

**ASHRAE TC 9.10 Laboratory Systems  
Orlando  
Tuesday February 4th , 2020  
Meeting Minutes**

**AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING  
ENGINEERS, INC.  
1791 TULLIE CIRCLE, N.E./ATLANTA, GA 30329  
404-636-8400**

**TC/TG/TRG MINUTES COVER SHEET**

TC/TG/TRG NO	9.10	DATE	February 4 <sup>th</sup> , 2020
TC/TG/TRG TITLE	Laboratory Systems		
DATE OF MEETING	February 4 <sup>th</sup> 2020	LOCATION	Orlando

Voting Members Present	Term Expires	Members Absent	Term Expires	Ex-officio members and additional attendance
Brad Cochran (Chair)	2020	Mary Foutz	2023	Guy Perreault
Christine Reinders-Caron	2023	Eric Ballachey	2022	Carol Donovan
Kenneth Kuntz	2021			Robert Weidner
Jason Atkisson	2021			Gayland Richardson
Martin Stangl	2023			Jim Coogan
Adam Bare	2020			Qaiser Abbas
Patrick Carpenter	2021			Kurt Rindoks
Wade Conlan	2020			Rachel Romero
Jacob Edmonson	2022			Ryan Parker
Tom Smith	2021			Robert Valbracht
Brent Fullerton	2022			Karl Aveard
Traci Hanegan	2020			Hoy Bohanon
Lloyd Le	2023			John Castelvechi
Nathan Ho	2020			Roland Charneux
				Kelley Cramm
				Brendan Dingman
				Kevin Gilkison

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			Glenn Friedman
			Charles Henck
			George Isherwood
			Rajendera Kapoor
			Mark Malkin
			Lawrence Meisenzahl
			Kurt Montairo
			Gordon Sharp
			Tim Wheeler
			Rob Citopowick
			Reinhard Siedl
			Steve Liescheidt
			Christine Benga
			Matthew Nesbitt
			Matthew Warren
			Gary Roepke
			Deirdre Carter
			Meng Kong
			Chris Kirchner
			Jessica Mangler
			Doug Ross
			Duncan Green
			Manish Kaimegh
			Ryan Soo
			Collin Hale
			Daryl Deangelis
			Mike Craig
			Mike Dobson

**DISTRIBUTION**

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<i>All Members of TC/TG/TRG plus the following:</i>	
TAC Section Head: Vance Payne	
TAC Chair: Tom Justice	
All Committee Liaisons As Shown On TC/TG/TRG Rosters:	
Standards liaison: Roger Hedrick	
Manager of Research & Technical Services Mike Vaughn	
Research liaison: Paolo Tronville	

### **Call to order 3:30 / Introductions**

Brad gave introduction to TC9.10 and reviewed high level objectives. Show of hands for new members. Introduction to TC9.10 website. Jim Coogan is web master. Roles and responsibilities are on the website.

Around the room – attendee introductions.

Reviewed Current Leadership and Follow-on leadership taking over in 2021.

Currently there are 16 voting members – preference is to have mix of manufacturers, owners, consultants, and contractors.

5 new corresponding members at the meeting

**Meeting is called to order (4:00 pm). Quorum is met 14 members present.**

### **Membership Update (Brad Cochran/ Guy Perreault)**

Rolling off February 4<sup>th</sup>, 2020 (after Orlando meeting)

- Nathan Ho
- Adam Bare
- Traci Hannigan
- Wade Conlan

Rolling on February 4<sup>th</sup> 2020 (First meeting in Austin)

- Guy Perreault
- John Varley

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- Glenn Friedman
- Kishor Khankari

**Approval of Kansas City meeting minutes (Brad Cochran)**

- Minutes from the Kansas City meeting were emailed previously.
- Comments on Kansas City Minutes:
  - Traci Hannigan was not present, Jason Atkisson is misspelled, Jacob Edmond son was not present, Wade Present
- Move to approve: Christine Reinders-Caron
  - Abstention – Brad, Traci, Adam, Tom Smith – 9 votes for approval.

**Section Head Report (Vance Payne)**

- Bill Artemis passed away prior to the meeting. Merged TC.
- ASHRAE looking to shrink the technical program and absorb some of the smaller TCs
- ASHRAE encourages having online meetings before the conference to reduce the number of rooms to be organized. People are not attending the sessions.
- TC9.10 looks good – large and productive
- Collecting statistics from the TCs i.e. activity, publications, productivity. TAC will be cutting the TCs that are not being productive and will be merged with other TCs.

