

ASHRAE MEETING – Denver
TC 2.3 - Gaseous Air Contaminants/Removal Equipment
TC Meeting

Tuesday – June 25, 2013 [13:00 - 15:30 (1:00 – 3:30 PM)]
 Tower Court B, Tower Building, Second Level

The meeting attendee list is as follows:

Last Name	Name	Member Status	Position	Present
Total Voting Members = 8 out of 14 in attendance				
Bayer	Dr. Charlene W. Bayer, PhD	V	Secretary	P
Flom	Mr. Michael C. Flom	V	Member	-
Grzywacz	Ms. Cecily M. Grzywacz	V-NQ	Member	-
Hafendorfer	Mr. Brian J. Hafendorfer	V	Member	P
Kerr	Dr. Caroline M. Kerr, PhD	V	Handbook Chair	P
Lau	Dr. Josephine Lau, PhD	V	Member	P
Lee	Dr. Chang-Seo Lee, PhD	V	Member	-
Lull	Mr. William P. Lull	V	Member	P
Middlebrooks	Mr. Matt Middlebrooks	V	Chair	P
Owen	Ms. Kathleen Owen	V	Research Chair	P
Schaaf	Mr. David A Schaaf, Jr	V	Program Co-Chair	P
Stanley	Mr. W. Brad M. Stanley	V	Vice Chair	P
Tronville	Dr. Paolo M. Tronville, PhD	V-NQ	Standards Chair	-
Zhang	Dr. Jianshun S. Zhang, PhD	V	Member	-
Total Non Voting Members = (1 provisional)				
Agopian	Mr. Nick Agopian	NV		-
Baker	Mr. Wane Baker	NV		-
Burkhead	Mr. Robert B. Burkhead	NV		-
Burroughs	Mr. H.E. Burroughs	NV	ALI Coordinator	-
Britt	Mr. Monroe A. Britt	None		-
Campion	Dr. Christopher L. Campion, PhD	NV	Member	-
Chen	Mr. Eric Chen	NV		-
Chen	Ms. Wenhao Chen	NV		-
Choi	Dr. Kyung-Ju Choi, PhD	NV	Program Co-Chair	P
Copley	Mr. Johnnie H. Copley	NV		-
Freeman	Mr. W. Freeman	NV		P
Krafthefer	Mr. Brian Krafthefer	NV	Member	
Listvan	Dr. Marilyn A. Listvan, PhD	NV	Publications Chair	P
Mathur	Mr. Ashish Mathur	NV	Member	P
Muller	Mr. Chris Muller	NV		
Roseberry	Mr. Jeffrey Roseberry	NV	Webmaster	

Last Name	Name	Member Status	Position	Present
Sherwood	Mr. Scott Sherwood	NV		P
Total Visitors =				
Ahn	Mr. Tim An	None		P
Bharadwaj	Mr. Rahul Bharadwaj	None		P
Chesson	Mr. Kam Chesson	None		P
Greist	Mr. Henry Greist	None		P
Haas	Mr. Daniel Haas	None	-	P
Hasihney	Mr. Peter Hasihney	None		P
Hingorani	Mr. Sanjeev Hingorani	None		P
Leusasseur	Ms. Paula J. Leusasseur	None	-	P
Parker	Ms. Ina Parker	None		P
Seyffer	Mr. Charles Seyffer	None		P
Tompkins	Mr. Dean Tompkins	None	-	P

Summary Motions

#	Motion	Vote
1	Brad Stanley moved to accept the Dallas minutes. Dave Shaaf seconded.	PASSED: 7 CNV 7-0-0-4 Chair not voting
2	Bill Lull moved that we start scheduling an hour for publications subcommittee so that we can use this for TC forum's during this time. Marilyn said that she talked to Tony Giometti about doing this and encouraged it, and that it will be shared with TC2.4. Gemma Kerr 2 nd . (Monday 3-4??? as a possibility.) We will have to submit to ASHRAE to request set up the subcommittee meeting.	PASSED: 10 CNV 7-0-0-4 Chair not voting
3	Gemma Kerr made motion to accept co-sponsorship of the TC5.10 forum. Kathleen Owen 2 nd .	PASSED: CNV 7-0-0-4 Chair not voting
4	Kathleen Owen moved to co-sponsor unvented combustion products RTAR for residences with 62.2. Gemma Kerr 2 nd . Bill Lull feels that it is too broad and too soon. Gemma Kerr said that we could participate more in the writing if agree to co-sponsor now. Reason for negative: Too broad and too expensive. Reason for abstention: More final RTAR – too early.	PASSED: CNV 6-1-1-3 Chair not voting
5	Brad Stanley moved for Brian Hafendorfer to serve as primary to MTG and Dan Hass as the alternate. Charlene Bayer 2 nd . We voted 6-0-1-4 (Brian abstained since not voting for himself).	PASSED: CNV 6-0-1-4 Chair not voting
6	Brian Hafendorfer moved to propose a new GPC topic to be <i>Classification of</i>	PASSED:

	<i>gas phase air cleaning devices</i> . Josephine Lau 2 nd .	CNV 8-0-0-4 Chair voting
7	Marilyn Listvan moved that TC2.3 considering being a cognizant committee on relevant FAQs. Gemma Kerr 2 nd . 7-0-0-4 CNV	PASSED: CNV 7-0-0-4 Chair not voting

Summary Action Items

#	Action Item	Owner
1	Need to determine from ASHRAE if TC2.9 is supposed to working with TC2.3 on the chapter.	Gemma Kerr
2	To send a note to Christine Sun, chair of the MTG that Brian Hafendorfer is primary and Dan Haas is secondary representatives from TC2.3 to the MTG.	Matt Middlebrooks

