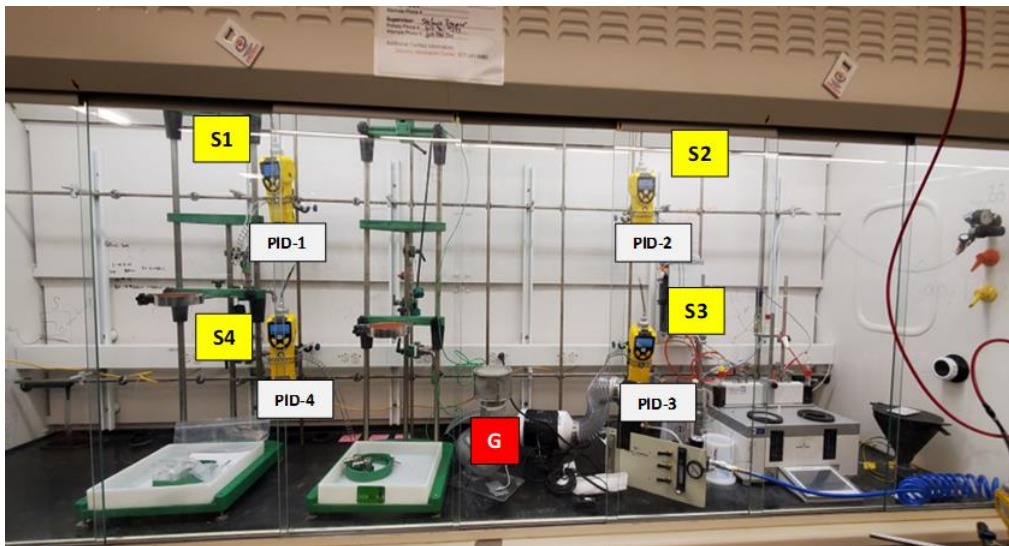


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Fume Hood Ventilation Effectiveness Test

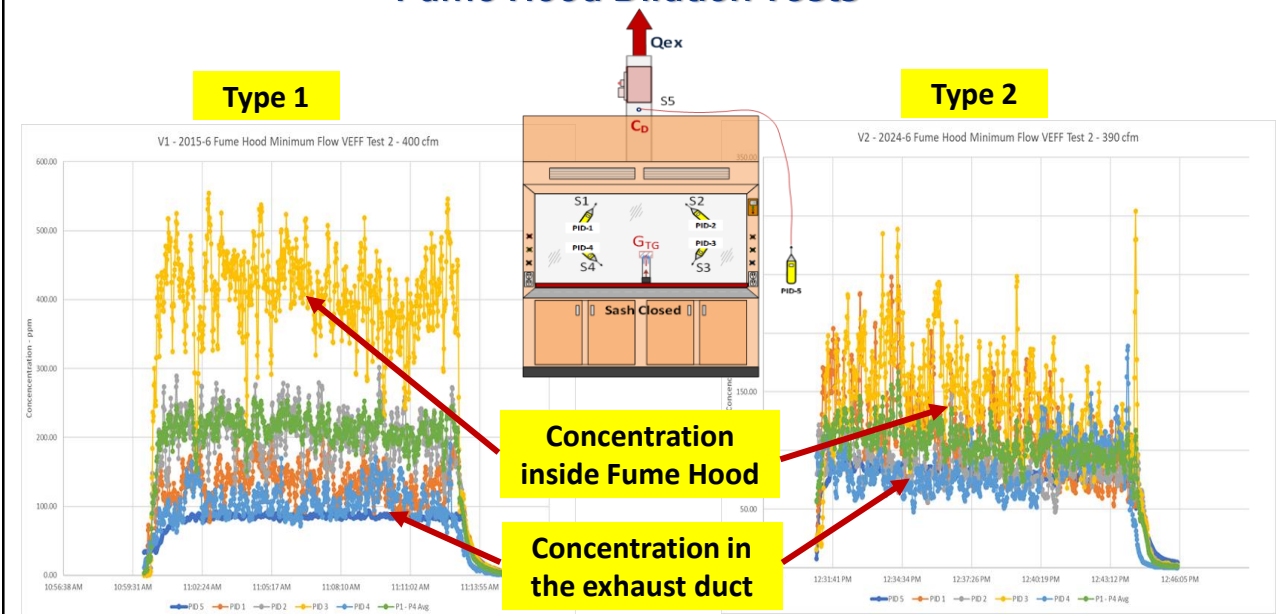


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Fume Hood Dilution Tests

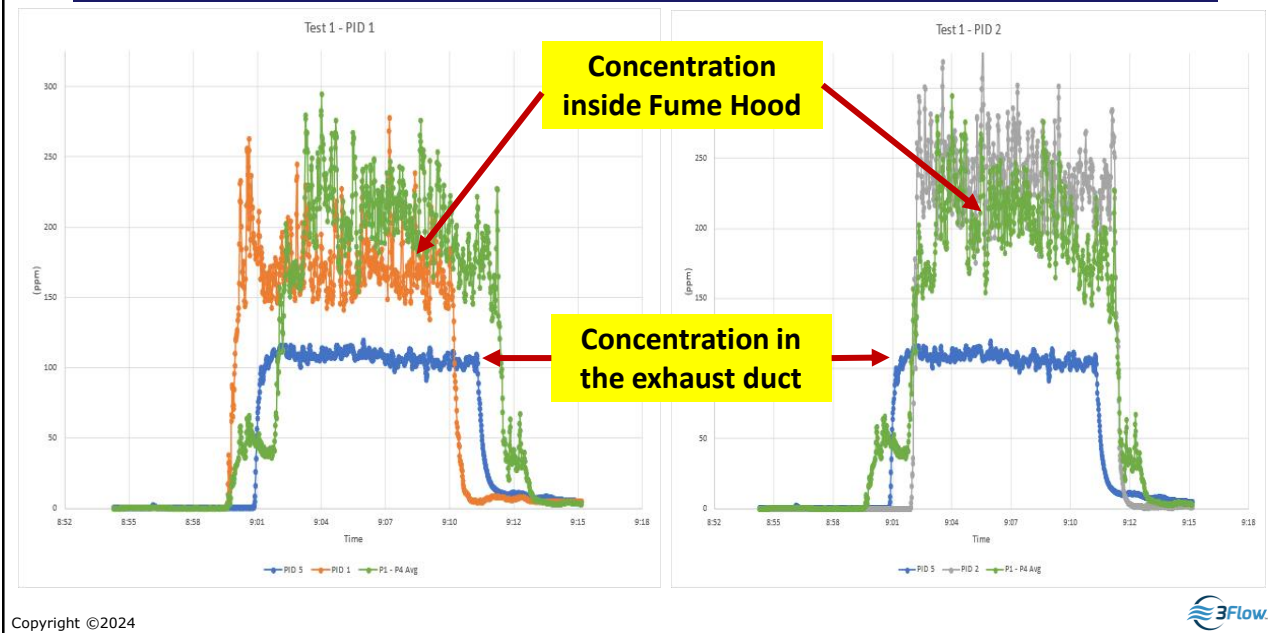


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Minimum Flow Fume Hood Dilution Test Results

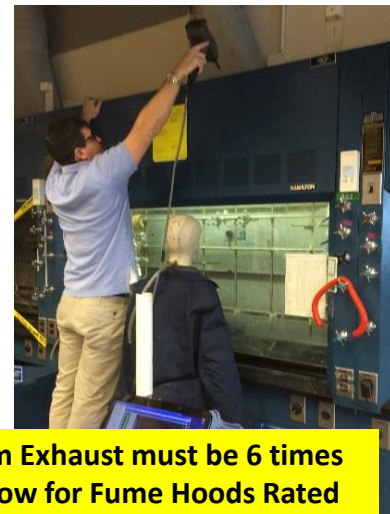


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Fume Hood Minimum Flow Dilution Test Results