**Research Subcommittee (Bob Weidner)**

- See sub-committee report on attachment.
- RP1573 – SF6 replacement gas – Waiting for comments on Tom's report. Research is completed. All comments in by end of February. Tom to address comments then back to the TC for approval. Contractually need to do a paper.
- Work Statement 1780 – Roland is work statement author. Going to executive statement. Ready for a vote.
- Work statement 1835 – Brad. Preparing to PES for review then will go out to bid.
- Ashrae is looking for research projects. TC9.10 additional topics : 1. Discussions on 3D printing, 2. Test and validation of demand control ventilation, 3. Air change effectiveness

**Program Subcommittee (Christine Reinders-Caron)**

- See sub-committee report attachment. Feb. 10<sup>th</sup> is deadline for program seminars for Austin. Program template is on basecamp.
- Seminar 18 – Smart Labs Overview / presentation

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**Handbook Subcommittee**

- No report

**Standards has been eliminated as a Sub-committee**

**Laboratory Design Guide (Ken Kuntz)**

- Sub-committee meeting held prior to main meeting
- Chapter 3 edits are complete – design. On the base camp
- Laboratory hood design – Lots of open discussion
- Chapter 11 – Controls is almost complete and will be sent to committee
- Wade is taking on the commissioning chapter.
- Separate base camp for design guide

**Laboratory Classification – (Adam Bare)**

- Sub-committee meeting held on Sunday to provide status / updates
- Not a lot of comments have been provided.
- Need to improve marketing of the document
- Tom Smith working on Risk Assessment approach with AIHA

**Journal (Roland Charneaux)**

- Roland – Retro-fit of existing labs. Brad looking for technical reviewers.

**Laboratory Design Course (John Varley on Sunday)**

- Approximately 50 people attended
- Scheduling was a conflict with TC 9.10 seminars.

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## **Liaison Reports**

Brad provided updates on liaison reports being provided on basecamp in order to capture important information and links if applicable.

- 4.3 and 4.10 report (Martin Steingal) – Discussion at the committee on what provide for guidance to model wind flow around buildings. Use of CFD to mode external flows around buildings may not be accurate. What level of guidance is appropriate to provide on this.
- 90.1 – Reducing the fan power requirements and proposals to go lower. Energy efficiency credits to trade off – be more prescriptive. PN&L potential to add 100% outside air building to the building stock close to the lab.
- SPC 110 (Nathan Ho) – Efforts started to revise the standard and areas to revamp. Committee looking for contributors interested in participating.
- 9.6 Healthcare (Traci Hannigan) – State of Washington passed a law May 2019 – 2026 voluntary encouragement for existing buildings to meet energy performance – 2026 will be mandatory. ASHE alarmed that standard 100 for healthcare facilities is off. Benchmarking for healthcare. Standard 100 is not intended to be used in that capacity per Traci.
- **TC1.4 – Guideline 36 – Addenda for laboratory rooms and controls for exhaust fans.**
- **MTG/ACR – Kishor Presentation**

## **Old business (Roland Charneux)**

- None Reported

## **New business**

- Brad review of Basecamp for TC9.10. Subcommittee Chairs reviewed information on Basecamp.
- I2SL Laboratory User Manual (P&W) / Cross-over with ASHRAE
- YEA new members – 5 or 6

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**Main Meeting adjourned at 5:50 pm.**

**Executive Meeting Research Vote WS-1780 Energy Recovery Wheels**

Bids received and reviewed by Rob Weidner

Motion to accept bidder no. 4, Brad Cochran, Second – Traci Hannigan

No abstentions. 11 – 0

Brad Cochran, Rob Weidner, Ken Kuntz, Jason Atkinson, Adam Bare, Roland Charneau, Traci Hannigan, Martin Steingal, Patrick Carpenter, Hoy Bohanon, Jacob Edmondson

**ASHRAE TC 9.10 Laboratory Systems  
Orlando Program Sub Committee  
Sunday February 2, 2020 2:00pm  
Meeting Minutes**

**Program Sub Committee Meeting, Annual Meeting Orlando 2020**

**Attendees:**

Christine Reinders  
Kyle Inge  
Ken Kuntz  
Ryan Parker  
Martin Stangl

Jim Coogan  
Carol Donovan  
Gaylon Richardson  
Jason Atkisson  
Duane Hammond

Karl Aveard  
Varun Kulkarni  
Roland Charneux  
Douglas Ross

**Orlando Programs**

**Sponsored Programs**

**Sunday 1:30-3:00**

Hilton LL, Orlando V - Seminar 18 “Brilliant Execution of Smart Labs”  
Chair – Brad Cochran, Speakers –Rachel Romero, Tom Smith, Diedre Carter