Meeting Minutes Begin

1. Call to order. Introduction of guests and members. Identify & Reporting from ASHRAE liaisons.
 - a. Introductions were made. No liaisons were present.
2. Review as needed and Approval of previous meeting minutes from Dallas.
 - a. Dallas draft minutes were reviewed and accepted via vote.
3. Subcommittee Reports
 - a. Handbook - *Subcommittee Chair Gemma Kerr*
 - i. Responsible Chap 11 published this year. Chapter 46 in middle of editing. Due March 2014. Need to be close to final by 1/14 meeting. Matt said that one thing that came if TC2.9 is supposed to working with TC2.3 on the chapter. **Action: Gemma will follow up with ASHRAE to find out.**
 - b. Membership - *Subcommittee Chair Matt Middlebrooks*
 - i. Currently have 14 members. Two will roll off. Matt Middlebrooks is remaining since time as Chair does not count as part of the chair's tenure. Jensen Zhang and Kathleen Owen will roll off. Brian Krafthefer, KJ Choi, and Chris Campion are rolling on. We are trying to ascertain Chris Campion's status since his employment status has changed and unsure if he will be able to be attending meetings. We may need to have an emergency roster change. Matt Middlebrooks is rolling off as chair. Brad Stanley will be Chair. Charlene Bayer will be Vice Chair. Cecily Grzywacz will be Secretary. We have identified all subcommittee chairs and co-chairs. We are rotating approximately four off and one on each year. Contact Matt Middlebrooks to become corresponding member and if interested in becoming a voting member. We will have 15 members as of July 1, 2013.
 - c. Planning - *Subcommittee Chair Brad Stanley*

- i. Attended by 15. The meeting discusses what we think is important and that needs to be discussed or set up as future programs. We discussed how we want to make the TC better moving forward. We discussed the need to focus, narrow scopes, and members only volunteer for what they can actually accomplish. Four specific areas: 1) 145.2 data lacking right now. 2) data on energized products. 3) residential 4) remaining life for filters 5) rating gas phase filters. General categories: performance data, environment – IEQ, performance metrics. Have research, publications, programs, etc. coordinated across these programs. ISO has a proposed item to establish a rating system. If we do the work on it and supply to the ISO committees, we should be able to provide the data that they need to have it meet our needs.
- d. Professional Development Coordinator - *Barney Burroughs*
 - i. No report since Barney Burroughs did not attend meeting.
- e. Program - *Subcommittee Chair KJ Choi*

**New York, January 18 - 22, 2014, www.ashrae.org/newyork
 Seattle, June 28-July 2, 2014, Chicago, Jan 24-28, 2015, Atlanta, June 27-July 1, 2015,**

Forum 2: Should the VRP be Held to the Same Performance/Monitoring Criteria as the IAQP, Charlene Bayer, Tuesday June 25, 9:45-10:45am. Governors Square 16, Track 1

Track 1 HVAC&R Systems and Equipment, **Track 2** HVAC&R Fundamentals and Applications, **Track 3** Environmental Health through Indoor Environmental Quality, **Track 4** Building Information Systems: Integrating Technology for Control, Management, Optimization and Efficiency, Track 5 International Design, **Track 6** Building Performance and Commissioning for Operation and Management, **Track 7** Hydronic System Design for Efficiency and Large Buildings, **Track 8** Tall Buildings: Performance Meets Policy

Dates:

Seattle Meeting – Conference Paper Abstracts due September 23, 2013, Technical Papers due for Review – Sep. 23, 2012,

Acceptance/Reject Notifications issued for Conf. papers abstracts – Oct. 7, 2013, Theme: **Track 3**

New York Meeting – Web site for Seminar and Forum proposal: open June 3, due August 12, 2013, Conference Pap., July 3, 2013 **T8**

Technical Pap: 41/65, Conf: 82/187, Seminar 47/79, Forum: 4/20 for Denver, For New York: Conf: 171

Type	Title	Co-Sponsor	Chair	When	Due Date
Seminar	Filtration: Friend or Foe/ "Real	TC 2.3 co-	KJ Choi	Denver	not

	Cost of Filtration” for Denver-2.4	sponsor			scheduled
Seminar	Filter performance for Ozone Jeff Siegel, Kathleen Owen, Jensen Zhang, Brad Stanley NOT RE-SUBMITTING	EHC, 62.1	Brad Stanley	?	Not submitted
Conference Paper or Technical Paper for Seattle	Research Mini-conference: Ongoing research on 145.1 by Jensen Zhang SEATTLE for submission by September 23		Matt Middlebrooks	?	Not submitted because final report not submitted yet
Seminar	Air Cleaning Standards – Example Test Results	2.4, 2.9	Chris Muller		not scheduled
Forum	Should the VRP be Held to the Same Performance/Monitoring Criteria as the IAQP	62.1	Charlene Bayer		scheduled
Forum	Sensors & Filtration: Can you measure what can harm you?	2.4	Brian Krafthefter		not scheduled
Forum	Filtration and Air Cleaning Position Paper	TC 2.4	Barney Boroughs	New York	
	Forum on Challenges of Commercial Kitchen Odor Control for High Rise Buildings <i>(TC2.3 co-sponsorship requested)</i> <i>(Commercial Kitchen odors to be addressed; we are to add the “science”-capturing everything & discarding it – discharge side – what we are a community need to do to address the problem – new stds, research – discuss the aspects and problems & how to solve. TC2.3 to provide the expertise in the chemical realm – odor is not clearly defined; what are the nuisance levels, etc.)</i>	TC5.10	Russ Robison (representative from TC5.10) Gemma Kerr TC2.3 representative	New York	
Forum	Sensors & Filtration: Can you measure what can harm you?	2.3	Brian Krafthefter	New York	
Conference	ASHRAE 145.2 Efficiency and Capacity Test Data for Four Gas Phase Cleaners	145	Kathleen Owen	New York	Paper due 7/2/13