- Minimum Flow for Containment – Q_{min}
- Air Change Rate @ Minimum Flow - ACHh
- Hood Dilution Factor - DF
- Max Generation Rate (20% of LEL) – G_{max}
- Flow Reduction from Design

Laboratory Hoods	Min. Design Flow	Dilution Factor DF
Hood Type 1	300	2.9
Hood Type 2	200	1.9
Hood Type 3	200	6.6
Hood Type 4	260	2.7

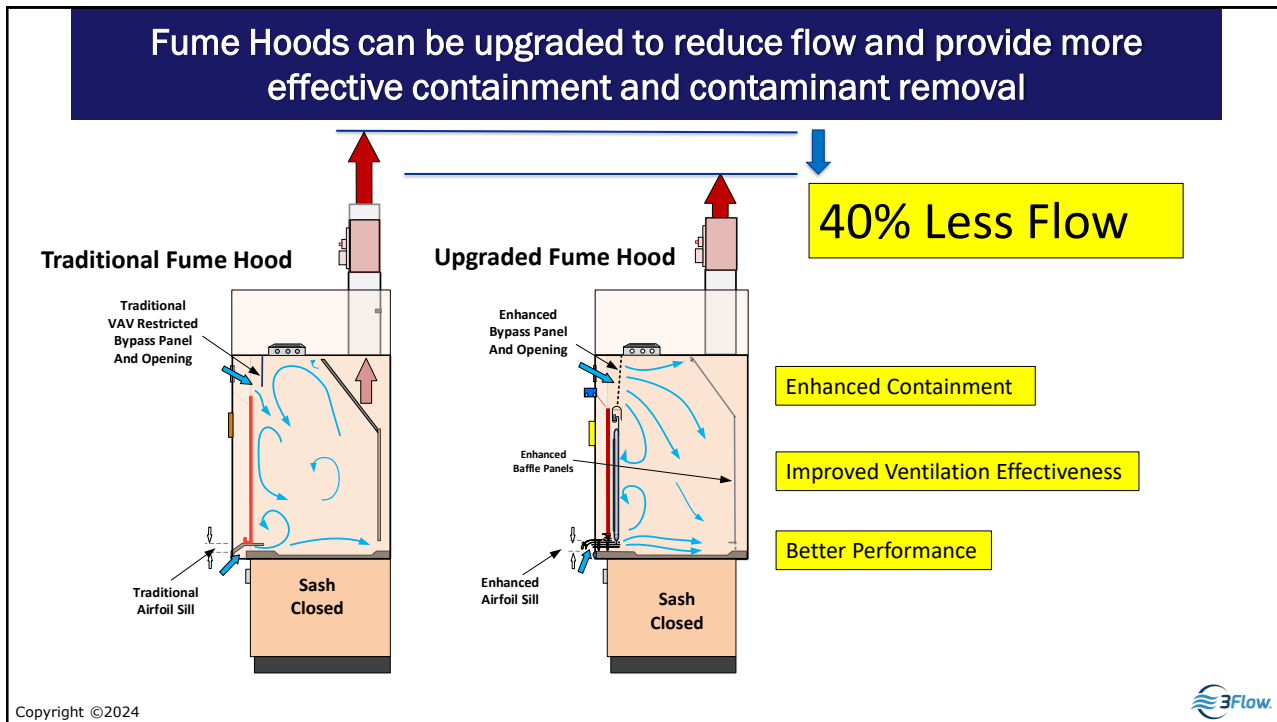


Minimum Exhaust must be 6 times design flow for Fume Hoods Rated RCB-3 or higher

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Thank You!

Questions

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**ASHRAE TC 9.10 Laboratory Systems
Program Sub Committee
Monday June 3, 1:00-2:00 PM EST
Minutes**

Program Sub Committee Meeting, Indianapolis Annual Meeting 2024

Attendees: Rachel Romero, Brad Cochran, Jerry Bogert, Elie Akiki, Kelley Cramm, Roland Charneaux, Bob Weidner, Raajesh Kumar Murugesan, Jake Edmondson, Greg Gross, Ryan Soo, Glenn Friedman, Jim Coogan, George Gartzounis

1. Review of Roles:

Programs Chair:

- Maintain a list of program ideas
- Solicit program chairs and speakers
- Solicit reviewers for Conference Papers
- Assist in submitting programs online
 - Go to Track Chair or ASHRAE staff for assistance
- Serve as the liaison between your TC and CEC
- Not responsible for presenting all of your TC's programs
- Notify chairs of areas of potential conflict times for TC 9.10:
 - TC 9.10 meetings on Tuesday from 2-6 pm
 - SGPC Guideline 36- Monday 8 am -12 pm (avoid if possible)
 - Other?

Session Chair:

- Develop a detailed **program abstract** and identify speakers (contact Track Chair with questions)
- Upload the required information on the session and speakers to the Conference website
- Preview speaker presentations to check that they meet the ASHRAE Conference Presentation Policy (found at https://www.ashrae.org/file%20library/conferences/speaker%20resources/conference-presentation-policy_final_2019.07.10.pdf)
- Make sure speaker presentations are uploaded prior to the Conference
- Coordinate presentations to minimize overlap and make sure the timing is correct
- Introduce and monitor session at the Conference
- Assist authors in identifying learning objectives & completing Q&A

2. Sponsored Program in Indianapolis:

Forum 1: Basics of Air Change Rates

Sunday, June 23

8:00 AM – 9:00 AM EDT

Program Level: Basic Program Track: Fundamentals and Applications Session Type: Forum Location: JW Marriott – Indianapolis, Grand Ballroom 1 Show 1 more tag

Summary: The supply airflow requirements for healthcare, cleanrooms, and laboratories facilities are often specified as Air Change Rates (ACR). Over the years several notions have been developed about ACR. This forum will systematically evaluate validity of popular notions regarding the ACR. The main objective of this session is to provide basic principles of air change rates. It will demonstrate where

ACR may be the appropriate metric and what other factors that designers of ventilation systems should consider. Attendees are encouraged to bring their laptops and use Excel spreadsheets to test various scenarios to test the impact of ACR on various parameters.

Chair: Kishor Khankari, PhD

Technical Committee: MTG.ACR Air Change Rate, 9.11 Clean Spaces, 9.10 Laboratory Systems

Seminar 5: Laboratory Standards and Codes Updates

Sunday, June 23

9:45 AM – 10:45 AM EDT

Program Level: Intermediate Program Track: Legislation, Standards, Codes, and Guidelines Session

Type: Seminar Location: JW Marriott – Indianapolis, Grand Ballroom 2 Show 1 more tag

Summary: This seminar reviews recent changes to NFPA 45 2024, Title 24 2025, and ANSI Z9.5 2022 with their impact to Laboratory systems and Lab space design. Expanded scope and clarifications in NFPA 45 now align with NFPA 30. This talk reviews updates to Z9.5 and how it aligns to ASHRAE Standard 110. Title 24 2025 now includes performance standards for laboratory exhaust.