**Co-Sponsored Programs**

**(Unofficial Sponsor) Tuesday 3:15-4:45**

Hilton LL, Orlando VI – Seminar 57: The history of the use of Air Changes per Hour in HVAC Codes, Standards & Guidelines

**Short Courses**

**Sunday 3:30-6:30**

Laboratory Design: The Basics and Beyond (code 65) – John Varley

**Follow up on Previous Submission Ideas**

- Jim Coogan - Fume Hood Containment Workshop
- Tom Smith - Research Presentation for Austin 2020

**Future ASHRAE Conferences**

June 27- July 1, 2020 – Austin, TX – Technical Chair – Bing Liu  
January 25-27 2021 – Chicago, IL – Technical Chair – Maggie Moninski  
June 26-30, 2021 – Phoenix, AZ – Technical Chair – Christine Reinders  
January 31- Feb. 2, 2022 – Las Vegas, NV  
June 25-29, 2022 – Toronto, ON

**Potential Sessions**

**Austin**

Jim Coogan & Tom Smith – Resubmit a session on fume hood airflow  
Tom Smith – Results of Research RP1573  
Tom Smith – Seminar on Testing Methods



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**Chicago**

Gaylon Richardson & Jim Coogan - Air control valves accuracy at low flow

Jim Coogan & Brad (Aus/NZ) – Standards for fume hood containment in the US & Europe & Australia

Jim Coogan – Singapore Green Labs Rating Standards – Pressurization approach vs. US approach with ISHRAE

Martin Stangl – International Design – Lab Design in Canada & the US Code differences in same climate zone

Carol Donovan & Tom Smith- Use of Lab Classification Guide & Method of Risk Assessment

Jason Atkisson – Designer, CX Agent, Owner – Madison Lab building 58% EUI reduction a Case Study

Ken Kuntz – Design Guide – Workshop by Chapter?

Kyle Inge – Implementation & use of classification document in Colorado

**Phoenix**

Carol Donovan – Mike McCloud University of Phoenix

Roland Charneux & Kishor Khankari - MTG.ACR – Air Change Rates

Research on exhaust of 3D Printers – Collaborate with Environmental Health & TC4.3

**Austin Deadlines**

**Monday, February 10, 2020 Program** (Seminar, Forum, Workshop, Debate and Panel) and Extended Abstract

**Tuesday, February 18, 2020** Conference and Technical Paper Final Accept/Reject Notifications

**Monday, March 2, 2020** Extended Abstracts Accept/Reject Notifications

**Monday, March 16, 2020** Debate, Panel, Seminar, Forum, Workshop Accept/Reject Notifications

**Friday, May 1, 2020** Upload of presentation open for review

**Monday, June 1, 2020** Presentation submissions due

**Chicago Deadlines**

Submissions website for conference paper abstract submissions opening soon!

**Wednesday, March 18, 2020:** Conference Paper Abstracts, Technical Papers and Paper Session Requests Due

**Wednesday, April 22, 2020:** Conference Paper Abstract Accept/Reject Notifications

**Monday, June 15, 2020:** Website Opens for Seminar, Workshop, Forum, Debate, and Panel Proposals

**Wednesday, July 8, 2020:** Final Conference Papers Due - Submitted for Review (Includes Bio, Learning Objectives and Methods of Assessment); Request for Conference Paper Sessions Due

**Monday, July 27, 2020:** Conference Paper Accept/Revise/Reject Notifications

**August 3, 2020:** Program Submission Deadline

**Monday, August 10, 2020:** Revised Conference Papers/Final Technical Papers Due

**Monday, August 24, 2020:** Conference and Technical Paper Final Accept/Reject Notifications

**Monday, October 5, 2020:** Seminar, Workshop, Forum, Debate, and Panel Accept/Reject Notifications

**Speaker Resources**

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

[https://www.ashrae.org/File%20Library/Conferences/Speaker%20Resources/SpeakersManual\\_0718.pdf](https://www.ashrae.org/File%20Library/Conferences/Speaker%20Resources/SpeakersManual_0718.pdf)

**Extended Abstracts to continue at Annual Conference Research Summit Tracks**

ASHRAE is making an extended abstract option at Annual Conference Research Summit tracks only.