Seminar	Filtration: Friend or Foe/ “Real Cost of Filtration” for New York-2.4	TC 2.3 cosponsor	KJ Choi	New York	
Seminar	Building performance of VRP & IAQP (<i>designed from the forum at Denver</i>)	62.1 as co-sponsor	Charlene Bayer Matt Middlebrooks Brian Hafendorfer	Seattle or New York	
Seminar	TC2.4: Does Particulate Matter Matter? (Ozone)	TC2.3 as co-sponsor	Marilyn Listvan	Seattle	

	Below ones slated for later or discard				
Seminar	Desiccant wheel Odor Removal		Nick Agopian	Later	
Seminar	Sorbents as Air Cleaners			Later	
Conference Paper	IAQP Case Study Documentation	TC 2.4	Barney Burroughs & Charlene Bayer	Later	
	UVPCO (Hugo Destail..., LBL) 1457 Report (Ramses, U of W)			Later	
	TG 2 (Building Security) – Where does filtration fit in		Matt Middlebrooks	Later	

If going to submit a conference paper, let KJ know, because he can target the reviewers so that the reviewers are knowledgeable about the subject. We have a better chance of getting conference papers submitted if the TC supports it rather just submitting it on your own. We need to submit names of new reviewers.

ASHRAE 145.2 Efficiency and Capacity Test Data for Four Gas Phase Cleaners – Kathleen’s conference paper abstract that has been accepted for NY. Paper due July 2, 2013.

Marilyn Listvan stated that we need to pick a potential topic for the New York forum for the publications slot. Suggestions were: 1) Remaining lifetime testing – *How do you determine when to change a gas phase filter?*- Paula Levasseur; 2) The GPC topic – Ashish Mathur; or 3) Brian Krafthefer’s topic *Sensors & Filtration: Can you measure what can harm you?*, which is applicable to both TC2.3 and 2.4. Marilyn Listvan will bring up in TC2.4 to see what they want. Add this to every agenda.

- f. Publications - *Subcommittee Chair Marilyn Listvan*
 - i. People need to send in personal bibliographies. To be put on web site or LinkedIn. These will be a reference list to anyone who wants to know learn about TC2.3. It also can be references of which we are aware that will be informational. Probably will be on LinkedIn rather than the web page, because easier to update. Please consider writing articles, such as conference papers.
- g. Research - *Subcommittee Chair Kathleen Owen*
 - i. Harvey Sacks to be new liaison after this meeting. New RTAR form is written, but not released yet. Limits of number of words in each section. We have to be very clear to be approved. Use research subcommittee chair to vet your RTAR or WS prior to submission. There is a shortage of RTARs in the “pipeline”. When you submit work statement to ASHRAE for approval, you can be notified when the committee is meeting, and then be on the phone with them to explain and advocate for your work statement. There was a meeting report on 1557. Going well and should finish on-time. Update report on 1457. Work still ongoing. Work in progress: WS 1579 on hold until 1491 completed. In progress: RTAR on 145.2 round-robin to be submitted by 8/14/13. Brad Stanley moving forward on table on manufacturers’ performance. A working group is brainstorming on residential IAQ to develop RTARs. We were asked to unvented combustion products RTAR for residences co-sponsor with 62.2. Kathleen Owen moved that we so co-sponsor. Gemma Kerr 2nd. Bill Lull feels that it is too broad and too soon. Gemma Kerr said that we could participate more in the writing if agree to co-sponsor now. 6-1-1-3 CNV Too broad and too expensive (negative). More final RTAR – too early(abstention)
- h. Standards - *Subcommittee Chair Paolo Tronville*
 - i. Paolo Tronville unable to attend so Matt Middlebrooks chaired meeting. We are a cognizant body for 145.1 and 145.2. 145.1 is under revision targeted for New York. 145.2 needs sufficient data for revisions to be performed. RP1557 was based on 145.1. The RTAR in preparation will be for 145.2. ASHRAE terminated a contract for a DOAS Design Guide. TC9.11 still proceeding on Clean Room Design Guide. There is a section of gaseous contaminants. Matt Middlebrooks and Chris Muller are reviewing. If any other members want to review, they need to notify Matt. Short time frame. 62.2 has formed an IAQ subcommittee. TC142 published the corresponding method to 145.2. LEED IAQP pilot program still ongoing. 62.1 addendum: approved to move from MERV 6 to MERV 8. Bathroom exhaust can be lower classification class based on air cleaning. Approved to letter ballot the additive effect of mixtures on IAQP with unresolved comments.
- i. Website - *Co-Subcommittee Chairs Jeff Rosebury and Paula Lévasseur*
 - i. Website is up. It is hosted by ASHRAE. The URL is <http://tc23.ashraetcs.org/index.html>. Any links that you want put in, i.e. LinkedIn, notify Jeff Roseberry.