Chair: Christine Reinders-Caron

Technical Committee: 9.10 Laboratory Systems, 7.6

3. Future ASHRAE Conferences

Feb. 8-12, 2025 – Orlando, FL: <https://www.ashrae.org/conferences/2025-winter-conference-orlando>

June 21-25, 2025 – Phoenix, AZ

Jan. 31-Feb. 4, 2026 – Las Vegas, NV

June 27-July 1, 2026 – Austin, TX

Speaker Resources

<https://www.ashrae.org/conferences/speaker-resources>

https://www.ashrae.org/File%20Library/Conferences/Speaker%20Resources/SpeakersManual_0718.pdf

a. Orlando Winter 2025 Conference Deadlines

- Wednesday, May 29, 2024 | Conference Paper Abstracts and Paper Session Requests Due
- Monday, June 17, 2024 | Conference Paper Abstract Accept/Reject Notifications
- Wednesday, June 19, 2024 | Website Opens for Extended Abstracts and Seminar, Workshop, Forum, Debate and Panel Proposals
- **Friday, August 2, 2024 | Panel, Seminar, Forum, Workshop, and Debate Proposals Due**
- Wednesday, September 4, 2024 | Conference Papers Due
- Friday, September 27, 2024 | Conference Paper Accept/Revise/Reject Notifications
- Friday, October 4, 2024 | Debate, Panel, Seminar, Forum, Workshop Scheduling Notifications
- Wednesday, October 9, 2024 | Revised Conference Papers Due
- **Monday, October 28, 2024 | Conference Paper Final Accept/Reject Notifications**

b. Orlando Tracks: <https://www.ashrae.org/conferences/2025-winter-conference-orlando/2025-winter-conference-technical-program>

- Fundamentals and Applications
- HVAC&R Systems & Equipment

- Refrigeration and Refrigerants
- Energy Storage and Grid Resiliency
- Pathways to Building Decarbonization
- Artificial Intelligence, Building Automation, and Controls
- Advanced Building Construction: Opportunities and Challenges
- Ventilation and Indoor Environmental Quality
- Future-Proofing the Built Environment

c. Suggested formats:

- **Seminar:** feature presentations on subjects of current interest
- **Panel Discussion:** can feature a broad range of subjects and explore different perspectives on industry related topics. This session format includes a panel of 3-4 speakers each addressing a facet of the session topic, followed by an interactive discussion lead by the session chair.
- **Debates:** highlight hot-button issues commonly faced by our membership. Industry experts, either on teams or as individuals, argue opposing sides of an issue, concluding with position summaries and audience feedback.
- **Forums:** The sessions are “off-the-record” discussed held to promote a free exchange of ideas. Reporting of forums is limited to allow individuals to speak confidentially without concern of criticism. There are no papers attached to forum
- **Workshop:** enable technical committees and other ASHRAE committees to provide a series of short presentations on a topic requiring specific expertise. These short presentations are provided with an increased emphasis on audience participation and training in a specific set of skills (60 or 90 minutes)

4. Proposed Programs:

Orlando:

- Total flow through the building- System operating mode test- turn down air flow rates fan flow doesn't go down
 - Forum? Presenters: Tom Smith
 - Track: Fundamentals and Applications
 - Special requests: re-submission from Jim Coogan
 - **Chair: Jim Coogan**
- Hour plug load data in labs
 - Panel discussion- what's available? to lead into a research project
 - Kelly has data to input into this.
 - Jake Edmondson- we do a week or two of metering, and we did quite a bit several years ago showing the actual loads were much smaller than what the load schedules show
 - My Green Lab?
 - **Chair: Rachel**
 - TC 9.10 Research Chair- Greg Gross, CPP- support forum

- 1780 Research project seminar
 - Cross-contamination- debate this subject in terms of the findings- Energy recovery wheels application and research
 - Should we continue research on sensible wheels
 - Cary Simmonson?
 - Action Item: Roland, Tom, Bob to meet and determine who would be presenter
 - **Chair: Roland**
- General air cleaning seminar
 - 145 came out of this
 - How this may relate to labs?
 - Bob to work with 185.5 to get speakers together
 - **Chair: Bob**
- Demand control ventilation in lab spaces- Demand Control Ventilation in labs to reduce air flow rates What is it? How does it work? Consider for Forum or Seminar; Kishor ready to present – Need 2 more speakers – Gordon Sharp? Overview of DCV – Tom Smith-
 - Tyler Kee, Phoenix Controls
 - Tom Smith- overview
 - Kishor Khankari as presenter
 - Justin Garner
 - **Chair: Ryan Soo**
- Lab case studies to decarb
 - Jason Atkisson?? Or Jessica Mangler
 - Kelley Cramm??
 - GSA/FDA- Smith Group- Rachel is POC here
 - Track: Pathways to Building Decarbonization
 - **Chair: Kelley Cramm**

Phoenix:

- Characterize Savings of controls (Phoenix)
 - PG&E through Tom Smith
 - Correlation between flow and energy to \$
- Commissioning in labs with TC 7.9- Justin Gardener

Unassigned:

- Decarbonization project- Chris Kirchner
 - Refrigerant switch out- pharma sites

- Ask TC on refrigerants?
- Control tuning and lab performance- Ryan Soo
 - Tom Smith? Ryan?
- Electrification:
 - Chris Kirchner- might have a project?
- Energy modeling of labs?
 - ORNL?
- Keith Hammelman- Education committee- 3-D printing exhaust?- could be case study as part of a different grouping

Jim Coogan

Jake Edmondson

Kelley

Raajesh

- Standard 100- lab specific tables- Glenn Friedman

ASHRAE 9.10 Research Subcommittee - 2024 Summer Meeting Agenda & Mtg Minutes (6/3/24)

Highlights in yellow are for/from RHW 6/25/24 Main Meeting Report

1. 1780-RP Research Project (Test Method to develop a Methodology to Evaluate Cross Contamination of Gaseous Contaminants within Total Energy Recovery Wheels) - University of Saskatchewan – Easwaran Krishnan – *Project Completed and presented in Chicago*
2. **1835-RP Update** (Characterizing the Performance of Entrained Flow Stacks) – Brad C. (CPP)
 - a. There were some data collection issues in
 - b. Test Rig is set up – proceeding
 - c. Fans on site; all equipment procured
 - d. Drone mounted sampling ports
 - e. SF6 Sampling
 - f. Brad 6.25.24 Update: Test site is up and running, need good data, working on protocol concerns to get good data.
3. **Research Projects in RTAR or Work Statement:**
 - a. RTAR 1963: “Survey of sources of contamination in existing labs” Roland C. and Tom Smith.
 - i. There was push back from RAC on the enormity of the project scope: contaminants from a Survey. Literature references were too light. ACGIH Manual; American Chemical Society. Also needed to determine what types of labs to be challenged.
 - ii. Title Update: “Develop a methodology to characterize and quantify emission rates from processes in labs.”
 - iii. “Heavy re-write”
 - iv. Method of test: Bottles, chemicals
 1. Box to contain chemicals to measurement
 2. Establishing airflow
 3. Risk assessment
 - b. WS 1936 - Ventilation Effectiveness for Labs:
 - i. Variety of Groups working on this - I2SL, ASHRAE MTG ACR, SP 129;
 - ii. WS 1936 (CO-RP-08) – Almost completed (Kishor, Jim, Roland,); almost completed; couple of months
 - iii. Co-sponsored by Price, Phoenix
 - iv. Jim C. is liaison from 9.10. – selecting and sizing diffusers especially during airflow turndown (out of range for diffusers at high flow)
 - v. Subgroup: Kelley, Jim, Bob, Roland, Jason Atkinson (Meet in 2 weeks after ASHRAE to discuss types of diffusers to be used) – concern of variable flow)
4. **Research Projects under consideration but no specific movement**
 - a. 1780 Part 2: Cross contamination in Sensible Wheels; Consideration for using higher velocities – Otto Van Geet – Roland, Otto, check w/ the 1780 team – Forum in Orlando
 - b. Using AI to help better operate buildings – Future research – Jim Coogan to provide input. RHW to follow up with Jim. Low Priority
 - c. Duct velocities in Lab exhaust – transport velocities required for chemical removal, prevention of condensate, etc. – Tom S. commented – heated acid vapors – condenses and rains back into hood – guidance needed; 110 committee members to be asked (RTAR) – Low Priority