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**Extended Abstracts Fast Facts**

- Available only for the Research Summit track presented at ASHRAE's annual conferences
- Subject matter must be appropriate for the Research Summit track.
- Three pages in length (maximum length, including figures and references)
- Extended abstracts will undergo one round of single blind review with two reviewers.
- Extended abstracts will be due Feb. 8.
- Authors of accepted extended abstracts would bring their latest research for an oral presentation at the conference.

**Austin 2020 Tracks – (June 27- July 1, 2020)**

**1. Fundamentals and Applications:**

Track Chair: Rupesh Iyengar  
[Rupesh\\_iyengar@yahoo.com](mailto:Rupesh_iyengar@yahoo.com)

**2. HVAC&R Systems and Equipment:**

Track Chair: Ashu Gupta  
[Ashu.energy@gmail.com](mailto:Ashu.energy@gmail.com)

**3. Research Summit:**

Track Chair: Kristen Cetin  
[cetinkri@msu.edu](mailto:cetinkri@msu.edu)

**4. Professional Development:**

Track Chair: Devin Abellon  
[devin.abellon@yahoo.com](mailto:devin.abellon@yahoo.com)

**5. Grid-Interactive Efficient Built Environment:**

Track Chair: Vikrant C Aute  
[vikrant@umd.edu](mailto:vikrant@umd.edu)

**6. Multifamily and Residential Buildings:**

Track Chair: Sonya Pouncy  
[sonyapouncy@gmail.com](mailto:sonyapouncy@gmail.com)

**7. Resilient Buildings and Communities:**

Track Chair: Christine Reinders-Caron  
[christinereinders@gmail.com](mailto:christinereinders@gmail.com)

**8. Zero Energy Buildings and Communities:**

Track Chair: Raul Simonetti  
[raul.simonetti@carel.com](mailto:raul.simonetti@carel.com)

**9. (Mini-Track) Building Myths:**

Track Chair Kimberly Pierson  
[kdpwildcat@gmail.com](mailto:kdpwildcat@gmail.com)

**Chicago 2021 Tracks – January 23-27, 2021**

**1. HVAC&R Fundamentals and Applications:**

- a. Track Chair: Robert Cox  
[bob.cox@jacobs.com](mailto:bob.cox@jacobs.com)

**2. Systems and Equipment:**

- a. Track Chair: Marianna Vallejo  
[Marianna.vallejo@jacobs.com](mailto:Marianna.vallejo@jacobs.com)

**3. Refrigeration & Refrigerants:**

- a. Track Chair: Gary Debes  
[gary.debes@comcast.net](mailto:gary.debes@comcast.net)

**4. Environmental Health Through IEQ:**

- a. Track Chair: Stephen Idem  
[sidem@tntech.edu](mailto:sidem@tntech.edu)

**5. Building Performance and Commissioning for Operation and Management:**

- a. Track Chair: Lee Ribbeck  
[lee.riback@gmail.com](mailto:lee.riback@gmail.com)

**6. Energy Conservation:**

- a. Track Chair: Nivedita Jadhav  
[nivi2307@gmail.com](mailto:nivi2307@gmail.com)

**7. International Design: Track Chair:**

- a. Track Chair: Farhan Mehboob  
[Farhan.mehboob@smehboob.com](mailto:Farhan.mehboob@smehboob.com)

**8. Standards, Guidelines and Codes:**

- a. Track Chair: Kyle Inge  
[kinge@peifla.com](mailto:kinge@peifla.com)

**9. (Mini Track) Virtual Design**

## **ASHRAE 9.10 Research Subcommittee Meeting Agenda (with current work status)**

Feb 2, 2020

### **Research Projects:**

#### *RP 1573 – SF6 Replacement Gas Project Status (Tom Smith – 3Flo)*

1. Research Project very near completion.
2. Tom submitted the final draft in Fall 2019.
3. Waiting for final comments by PMS and Vote of Approval.
4. Approved report will be submitted to TC 9.10 voting members post Winter Meeting for review and approval.
5. Tom issued the “DISPOSITION OF ASHRAE SPONSORED RESEARCH RESULTS” and a brief of that summary is provided below:

Summary: The work revealed that Isopropyl Alcohol (IPA) and other alcohol mixtures can be vaporized, mixed with air, discharged from the ASHRAE 110 outlet diffuser, and detected using simple, low cost and readily available Photoionization Detectors (PIDs). Hundreds of tests revealed that the alternative test method provided: 1.) comparable results to the current ASHRAE 110 method using SF<sub>6</sub>; 2.) dramatically reduced the impact on the environment; and, 3.) was simpler and less costly to conduct. As a greenhouse gas, IPA is reported to be 0.5 times CO<sub>2</sub> and 48,000 times better than SF<sub>6</sub>. The results of the project indicate that use of IPA and PIDs provide a suitable and attractive alternative to SF<sub>6</sub>.

However, the study revealed that deployment of the alternative test method will require development of a user friendly, repeatable method of vaporizing and discharging the IPA or alcohol mixture. Development of a commercially available tracer generation system was beyond the scope of the 1573 project, but once complete the alternative tracer test using IPA or other comparable alcohol mixture together with low cost PIDs may lead to broader application of ASHRAE 110 tests, further improvements in fume hood performance and better protection for people working with airborne chemical hazards. In addition, the methods can also be applied to evaluate performance of other types of exposure control devices and ventilation systems leading to greater safety and better protection for people working in labs and critical workspaces.

### **Work Statements:**

#### *WS 1780 (Test Method to develop a Methodology to Evaluate Cross Contamination of Gaseous Contaminants within Total Energy Recovery Wheels) – Roland C.*

1. WS 1780 was rebid in the Fall 2019 because per ASHRAE Mike Vaughn, it was very unlikely that the research would be approved due to a single bidder with a high price tag (despite average scoring being above 80%). Too many levels of approval to go through.
2. The PES is currently in evaluation of four bids and expect to have a selected bidder approved by the PES and presented for TC 9.10 vote at Tuesday's meeting.

*WS 1835 (Characterizing the Performance of Entrained Flow Stacks) – Brad C. (CPP)*

1. Brad completed the Work Statement and the Work statement was approved by TC 9.10. as is in October 2019.
2. The Work Statement is now being prepared for bids. Out to bid in Spring.

**Research or RTARS in progress, initiated or under consideration:**

1. RTAR to “Survey of sources of contamination in existing labs” Roland C. and Tom Smith (on hold).
2. RTAR on Air Change Rates: MTG committee encompassing several TC’s looking into the why’s and where’s of Air Change Rates – Literature research on-going is first phase.
3. 9.7 Higher Education – working on RTAR looking for TC9.10 to Co-sponsor specifically research for “labs being used in higher education”. Waiting on 9.7. Independent research project on-going (Tom Smith).
4. 1573 Follow-up Research Project to address additional scope not addressed in SF-6 Replacement Study (Bob Weidner and Tom Smith to develop RTAR post SF6 Research) (on Hold).
5. 3D Printing, Laser Issues – emerging issues brief, parallel studies on-going at AIH. Kishor involved. 62, 9.10, Industrial Ventilation; Environmental Health.
6. Demand Control Ventilation in labs to reduce air flow rates; how is this verified? Sensors installed improperly, never properly tested or maintained.

**ASHRAE TC 9.10**  
**Lab Classification Subcommittee Meeting**  
Orlando Winter Conference  
Sunday, February 2<sup>nd</sup>, 2020  
1:00 – 2:00 p.m.

**Minutes:**

**1. Introductions. Attendees:**

Adam Bare	Ryan Parker
Karl Aveard	Ken Kuntz
Jordan Enns	Kyle Inge
Christine Benga	Gaylon Richardson
Jonathan Baguley	Duane Hammond
Carol Donovan	Martin Stangl
Brendan Dingmann	Roland Charneux
Duncan Green	

**2. Recap of activities since the LVDL guide was published**

- Focused on getting the word out.
- Various presentations / seminars.
- Basecamp site has been created. The LVDL guide has been posted to it. Meeting minutes will also be posted there.

**3. Open discussion / feedback**

- The LVDL guide needs some minor formatting revisions.
- Feedback:
  - There was a request for a “quick start guide” to be included at the front of the LVDL guide, to briefly explain the steps on how it should be used.
  - For differential pressure control, there is a concern that the stated minimum room differential pressure of 0.01” wg (for LVDL-4) is too low. This is just a minimum, but ANSI and the Design Guide both reference a higher range (0.03”-0.05” wg). The committee should discuss whether the minimum in the LVDL guide should be increased.
  - There were multiple presentations at I2SL showing that some universities are using the LVDL guide, with positive results.