4. MTG-EEC Report

- i. Brad Stanley: Energy Efficiency Classification for Filters. It was informal because chair unable to attend. At Dallas the MTG decided to get a document out. The group (PPIS) still needs to be approved. ASHRAE has requested additional changes, so it has not yet been approved. Hopefully this meeting or next. The outcome will be a guideline document. Excludes any energized filters. The chair is Geoff Crosby. He is asking for users of filters or design systems to join the committee, volunteers. Discussion about how filters age and what happens when filters age. Working toward focusing the scope. By tomorrow, an update on the guideline approval. If this is approved, the MTG will be dissolved because a GPC will be formed. It will be under TC2.3 and TC2.4 as cognizant committees. No membership votes required because we voting in January. Send Brad Stanley a note if you want to be notified as to the ongoings and be on the project committee. Chris Campion is the lead representative and Brian Hafendorfer is the alternate. ~~Brad Stanley~~ Brad Hafendorfer is the Vice Chair. We need someone to serve as the alternate. Brian Hafendorfer to be as primary and Dan Hass as alternate. We voted 6-0-1-4 (Brian abstained since not voting for himself) CNV Matt Middlebrooks will send a note to Christine, chair of the MTG.

5. Report from TC liaisons.

No report.

6. New Business

- a. In planning meeting, discussed rating gas filters for rating and method of lifetime test. Something similar to MERV. It would mean something to users and could be put into requirements. Expand into acceptable air quality in specifications, but no in the engineering community knows how to find, or what they mean, or apply these levels. What levels of O₃ are acceptable? Could be a guideline or other specification material. The technology would be more heavily adopted. It could be written into other existing or new standards. Basis of fundamental what is acceptable level of O₃ or other contaminants. What is acceptable? What should I test for? If you have five gases, what does it mean? Is there a cumulative level that a filter can handle? What is lacking is that 145.2 test is one compound at a time. Therefore it will be difficult to handle mixtures. If you put five chemicals into a carbon bed, the efficiency will change; therefore, hard to give a rating. MERV ratings are under specified conditions; we could specify the conditions. Do you start now or do you wait for GPC 27 or 145.2 data to start? Should start now due to the timeframe to get things through ASHRAE. LEED gives points for acceptable outside air. When do you test acceptability? What is acceptable outside air? Are we asking to form an SPC or a GPC? Is there enough interest in the topic to propose a GPC? Ashish Mathur as chair and Scott Sherwood as Vice Chair. GPC topic to be *Classification of gas phase air cleaning devices*. We have at least five people interested. Brian Hafendorfer, Paula Levasseur, Don Haas, Scott Sherwood, David Schaaf, and Ashish Mathur. Brian made a motion to create or explore the opportunity for GPC. Josephine Lau 2nd. 8-0-0-4 CV.

- b. ASHRAE FAQs. Marilyn Listvan: there are some IAQ FAQs. TC4.1 is listed as the cognizant committee. Steve Comstock said that we could be listed if we are interested. These are very generic and do not quote numbers. Marilyn Listvan moved that TC2.3 considering being a cognizant committee on relevant FAQs. Gemma Kerr 2nd. Matt Middlebrooks said that we have to be careful for what we volunteer. These are official ASHRAE FAQs listed on ASHRAE's website. FAQs are prominent on the ASHRAE website. 7-0-0-4 CNV

Said good-bye to Matt Middlebrooks thanking him for his service as the chair of TC2.3.

- 7. Agenda suggestions for the Winter Meeting in New York.
 - a. Agenda items for New York. Marilyn we need to pick a potential topic for the New York forum for the publications slot. Remaining lifetime testing – *How do you determine when to change a gas phase filter?*- Paula The GPC topic - Ashish. Or Brian Krafthefer's topic *Sensors & Filtration: Can you measure what can harm you?*, which is applicable to both TC2.3 and 2.4. Marilyn will bring up in TC2.4 to see what they want. Add this to every agenda.
 - b. Title and scope draft of GPC for the next meeting. Scott will take an initial stab.
ACTION: Matt will send the GPC form.

8. Adjournment

Gemma Kerr moved to adjourn. Brian Hafendorfer 2nd. Meeting adjourned at 3:10.

ASHRAE MEETING MINUTES – DENVER TC 2.3

- Gaseous Contaminants/Removal Equipment

Handbook Sub-Committee Meeting

Monday, June 24, 2013

4:15-6:00 p.m.

Sheraton Hotel, Tower Building, Terrace Room (Terrace Level)

The meeting was chaired by Gemma Kerr (Handbook Chair for TC 2.3). Participants introduced themselves. Present were:

Name _____

Charlene Bayer

Henry Greist

Dan Haas

Gemma Kerr

Paula Levasseur

Bill Lull

Ashish Mathur

David Schaaf

Sheldon Jeter (Liaison)

Sheldon Jeter, the ASHRAE Liaison for Applications Chapter 46 *Control of Gaseous Indoor Air Contaminants (2015)*, told us that the checklist that we need to submit along with the Chapter is changing. He will forward a copy of the new version to us. The Chapter is due to be submitted to ASHRAE March 15, 2014.

Henry Greist commented that TC 2.9 (UV) have expressed an interest in Chapter 46. Gemma said that she would have expected them to be more interested in TC 2.4's air cleaner chapter which does devote space to UV disinfection of air and surface microbiological contaminants. Chapter 46 deals with photo-catalytic oxidation (PCO) air-cleaning only.

The remainder of the meeting dealt with revision of Chapter 46. Some changes were agreed in Dallas, and others have been proposed since then using TrackEdit and inserted Comments, and appear in Draft 2. It was agreed that we should review progress on the items agreed in Dallas first, as shown below.

1. Re: Checking the equations that allow contaminant concentrations to be calculated from emission, ventilation and filtration rates, **Brian and Chang-Seo will review equations 1-7 and decide whether to keep, revise or replace them.** This item has not been completed. It is a revision that we need to do for the 2015 edition. Gemma will contact Brian and Chang-Seo about progress.
2. Re: the circulated breakthrough test graph from 145.1, it provides different information from the present Figures 3A and 3B, which are poorly labeled and difficult to understand. However, the graph by itself does not provide adequate information.