- i. Review Industrial Ventilation -
- d. Hazardous emissions in Vivariums; nuisance odors, air changes – historic design practices; advances in technology. ALAC criteria – 10AC without protective environment. Should be more research. “Hot topic” liaison (Henry Hayes 2.2) – put on back burner; TC 9.10 to take over animals – Discussion w/ TC 2.2; **Low Priority** (Other air cleaning technologies)
- e. **Potential research needed following forthcoming Program Initiatives:**
 - i. **Demand Control Ventilation in labs to reduce air flow rates What is it?** How does it work? Consider for Forum or Seminar; Kishor ready to present – Need 2 more speakers – Gordon Sharp? Overview of DCV – Tom Smith
 - ii. **Hourly data on lab plug loads needed; are metrics available?** Database follow up from Labs21 may be helpful – Future Program – Lab2Zero? My Green Lab has this data. May be a data collection project to consolidate this data. Data should be reflective of type of lab – Get insight from Rachel – 9.6 is doing data collection (work together)
 - 1. Alrcuity
- 5. Review of pertinent on-going research outside 9.10
 - a. RP 1833 – MTG ACR - Air Change Rates – **Research is Complete**; Future program should come out of this. Sets basis for future research. Completed – RHW to check for report – History of the Air Change – Technology Portal
 - b. 3D Printing Hazardous Issues (nano particles, chemicals, fumes, etc.) – TC 9.7 discussing; Roland to follow up and also Jason Atkisson – Protocol for investigation for contaminant emission could be used for 3D. (Keith Hammelman was mentioned as potential lead) – Kelley interested; UL 2904 Test Method for assessing particle and VOC’s from 3d printers
- 6. Open to floor for Research Topics: None
- 7. Attendees (17): Bob Weidner, Brad Cochran, Kelley Cramme, Roland Charneaux, Jake Edmondson, Jerry Bogert, Raajesh Kumar Murugesan, Greg Gross, Jim Coogan, Glenn Friedman, Ryan Soo, George Gartzounis; Ken Crooks; Bob Valbracht, Ryan Parker, Otto Van Geet, Jason Atkinson

ASHRAE TC 9.10 Laboratory Classification Subcommittee

Meeting Minutes – Version – DRAFT

Virtual Meeting (MS Teams) - 2024/06/04 - 11:00am MST (Summer Conference)

These draft minutes are not the official minutes until approved by this committee.

Attendees

Names		
Danny Sanchez	Kelley Cramm	Elizabeth Kolacki
Robert Weidner	Debbie Decker	Greg Gross
Guy Perreault	Jake Edmondson	Jerry Bogert
Jim Coogan	Raajesh Kumar Murugesan	Ken Crooks
Glenn Friedman	Jerry Bogert	Ryan Soo

Old business

Updates to previous action items noted in red

#	ACTION	RESPONSIBILITY	STATUS
1.4	Tentative next revision target for late-2023 (revised to 2025) May need to align with other key publications	Danny S.	Opened
3.1	Contact ASHRAE Distinguished Lecturer Program	Guy P.	Opened
4.2	Need to develop white paper/webinar series as part of LVDL PR campaign (in parallel with the ASHRAE Distinguished Lecturer Program)	TBD	Opened
7.5	Pre-public document review by AIHA and ACS	Danny S.	Opened
7.6	Document format needs attention (landscape vs portrait table orientation)	All	Opened
8.1	Draft definitions for new Lab design subgroups	Tom S.	Delayed until doc re-org. is finished
9.2	Subcommittee will aim to have doc draft ready by 2024 Summer Conference	All	Opened
9.3	Subcommittee will aim to have doc finished by 2025	All	Opened
10.3	Recommendation to align the topics in LVDL with Z9.5 sections	All	Opened

Action Items

#	ACTION	RESPONSIBILITY	STATUS
12.1	Available draft shared with the meeting attendees	Robert Weidner	Completed
12.2	Draft word document: review and provide feedback	All	Opened
12.3	Finalize first draft	Danny S.	November 2024

Open discussion

- Review of current progress on Table 3 reorganization
- Next edition targeted for 2025
- Call to volunteers for sub-committee Chair substitute
- Review of other modifications to LVDL Document (Purpose and Scope section)

Adjournment

- 2024/06/04 11:30 am MST

Next Meeting

- (Tentative) September 20th, 2024 @ 1:00pm MST

Minutes submitted by: Danny Sanchez, 2024/06/04

Minutes approved on: [Date]

TC 9.10 Standards Report:

ASHRAE 110 (Laboratory Fume Hoods Performance Testing) Tom Smith

- Round robin testing of 110 ejectors
- Continued testing of ejectors for both IPA and Propylene
- Targeted for publication in 2026

ASHRAE 129 (Measuring Air Change Effectiveness) Kishor Khankari / Tom Smith

- Committee's objective is to evaluate ventilation effectiveness
- MOT is currently for lab testing
- Modifying standard to add field testing with hybrid air tracer
- Formed four task groups – lab, CFD, field testing, metrics

ASHRAE 241 (Control of Infectious Aerosols) Tom Smith

- Update Field Testing and Appendix

Z9.5 (Laboratory Ventilation) Jim Coogan

NSF 49 (Bio-Safety Cabinets) Justin Garner

- Working group evaluating language in the standard that mandates dedicated exhaust systems for 2B2 cabinets; committee recognizes the reality of current design applications and has asked for input from the lab controls marketplace

ASHRAE Guideline 36 (Best in Class HVAC Control Sequences) Jim Coogan, Kelley Cramm, Ryan Soo

- During public review period, there was a coordinated effort within 9.10 to review and provide comments. The chair of GDL 36 also attended one of the meetings and listened to feedback from 9.10.
- Jim Coogan presented an alternate SOO in the GDL 36 meeting in Indy
- GDL 36 will form a working group – asking for volunteers from TC 9.10 (Jim and Kelley to coordinate)
- Traci Hanegan will reach out to TC 9.6 to discuss how these sequences affect healthcare applications

Standard 170 (Ventilation of Health Care Facilities) – Brendon Burley

Respectfully submitted by Justin Garner on June 25, 2024

TC 9.10 Laboratory Design Guide Subcommittee

Meeting Minutes

3 June 2024

Virtual (via Zoom)

Attendees:

Bob Weidner
Bob Valbracht
Greg Gross
Jake Edmondson
Jerry Bogery

Jim Coogan
Ken Crooks
Mark Malkin
Raajesh Kumar Murugesan
Roland Charneux

Ryan Parker
Ryan Soo
Anne Juran

Discussion:

1. Table of Contents (TOC) Committee has been working for several months
 - a. Used the OPR as a guide for the flow
 - b. General reorganization – many chapters are renumbered
 - c. A few chapters have been broken apart with portions moved to other chapters
2. Ready for group to help move parts from one chapter to the next. Will get ASHRAE IT to add group of volunteers to Authoring Portal.
 - a. Volunteers (from Jan 2024 meeting)
 - i. Brooks Stout
 - ii. Ryan Soo
 - iii. Tyler Kee
 - iv. Sid Premkumar (premkumar.siddharth@arup.com)
3. Reviewed completed TOC will group. Suggestion was made to add discussion of emergency scenarios (maintaining exhaust, life safety, emergency power). This is currently in Chapter 4, Laboratory Planning, but may ultimately move.
4. Goal is to complete the Guide by March 2025.