#### 4. Next steps

- Continue getting the word out. Consider whether presentations should be given at regional chapter meetings.
- Evaluate means for soliciting feedback & comments. Basecamp could be used to receive comments.
- Discuss the status of Tom Smith's efforts with AIHA to produce a guide for performing risk assessments, and evaluate how that guide and the LVDL guide can & should be used together.

**ASHRAE TC 9.10 Laboratory Systems  
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Meeting Minutes**

**Attendees:**

Mike Amstadt	Karl Aveard	George Augustini
Brendon Burley	John Castelvechi	Rob Chopowick
Brad Cochran	Brendan Dingman	Jake Edmondson
Kevin Gilkison	Nathan Ho	Kishor Khankari
Chris Kirchner	Ken Kuntz	Lloyd Le
Larry Meisenzhal	John Barrett Neubauer	Guy Perreault
Kurt Rindoks	Gary Roepke	Doug Ross
Gordon Sharp	Tom Smith	Bob Weidner
Tim Wheeler	Reinhard Seidl	Christine Benga
Jim Coogan	Martin Stangl	Trevor Zeller
Glenn Friedman	Deirdre Carter	Gaylon Richardson
Rajendera Kapoor	Ryan Parker	Corey Metzger
Vineet Nair	Mike Craig	Jay Ernacio
Shuni Mao	Ashley August	Kurt Munteiro
Justn Opperman		

**-Reviewed goals of sub-committee**

*Complete rev 3 of the Design Guide within 3- 5 years  
Edit and revise a few chapters at a time until complete  
Add content as necessary*

**-Reviewed previous meeting minutes and action items**

*Discussion of Lab Hood Design methodology  
Chapter 11 controls additional edits  
Ideas for additional content:*

- O&M chapter harmonized with other ASHRAE publications
- How design guide applies to Z9.5 and where it applies
- Additional Chapter: Lab Classification-How to use, free download (smart guide)
- Additional Chapter: Exposure Control Devices Tom Smith
- Additional Chapter: Ventilation Effectiveness Kishor Khankari
- 3D printing ventilation

**-Reminder for everyone to obtain permission for image utilization in guide**

**-Discussed Basecamp website and usage**

*Ken Kuntz will post Agenda, notes and current chapter edits  
Authors of documents can define "Users" or "Clients" which determines edit or view rights.  
Guy Perrault is looking at a separate Basecamp site just for the Design Guide. This will allow only editors to make changes.*

**-Chapter 3: Design Process**

*-Sent to Main Committee for review*

*A copy of the “final” draft is in the TC9.10 basecamp*

-Chapter 5: Laboratory Hood Design

*Presentation / Discussion – Larry Meisenzahl*

*Commentary and statements where prioritized by importance*

*Key Points: 12 ACM vs Face Velocity (Volume of air stays constant vs airflow rate)*

*Containment (Safety) is a function of airflow volume rather than face velocity*

*Geometry of hood must change for this methodology to work – i.e. Spiral*

*Current fume hoods could be retrofitted to contain necessary geometry*

*No Bypass is needed with this construction*

*Questions: If basing findings on concentrations, where are the concentration levels measured at and is it well mixed?*

*Data recorded in the paper was all done with one sash opening. More information is needed as it cannot determine the impact of velocity.*

*The concentration within the vortex is unknown. Need to ensure that it would not exceed the lower explosive level of a gas.*

*Design recommendation is not commercially available or in current installations at this time. No validation of performance can be done.*

*Group recommendations for Chapter 5 Design Guide:*

*Update current chapter to include comments stating additional research is being pursued regarding the constant volume methodology and spiral struction.*

*Start a research proposal in tin TC 9.10 to test the Vortex hood construction and methodology*

-Chapter 11: Controls

-John Castelvechi combined multiple author’s edits into one document

-Need to combine Exhaust fan control section as we have two different versions

-Jim Coogan is reviewing for further edits

-Standard 36, HVAC Controls has received several amendments one of which is Laboratory Controls. Jim Coogan is on this committee and will keep us informed as it goes to public review.

-Additional chapters to start editing?

-Wade Conlan has started editing Chapter 14 on commissioning

-Chapter 10 Energy Recovery was also mentioned as a good chapter to start on