Discussion of what facts an uninformed engineer needs to know suggested the following:

- (1) that the more grams of media/cfm a filter contains, the more efficient and long-lasting it will be;
- (2) that higher concentrations of contaminant will result in shorter filter life whatever the efficiency of the filter;
- (3) that contaminant carryover or breakthrough will occur if the contaminant concentration is too high or the exposure time of the filter too long.

Jeff felt that Figure 3A would be easier to understand if the curves were for different bed depths rather than the current units. Contaminant loss and retentivity should be discussed for physical adsorbents.

Ashish, Jeff and Paula will take care of this item. The new Figure(s) and supporting text are due October 31.

3. Re: revision of the Installation, Startup and Commissioning section. **David Schaaf has completed a revision. Most of this was reviewed and changes approved. Gemma agreed to send the un-reviewed parts to Bill, who will review them. Bill will also revise the Operations and Maintenance section by October 31. Gemma will remind Bill periodically about what he said he will do.**
4. Re: defining and discussing clean air delivery rate (CADR) as a measure of air cleaner performance, **Gemma has prepared a paragraph and it is included in Draft 2.**
5. Re: adding text referring to contaminant exposure standards in EHC Chapter, **Gemma has determined where this needs to go and will add the text by October 31.**
6. Re: HVAC Applications liaison Sheldon Jeter saying that he would like to see us add example calculations of concentration to the chapter (in both sets of units), this action item was postponed until review of the equations has been completed.

7. Re: the control material (and associated references) removed from Chapter 11, **Ashish reviewed this material and recommended that none of it be incorporated into Chapter 46.**
8. Re: Brian's review of the Chapter (distributed before the meeting), Brian said that he had sent a marked up copy of Chapter 46 to ASHRAE with his review, but Gemma reported that she had not received it. **The marked-up file was distributed to meeting attendees and was used as the basis for Draft 2.**

There were eight items for discussion in the review, which were dealt with as follows:

- (1) include discussion of heat exchangers and desiccant wheels which can either be system sources of contaminants or removal devices, also fan leaks as sources. **No action item was specified;**
- (2) there is no discussion of byproduct release from chemisorption or PCO or ozone reactions. RP-1491 might provide useful information on ozone. **No action item was specified;**
- (3) Table 1 on cigarette emissions, see comments in marked-up file, **comments are minor and recommended changes appear in Draft 2.**
- (4) Table 5 on typical outdoor concentrations of contaminants, see comments in marked-up file, **comments are minor and recommended changes appear in Draft 2;**
- (5) Equation 1, action items already identified above;
- (6) add example calculations, action items already identified above.
- (7) Figure 1 only shows human sources of contaminants, no materials or system sources. **Brian has redone Figure 1 and it is included in Draft 2;**
- (8) Figure 3 deficiencies, action items already identified above.

General comments about the Chapter included the following:

ÿ We should use the phrase “reduce exposure to” rather than the word “control” when talking about contaminants, because engineers typically use “control” to mean something quite different;

ÿ When discussing radon, use the full name not the chemical symbol Rn;

Gemma will check occurrences and change as appropriate.

Two new action items were identified:

1. Paula will replace some definitions at the start of the Chapter with those agreed upon at the SSPC 145 meeting;
2. Gemma will update references to 145.2 to reflect the fact that the Standard has now been published.

Gemma will incorporate all agreed items and new submissions and send out Draft 3 to the Committee in November.

There was no other business.

The meeting was adjourned at 5:55 pm.

TC 2.3 Gas-Phase | Planning Subcommittee | Agenda
ASHRAE MEETING – Denver
Tues. 6:30 a.m. – 8:00 a.m. Tower Court C (Tower Building, Floor 2)

Attendees:

Brad Stanley (Subcommittee Chair)
Charlene Bayer
K-J Choi
Henry Greist
Brian Hafendorfer
Sanjeev Hingorami
Gemma Kerr
Paula Levasseur
Marilyn Listvan
Bill Lull
Ashish Mathur
Matt Middlebrooks
Kathleen Owen
Charlie Seyffer
Dean Tompkins

Minutes of Meeting: Activity in meeting indicated in **Red**

1) Current Items

a) Membership Discussion (if needed)

- i) Chris Campion is/will be a voting member but is not attending anymore.
- ii) Looking toward next secretary, management will think.
 - (1) Handbook – Vice Chair = Brian Krafthefer
 - (2) Research – Secretary = Paula Levasseur, thinking on Vice Chair
 - (3) Standards – no vice chair
 - (4) Pubs – no vice chair
 - (5) Membership – Vice Chair = Brad Stanley
 - (6) Program – Vice Chair = Mick Flom

b) Website

- i) <http://tc23.ashraetcs.org/activities.html>
- ii) News - ?
 - (1) Change “Under Construction” to “No Current Content”
 - (2) Add “You may also check our linked-in group for current topics.”
- iii) Activities – maybe place research table or sanitized version there.
 - (1) Recommend adding Research Summary Table
- iv) Published Content - ?
 - (1) Jeff work with Marilyn Listvan
- v) FAQ - ?
 - (1) Change “Under Construction” to “No Current Content”