Chapter status (updated for new TOC)

Ch	Title	Chapter Lead	Edit/Review Team	Notes
TOC		Anne Juran	Tom Smith, Guy Perreault, Chris Kirchner, Doug Ross, Bob Weidner	
1	Introduction	Bob Weidner		
2	Background	Bob Weidner		
3	Design Overview	Chris Kirchner	John Castelvechi, Wade Conlan, Doug Ross	New title; parts of Ch 20 will move here
4	Laboratory Planning	Brooks Stout	Harris Sheinman, Danny Sanchez, Daniel Herzig	-Needs more work -incorporate / reference lab classification?

				-need to write about emergency scenarios
5	Integration of Architecture and Engineered Systems	Brooks Stout	Harris Sheinman, Danny Sanchez, Daniel Herzig	-new chapter created from parts of old Ch 4 and old Ch 20 (Sustainability)
6	Load Calculations	Anne Juran, Danny McGrail	x	-new chapter created from part of Ch 1
7	Exposure Control Devices and Exhaust Hoods	Kurt Rindoks	Larry Meisenzhal, John Castelvechi, Brooks Stout, Ken Kuntz, Tom Smith, Ken Crooks	-renamed/numbered from old Ch 5 -some parts of old Ch 20 (sustainability)
8	Airflow Patterns and Ventilation Effectiveness	Wei Sun, Kishor Khankari	Tom Smith, Salil Sansare, Dan Frasier, Jim Coogan, Brad Cochran, Chris Kirchner, Mike Carl	-new chapter from combining vent eff from old Ch 12 and CFD from old Ch 17
9	HVAC Systems	Brendan Dingman	Bob Weidner, Brendon Burley, Charles Murphy, Wei Sun, Pierre Luc Baril, Chris Kirchner, Nathan Ho	-old Ch 6 + system selection from old Ch 3 - some parts of old Ch 20 (sustainability)
10	Air Treatment	Bob Weidner	Rami Alkahlil, Charles Murphy	-previously Ch 8
11	Exhaust Stack Design	Brad Cochran	Ken Kuntz, Glenn Friedman, Martin Stangl, Nathan Ho	-previously Ch 9
12	Energy Recovery	Roland Charneux	Bob Weidner, Brendon Burley, Chris Kirchner, Glenn Friedman, Charles Murphy	-previously Ch 10
13	Process Cooling	Jason Atkisson	Brooks Stout, Charles Murphy, Nathan Ho	-previously Ch 7 -Halfway done
14	Controls	John Castelvechi	Guy Perrault, John Garrett Neubauer, Brendon Burley, Brad Cochran, Doug Ross, Ken Kuntz, Jim Coogan, Wei Sun	-previously Ch 11 - some parts of old Ch 20 (sustainability)
15	Testing, Adjusting, and Balancing	Wei Sun	Tom Smith, Salil Sansare, Dan Frasier, Jim Coogan	-new chapter, but all part of old Ch 12
16	Commissioning	Daniel Frasier	Carol Donovan, John Garrett Neubauer, Tom Smith, Wade Conlan, Glenn Friedman, Harris Sheinman, Mike Amstadt	-previously Ch 14 -adds hood performance verification and continuous monitoring from old Ch 5

				- some parts of old Ch 20 (sustainability)
17	O&M for Laboratory HVAC Systems	Stefan Zandelin	Carol Donovan, Tom Smith, Harris Sheinman, Guy Perreault, Stefan Zandelin, Danny Sanchez	-previously Ch 13
18	HVAC System Economics	Rajendera Kapoor	Tao Zhang	-previously Ch 15
19	Microbiological and Biomedical Laboratories	Daniel Frasier	Carol Donovan, Rami Alkahlil, Harris Sheinman, Wei Sun	-previously Ch 16
20	Sustainable Design	Rachel Romero	Brooks Stout, Chris Kirchner, Tao Zhang, Roland Charneux	-previously Ch 18 -much has been moved to other chapters -add discussion of I2SL, Benchmarking Tool, Lab2Zero, Smart Labs
Color code:	Completed	Ready for Review	Edits underway	Unknown

Notes for TC 9.10 meeting at the ASHRAE annual meeting on June 25, 2024
Mark Malkin

Handbook – Chapter 17 on Laboratories in the 2027 edition of HVAC Applications:

The chapter in the 2023 edition was 24-pages long which seems about average for the book. I have heard rumblings about the overall size of the volume, and whether to break it into two, or maybe even just have a pdf or online edition. No decision yet that I know of.

A challenge for us may be if we are asked to reduce the size of our chapter, what would we leave out, or refer to the Design Guide instead?

Easier work will be to add material based on what is included in the 3rd edition of the Design Guide, particularly if it is ready by March 2025.

Initial ideas that I had of some things that may be helpful including in the Handbook are:

- Description of sub-ducts or the 22-inch rule from the IBC and NFPA 45
- Description of Laboratory Suites introduced in the 2018 edition of the IBC
- Ongoing research on replacements for SF₆ for ASHRAE 110 fume hood testing
- Research results on the cross-contamination within energy recovery wheels
- Classification of laboratory ventilation design levels, and management plans
- Determining air change rates based on CFD modeling of air distribution
- Issues specific to maker-spaces being installed in educational facilities
- Guideline 36 as related to lab pressurization during an emergency condition

So far there are six members of the TC who volunteered to edit the Chapter: Ken Crooks, Tyler Kee, Chris Kirchner, Guy Perrault, Ryan Soo, Brooks Stout. Others are welcome.

Our deadline will likely be sometime between April 1st and July 31st, 2026. A schedule was not shown for the 2027 HVAC Applications during the meeting on Sunday morning, so I extrapolated from the schedule shown for the edits due soon for the 2025 Fundamentals.

Also, as expected it is still early for us, as the chapter versions for editing are not yet on the authoring portal. It was mentioned on Sunday that we can anticipate those by the Winter meeting in February in Orlando, or maybe not until the annual meeting in Las Vegas in June.

It was emphasized at the meeting that the TC needs to officially vote on acceptance of changes to the Chapter. I was in the TC 4.3 meeting on Ventilation yesterday and they voted on Chapters 16 and 24 for the 2025 Fundamentals which seemed to work out okay. Maybe we can plan on something similar at the annual meeting in 2026 in Austin Texas?

2024 ASHRAE Annual Conference

June 22-26, 2024 | Indianapolis, IN

TC 9.10 Laboratories Notes on California Title 24 Pending Changes

Glenn Friedman PE, Taylor Engineers

June 25, 2024,

ASHRAE Indianapolis



What is pending in California Title 24 Energy Code for Laboratories?

The Statewide CASE Team is recommending five measures in this proposal:

1. Modification to the existing lab VAV requirements in Section 140.9(c)1 to include unoccupied setback requirements.
2. Adding new requirements for heat recovery for some laboratory exhaust systems.
3. Adding additional design fan power and control combinations to the prescriptive requirements in Section 140.9(c) for laboratory exhaust fan system power consumption
4. Adding a new requirement to limit reheat by requiring zone level heating/cooling capacity to avoid overcooling at the air handler and then reheating at downstream zones.
5. Code cleanup in Sections 100.0 (scope), 100.1 (definitions), and 140.4 (prescriptive requirements for space conditioning systems), including expanding the scope to include the L occupancy group.

Questions

Glenn Friedman PE, Taylor Engineers, gfriedman@taylorengeers.com

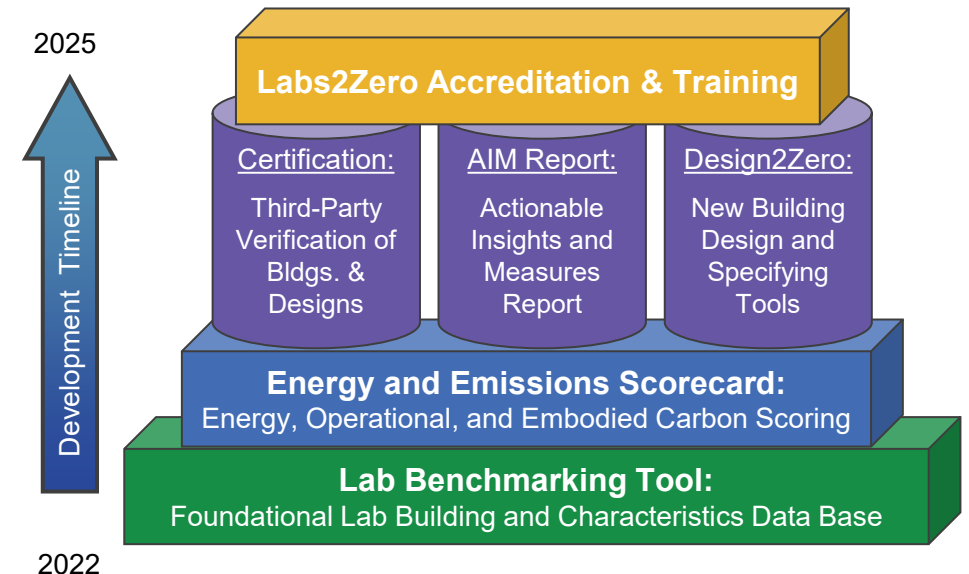


Decarbonizing the World's Laboratories



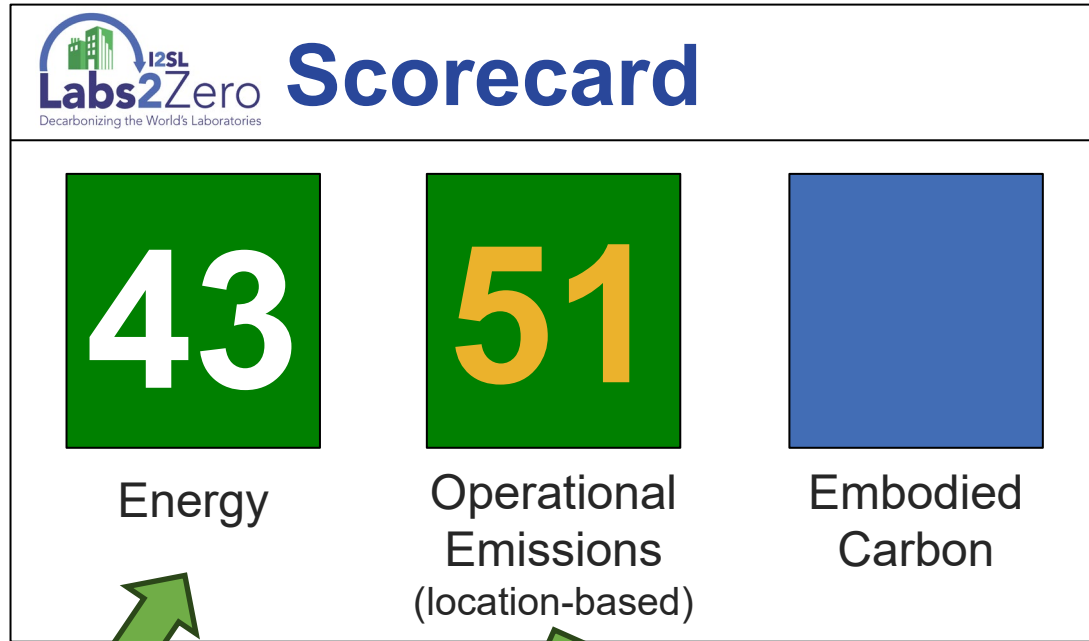
Our 2023 – 2024 Roadmap

- **Fall 2023**
 - LBT's new look ✓
 - Energy Score pilot release ✓
- **Spring 2024**
 - **Operational Emissions pilot scoring** ✓
 - **Embodied Carbon benchmarking** ✓
 - **Energy Score target setting** ✓
- **Late 2024**
 - **AIM Report Pilot**
 - I2SL's most ambitious initiative!
 - Automated Level 1 Audit



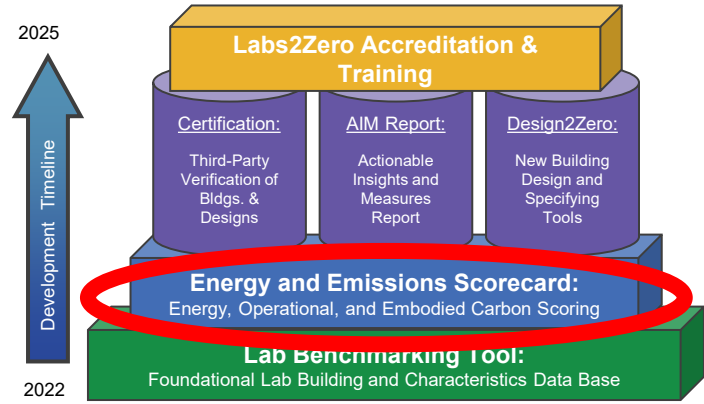
- Both are 1-100 scores, where 100 is best

Still Free to Use!



Launched Oct 2023

Launched May 2024



Location vs. Market-Based Scoring



- Two common ways to report:

Location-based:
based on
local electric
grid intensity

Market-based:
includes
RECs, PPAs,
green tariffs,
etc.

Data in LBT:



**Selected for
pilot score**



Future work

Approach selected:

Where to See Your Lab Building Scores



- See a summary of your buildings' scores in the **Your Buildings** tab
- Click on **Building Details** to see more info and performance over time

The screenshot shows the Laboratory Benchmarking Tool (LBT) interface. The top navigation bar includes 'Home', 'Your Buildings', 'Labs2Zero', 'Analysis Tools', 'Portfolio Mgr', 'Info', and 'i2SL'. The 'Your Buildings' tab is selected, showing a list of buildings with columns for 'Data Year (or Design Phase)', 'Labs2Zero Energy Score', 'Labs2Zero Operational Emissions Score', 'Site EUI (kBtu/sf/yr)', and 'Embodied GHGI (kgCO2e/sq.m)'. A green arrow points to the 'Your Buildings' tab, and another points to the 'Building Details' button for the 'Favorite Lab Building'.

The 'Building Details' page for the 'Favorite Lab Building' shows the 'Labs2Zero Scorecard' for 2023. The 'Energy Score' is 43 and the 'Operational Emissions Score (Location-Based)' is 51. A green arrow points to the 'Energy Score' box. The 'Performance Over Time' chart shows the Energy Score increasing from 2022 to 2023. The 'Building Details Summary' section provides additional information about the building's performance.

The 'Labs2Zero Scorecard' for 2023 shows the following scores:

Score	Category
43	Energy Score
51	Operational Emissions Score (Location-Based)

Where Else to See the Scores

- **Both scores are displayed for all LBT buildings with energy data**
 - Charts show scores for each user's buildings and for anonymous peer group



New: Energy Score Target Setting



- Calculate energy use goals to achieve a target Energy Score
- Helpful for setting new building design sustainability goals
- Will come later for the Operational Emissions Score



[Home](#) [Your Buildings](#) [Labs2Zero](#) [Benchmark Analysis](#) [Op Practices](#) [Actionable Insights](#) [Portfolio Mgr](#) [FAQ](#) [About](#) [i2SL](#)

 **Laboratory Benchmarking Tool**

Energy Score Target Setter

Use this page to calculate the energy consumption levels you'll need to beat to achieve your target Labs2Zero Energy Score. You don't need to be logged in to use this page.