- (2) Three possible:
 - (a) ID 34 – 37; contaminant questions
- vi) Links
 - (1) Add Linked-In 2.3 outreach website
- c) Research – Quick Discussion
 - i) Round Robin Testing of ASHRAE 145.2 : We need to think of some people who would be good to help Gemma with the RTAR. She is the only one I documented that would be working on that.
 - (1) What Gemma needs are reviewers: Kathleen Owen and the new ASHRAE Liaison.
 - ii) Air Emissions from Unvented Combustion Devices and Indoor Air Quality: We may need to vote on cosponsorship of the potential the RTAR
 - (1) TC 2.3 needs to vote on participation on this RTAR. Recommend a conditional.
 - (2) Will require a 2/3 vote.
 - iii) Cosponsorship of WS 1614 Evaluation of Effectiveness of UV Systems [for the abatement of grease and fuel potential from commercial kitchen exhaust systems]: Do we know if we are official cosponsors of this WS? I checked my notes and it looked like we voted, but only had a majority vote, whereas Research requires a 2/3 vote to pass
 - (1) Kathleen Owen will get with Russ Robinson to confirm.
 - iv) Research RTARs are lacking, only 3 in queue now
 - (1) Aug 12 is the deadline for next submission.
 - (2) If RTAR's are submitted by then, there will be a good chance to get in.
 - (3) TC 2.3 RTAR for this deadline: Round Robin Testing of ASHRAE 145.2
- 2) Looking Forward
 - a) FOCUS: To get things done and make things cohesive.
 - i) Research ties into Programs ties into Publications
 - (1) Bill Lull said we desperately need 145.2 data to be put out.
 - ii) Let old ideas without traction drop; look to items that we can put energy behind.
 - iii) Limit individuals to contributing to one Research Item.
 - (i.e. Individuals should not volunteer if they are not going to actually do it in a timely manner -- preferably before the next meeting.)
 - 1. Target Reminders will help
 - 2. RTAR Leads or PMS participation/ lead may need to be limited to one
 - b) Focused Research Area Suggestions
 - i) Specific Topics
 - (1) ASHRAE 145.2 Test Data
 - (2) Energized Product (UVPCO, Ionizers) Performance & Byproduct
 - (3) Residential Buildings -- tied into 62.2
 - (4) Suggested in Meeting
 - (a) Remaining Life – Changing Filters
 - (b) Rating Gas-Phase Filters (may require users, web e-mails).
 - ii) General Categories
 - (1) Performance Data
 - (2) Environment

- (3) Sensors (IAQ, Filter Performance)
 - (4) Effective Measurement metrics
- 3) Adjourn

MEETING MINUTES
TC 2.3 - Gaseous Contaminants/Removal Equipment
Research Subcommittee Meeting
Silver, Tower Bldg, Mezzanine Level
Denver, CO Sunday 5:00-7:00 pm

1. Meeting was called to order at 5:10 by Kathleen O.
2. Introductions and Sign-In were completed – attendees listed below
3. Review of Minutes from Dallas
 - A. Original minutes were correct, sent out in February. File sent on June 18 was incorrect.
4. RAC Report (Liaison TC 2.3 – David John)
 - A. David John not present
 - B. Kathleen informed committee that a new liaison has been assigned. She will meet him at the research breakfast on Monday AM. See notes below.
5. Presentations/Up-Dates on Current Research Projects
 - A. 1557-RP “Evaluation Lab Comparison of Relative Performance of Gas Phase Filtration Media at High and Low Challenge Concentrations”
 - I. Summary meeting was held with PMS about 2 weeks ago. A draft final report, received on June 20th, is being reviewed by the PMS.
 - II. 4 gases on all 6 completed.
 - III. Initially looks as though performance at high concentration simulates what happens at low.
 - IV. Final report is due on August 31st.
 1. Should come with electronic data (.xls) spreadsheet
 2. Should come with recommendations about the 145.1 test method
 3. Action Item: After Final Report is issued, Brad Stanley will send out a letter ballot for approval so that we do not have to wait all the way until next meeting.
 - B. 1457-RP “By-product Production from Photocatalytic Oxidation Associated with Indoor Air cleaning Devices”
 - I. Ramsey was not present.
 - II. Dean Tompkins presented a summary of work that Ramsey has completed since last time.
 1. Overview of Apparatus and Equipment
 2. Operating Procedure Summarized
 3. Plot of concentration decay and some generation over time by different compound mass was displayed. Challenge gases were:
 - c. DCD
 - d. Acetaldehyde

- e. Ethanol – aldehyde intermediate shown
 - f. Acetone – intermediate looks to be acetaldehyde and others
 - 4. Action Item: C/C₀ plots for byproducts were not shown in 2D plots, but are needed.
 - 5. Action Item: Is chlorine dioxide a byproduct for DCB and Limonene?
 - 6. 2D Only Plots for challenges of:
 - c. D-Limonene
 - III. How long will calibration curves take with standard gases that are coming for Ramsey? Tanks to run calibration curves are due in the end of July. Dean estimated 1 week time would be required to complete calibration.
 - 1. Estimate this will be complete or along the way in August.
 - IV. Action Item: acetaldehyde needs to be run a few more times to get data that appears correct, if the data presented is all of the data available.
6. Work statements & RTARs: status updates
- A. 1579-WS Testing and Evaluation of Ozone Filters for Improving IAQ. On Hold
 - I. Waiting on 1491 results. ASHRAE has approved allowing 1579 to be on hold until 1491 is completed. This is a 2 year project, still a couple years out before a final report will be issued. Bill Lull states that Michael Vaughn stated the project should be completed by February 28, 2014.
 - B. 1625-RTAR Application of Indoor Air Quality Procedure:
 - I. Delete this RTAR, no action.
7. Proposed RTARS: status updates
- A. Round Robin Testing of ASHRAE 145.2.
 - I. Chris Campion has left ASHRAE and was leading this project.
 - II. Gemma will take the RTAR and try work through it. Gemma hopes to submit by the next deadline.
 - B. Field performance of typical gas-phase air cleaning technologies over service life.
 - I. Spreadsheet was put up and described with ~ 10 rows of data and explained
 - II. Action Item: Brad will Distribute to Manufacturers to fill in ~20 -50 rows before the next meeting.
 - C. Cost of Ownership – ventilation vs IAQ.
 - I. No action has been taken, table.
 - D. Evaluating air cleaner technologies/devices for treating formaldehyde
 - I. No action has been taken, table.
 - E. Kitchen Hood – went through out of 5.10.
 - I. Only here for awareness.
 - II. Brian Krafthefer is a representative in this group.