Building Information

Please complete all fields.

* **Location**

* **Gross Floor Area (sf)**

* **Lab Type**

* **Predominant Lab Use Type**

* **Lab % Area**

* **Occupied Hours per Week**

* **Fuel Types Used by Building (check all that apply):**

☒ Electricity ☐ District Steam or Hot Water

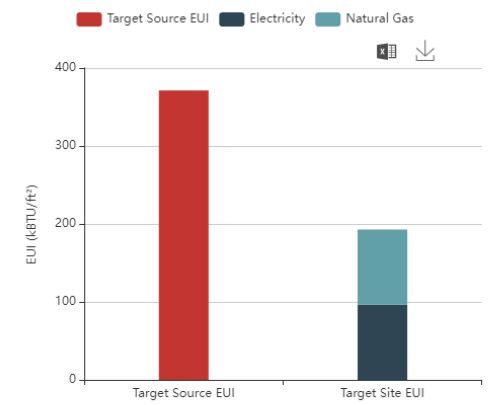
☒ Natural Gas ☐ District Chilled Water

* **Target Labs2Zero Energy Score**

Calculate

Target Setter Results

This chart shows the energy use intensity targets (source and site EUIs) corresponding to your chosen target Energy Score. The chart is displayed after you click Calculate. Use the Fuel Amounts box below to adjust the fuel mix to match your building.



Category	Electricity (kBtu/ft²)	Natural Gas (kBtu/ft²)	Total (kBtu/ft²)
Target Source EUI	370	0	370
Target Site EUI	100	90	190

Adjust Individual Fuel Amounts

Adjust the breakdown of fuel types to customize your results then click Update Chart. The default is an even split of Site EUI between fuel types.

Electricity % 2,826,314 kWh

Natural Gas % 96,434 Therms

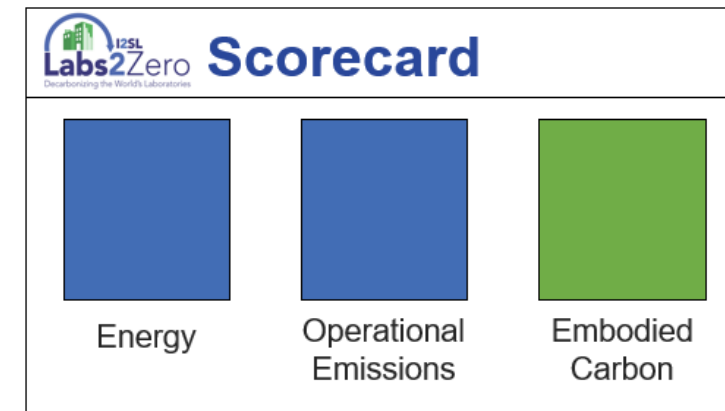
Update Chart

- No embodied carbon benchmarking or scoring for labs...or other bldgs.

Step 1: Create an embodied carbon benchmarking **site** 

Step 2: Create an embodied carbon **score** for buildings

- Both steps need **building data** (life cycle assessments)
 - Anonymized and used to **seed** benchmarking database
 - Focused initially on structure and enclosure & product stage (A1-A3)
- **Please enter your LCA data if you can!**



Entering Embodied Carbon Data



- The LBT now includes embodied carbon benchmarking!
- **It also now accepts data from buildings in design (or in construction)**

The new Basic Info tab asks what type of data you are entering so the LBT can ask the right questions

The screenshot shows the 'Edit Building: Favorite Lab Building' form in the Laboratory Benchmarking Tool. The form has a navigation bar with tabs: Basic Info, Building Info, LCA Data, Structural Information, and Lab Area. The 'Basic Info' tab is active. The form contains two main sections: 'Type of Record' and 'Data Types'. In the 'Type of Record' section, 'Type of Record' is set to 'In Design or In Construction' and 'Project Phase' is set to 'Schematic Design'. In the 'Data Types' section, 'Data Types to be Entered' is set to 'Embodied Carbon Data' and 'Building Status' is set to 'Test Data'. There are 'Submit', 'Cancel', and 'Delete Year' buttons at the top right, and a 'Next' button at the bottom right.

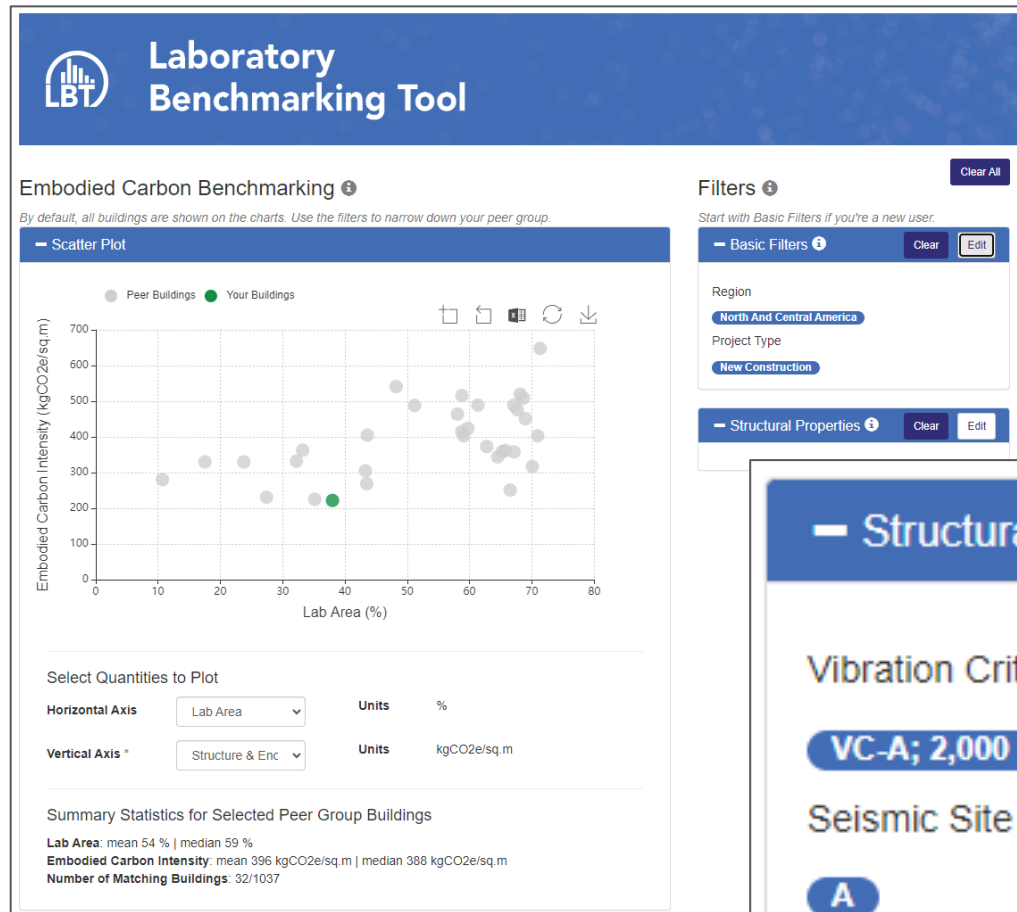
Type of Record	
* Type of Record	In Design or In Construction
* Project Phase	Schematic Design

Data Types	
* Data Types to be Entered	Embodied Carbon Data
* Building Status	Test Data

Embodied Carbon Benchmarking



- A dedicated Embodied Carbon Benchmarking page includes relevant filters and metrics for comparison



— Structural Properties

Clear Edit

Vibration Criteria

VC-A; 2,000 MIPS (microscopes)

Seismic Site Class

A

We are still building the peer group database for embodied carbon – please enter your data if you can!

Looking Ahead:

The AIM Report

Labs2Zero's Largest Initiative!

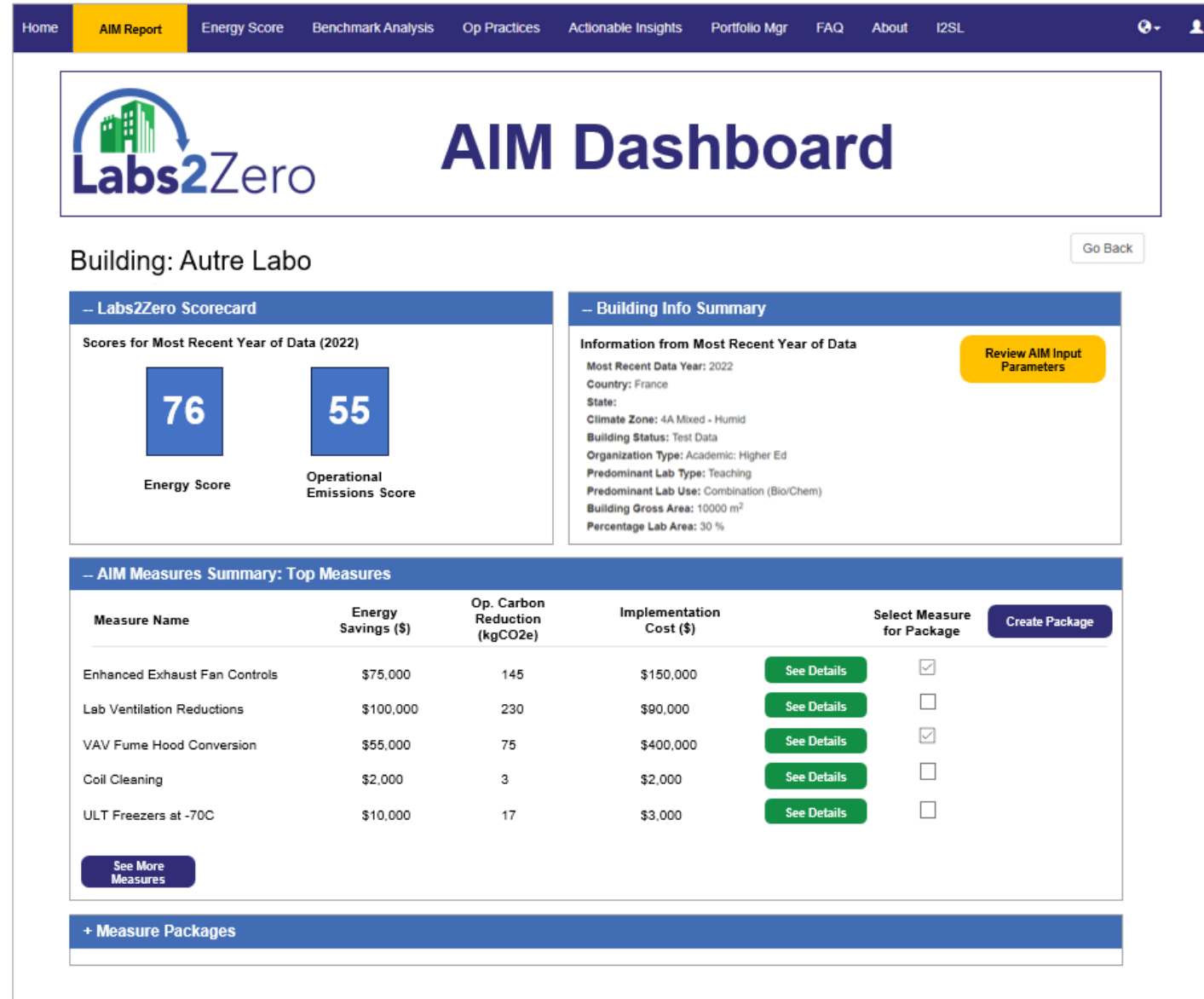


The AIM Report: An Automated, Interactive Level 1 Audit



- Provides savings, costs, and case studies for measures
- Focused on lab buildings
- Helps to build the business case to help fund next steps

First release later this year will be focused on existing buildings (AIM) and energy measures



Call for Case Studies & Reference Projects!



- AIM Report will showcase relevant case studies:
 - Looking for projects on:
 - New and existing labs
 - Energy & emission reduction measures
 - Looking for details if available on:
 - Savings results (energy, emissions, \$'s)
 - Installed costs
 - Lessons learned
- **Please contact me (President@i2SL.org) to submit case studies/reference projects**

**UNIVERSITY OF KENTUCKY
LEE T. TODD, JR. BUILDING**

GBA collaborated with lab ventilation specialist 3Flow to provide comprehensive retro-commissioning and demand ventilation assessment.

[Talk to an Expert >](#)

The Objectives

Formerly known as the Biological Pharmaceutical Complex Building, the Todd Building is a five-story, 288,000-square-foot lab facility, home to the UK College of Pharmacy. It opened in 2010.

This multi-phase project involved several assessments, resulting in development of multiple facility improvement measures (FIMs) and Retro-Commissioning Measures (RCMs). It includes an assessment of building equipment and systems, as well as 203 exposure control devices, including 85 fume hoods. Environments of 94 distinct lab spaces were also evaluated.

The Response

The initial phase of the project included a high-level retro-commissioning evaluation and a laboratory ventilation risk assessment (LVRA) by partnering firm 3Flow. Preliminary Facility Improvement Measures (FIMs) were identified to highlight deficiencies in the building systems.

Correcting such deficiencies may or may not have an impact on energy usage but may be necessary for implementation of energy-saving retro-Cx measures.

The second phase involved an ASHRAE Level 1 energy audit, a full retro-commissioning investigation, scope, and a demand for ventilation assessment (DVA). RCM measures (RCMs) were identified to reduce energy usage; savings for all RCMs were calculated using HVAC 8760 engineering calculations. The client is currently selecting RCMs for implementation. After selected measures are implemented and any system upgrades are completed, an additional phase will provide commissioning and measurement and verification.

• FIMs developed during phase one included a heating system flush, Phoenix air valve point mapping, a fume hood "Shut the Sash" program, monitoring-based commissioning, a fume hood minimum airflow reduction, exhaust fan system control repair, and improving the lab BMS screen information.

• Twelve RCMs were developed during phase two. These included classroom AHU scheduling, optimization of static pressure setpoints, chilled water pump optimization, heating hot water differential pressure reset, correction of building over-pressurization, adjustment of ventilation setpoint in the Apothecary Cafe, humidity sensor calibration, correction of VAV reheat valve leak-by, zone CO2 sensor optimization, preheat coil pump optimization, correction of flue gas heating and cooling improvement of PID loop controls, and lab rebalancing and minimum airflow reduction based on the LVRA and DVA analysis. A Capital Improvement Measure, Upgrading Lighting to LED, was also identified.

- Seven Facility Improvement Measures
- Twelve Retro-Cx Measures
- Over \$350,000 potential annual cost savings (18% energy savings vs. baseline)
- Lab ventilation testing recommendations
- Included work on air valves and controls and implementation of setbacks
- 2,466 equivalent tons of CO2 saved



2024 I2SL Conference Sept. 29 – Oct 2, 2024: St. Louis

Get involved!

- Serve on our TACs
- Pilot our scores
- Contribute data
- Sponsor the program

Contact:

Gordon - president@i2sl.org