- F. Residential IAQ?
 - I. Residential IAQ – Progress Report
 - 1. Wenhao Chen wrote up a draft document which summarized the issues and possible relation to TC 2.3 issues. (attached)
 - 2. Wenhao is seeking volunteers to work on these topics. Wenhao can contact Stephanie Mason (from 62.2).
 - 3. Co-sponsorship
 - II. Unvented Combustion Products – Residential
 - 1. Ina Parker expressed an interest in working on residential IAQ projects.
 - III. Please contact Wenhao at Wenhao.Chen@cdph.ca.gov if you'd like to help write or brainstorm.
- 8. New Ideas for RTARs
 - A. Jensen mentioned the EHC research list: SVOCs (lighter ones may be similar to VOCs),
 - I. Action Item: Charlene to contact Ann Marie Summer to work with Jenson Zhang on this.
 - B. Remaining Life Analysis Test Method for Gas-Phase Medias
 - I. Ashish Mathur mentioned this.
 - II. Brainstorming will happen with Matt Middlebrooks & Paula Levasseur and Ashish Mathur.
- 9. New Business
 - A. None
- 10. Break into Working Groups, if there is time
 - A. None
- 11. Updates from Research Subcommittee Chairs Breakfast – (breakfast occurs after the research meeting, so these notes were added afterward)
 - A. Our new liaison after this meeting will be Harvey Sachs hsachs@aceee.org
 - B. There is a new RTAR form. It's a pdf file that you can type into. Its best feature is that it limits the number of words that we can use and that RAC can expect. We need to be concise and focused. Please make citations to literature in the Background section and include the reference in the Reference sections. This form should be available soon. Any RTARs that are currently in the works may use the old form (but KO thinks it would be a good idea to switch).
 - C. Only 5 RTARs were submitted for consideration this time: 2 conditionally accepted, 2 returned, 1 rejected
 - D. 7 TRPs may be ready for bid in the fall, none currently ready. ASHRAE needs more RTAR & WS.
 - E. Someone from the PES or related may attend RAC meeting (can be by phone) when they are considering our WS. Not clear as to whether we can do so for RTAR. But our liaison should be prepped to be our spokesman before the RAC meeting.
 - F. Next deadline for RTARs appears to be August 15.

- G. Presentation on responsibilities of PES in evaluating proposals. There will be revisions made to the ASHRAE Research Manual to make it clearer including:
- I. Section 6.2 should say that the Research liaison will be present during the PES eval meetings to assist with evaluation of proposals.
 - II. Each PES member must individually review and score each proposal before the group meeting. When the group meets, the proposals should be discussed. Individuals may reveal their scores. After discussion, each member should reconsider their scores. Then the group does the proposal evaluation form & Summary Sheet (in the Research Manual).

12. Dinner plans

- A. Mentioned

13. Meeting adjourned

Attendees - present	Affiliation	Attendees - present	Affiliation
Kathleen Owen – Chair	RTI	Marilyn Listvan	Listvan & Assoc.
Dean Tompkins	Consultant	Philip C. Farese	Advantix Systems
Paula Levasseur - Sec	Cameron Great Lakes	Steve Zitin	Bioclimatic Air Systems
Brad Stanley	AAF	R. Vijayakumar	AERFIL
Ina Parker	Ahlstrom Filtration	Kyung-Ju Choi	Univ of Louisville
Gemma Kerr		Ashish Mathur	UVDI
Stephany Mason	Eurofins Air Toxics	Rahul Bharadwaj	AAF
Peter Freeman	Jacobi Carbons	William Lull	Garrison/Lull
Henry Greist	Lennox	Charles Seyffer	Camfil
Zuraimi Sultan	NRC Canada	Charlene Bayer	Georgia Tech & Hygiene Sciences
Thad Ptak	Columbus	Matt Middlebrooks	Filtration Group
Sanjeev Hingorami	Lennox	Keith Chesson	Clarcor
Brian Hafendorfer	Trane	Jan Fretthold	Air Tech Intl.
Dave Schaaf	MWV	John Simenson	Johns Manville
Peter Hoekstra	IBR	Grace Byfield	RTI
Chris Muller	Purafil	Dan Haas	Clarcor

Wenhao Chen's Residential IAQ – Progress Report

Background:

People, especially infants and the elderly, spend a majority of their time in homes.¹ The importance of the residential environment to cumulative air pollutant exposures has been demonstrated in prior research.² Recent LBNL studies identified nine pollutants as priority hazards in residences, including PM_{2.5}, formaldehyde, acetaldehyde, acrolein, benzene, 1,3-butadiene, 1,4-dichlorobenzene, naphthalene, and nitrogen dioxide. These studies also identified three contaminants which may cause site-specific health problems in homes, including second hand smoke, ozone, and radon.^{3,4}

Besides source control and ventilation, air cleaning devices have generally been recognized as a good supplemental approach for reducing contaminant concentrations indoors. However, the question of whether and how to best apply air cleaning/filtration for home exposure reduction remain unclear, especially for the gas-phase. The goal here is to develop RTAR(s) that can help to answer (or partially answer) the above question.

Progress up-to-date:

A brainstorming call was conducted on April 23. Participants include Frank Hammes, Kathleen Owen, Jeffrey Roseberry, Zuraimi Sultan, Richard Hecker and Wenhao Chen.

Preliminary potential RTAR ideas generated from this call include (in random order):

- General
 - ✓ Literature review and health benefit analysis of reducing indoor concentrations of gaseous pollutants in homes.
 - ✓ Evaluating the performance of off-the-shelf air cleaning devices/filters for VOCs and ozone removal for residential applications via controlled field experiments.
 - ✓ Modeling the effect of housing characteristics and pollutant source characteristics on the effectiveness of air cleaning devices in residential applications.
- For Specific Gaseous Pollutant
 - ✓ Evaluating Performance and Role of Formaldehyde Removal Filters in Reducing Home Exposures.
 - ✓ Evaluating Performance and Role of Ozone Removal Filters in Reducing Home Exposures.
- For In-room Air Cleaners
 - ✓ Developing standard test method that incorporates the measurement of removal effectiveness as well as potential byproduct generation.

No further action has been taken due to the lack of response from the group on how to prioritize (or synchronize) these ideas to generate a specific RTAR.

Plan for Next Step:

Invite inputs from TC2.3 meeting at Denver. Establish WG to develop a RTAR before 2014 winter meeting based on one (or more) selected ideas.

1. Klepeis NE, Tsang AM, and Behar JV. Analysis of the National Human Activity Pattern Survey (NHAPS) Respondents from a Standpoint of Exposure Assessment. 1996. Final Report, EPA/600/R-96-074. U.S. Environmental Protection Agency.
2. Weisel CP, Zhang J, Turpin BJ, Morandi M, Colome S, Stock T, and Spektor DM. Relationships of Indoor, Outdoor, and Personal Air (RIOPA), Part I. Collection Methods and Descriptive Analysis. Research Report 130 Pt 1. Health Effects Institute.
3. Logue, J.M., T.E. McKone, M.H. Sherman, and B.C. Singer. 2010. "Hazard Assessment of Chemical Air Contaminants Measured in Residences." *Indoor Air* 21:92 109.
4. Logue, J.M., P.N. Price, M.H. Sherman, and B.C. Singer. 2011. A Method to Estimate the Chronic Health Impact of Air Pollutants in U.S. Residences. *Environmental Health Perspectives*. LBNL-5267E.

MEETING MINUTES
TC 2.3 - Gaseous Contaminants/Removal Equipment
Standards Subcommittee Meeting
Monday, June 24th 2013, 6:00-8:00 p.m.
Tower Building, Tower Court A, Denver, CO, USA

Attendance

Name

Charles Seyffer
Kathleen Owen
KJ Choi
Sanjeev Hingorani
Ashish Mathur
Paula Levasseur
Henry Greist
Brad Stanley
Charlene Bayer
Gemma Kerr
Dean Tompkins

1) Update on standards within scope of ASHRAE TC 2.3

- a) GPC 27P “Procedures for measurement of gases in indoor environments” – *Gemma Kerr*
Still progressing, ~ 1 year from completion.
- b) ASHRAE Std. 145.1-2008 “Laboratory Test Method for Assessing the Performance of Gas-Phase Air Cleaning Systems: Loose Granular Media” – *Kathleen Owen*
Under revision, should be finished in New York and then go out for public review.
- c) ASHRAE Std. 145.2-2011 “Laboratory Test Method for Assessing the Performance of Gas-Phase Air Cleaning Systems: Air Cleaning Devices” - *Kathleen Owen*
Still accumulating experience using method.

2) ASHRAE SPCs/SSPCs/TCs/TGs/TRGs activities

- a) MTG-EEC - Energy Efficiency Classification of General Ventilation Air-Cleaning Devices – *Brad Stanley*
GPC submission tabled by PPIS – revisions to be discussed tomorrow.
- b) TC 2.4 “Particulate Air Contaminants and Particulate Contaminant Removal Equipment” – *Gemma Kerr*
52.2 mired down in contentious addenda. Beginning to propose their own research projects (52.2 Research Subcommittee).
2.4 Research heard several proposals around residential methods/standards.
- c) TC 2.9 “Ultraviolet Air and Surface Treatment” – *Matt Middlebrooks*
 - i) SPC 185.1 “Method of Testing UVC Devices for use in air handling units or air ducts to inactivate airborne microorganisms” – almost ready for 2nd public review.
 - ii) SPC 185.2 “Method of Testing Ultraviolet Lamps for Use in HVAC&R Units or Air Ducts on Irradiated Surfaces” – addressing comments received from public review.
- d) TC 9.11 “Clean Spaces” – *Matt Middlebrooks*
Still progressing on Cleanroom Design Guide – sent sections to reviewers for comments.
- e) SSPC 62.1 “Ventilation and IAQ High Rise Buildings” – *Brad Stanley*
Approved addenda to move from MERV 6 to 8 prior to cooling coils. Approved addenda to allow reclassification of bathroom exhaust based on air cleaning. Additive effects of mixtures within IAQP approved to go out for letter ballot with unresolved comments.

- f) SSPC 62.2 “Ventilation and IAQ Low Rise Buildings”
Formed IAQ subcommittee.

3) Information Exchange

- a) AFS – *KJ Choi*
Fall Conference “Innovations in fiber media and membranes”: Oct. 14-16, 2013, Cincinnati, OH
2014 Annual Conference: May, 2014, Houston, TX (dates TBD)
- b) ASTM D22.05 “Air Quality” SC “Indoor Air”
No Update
- c) ASTM D28.04 “Activated carbon” SC “Gas Phase Evaluation Tests” – *Paula Levasseur*
 - i) D6646 - 03(2008) “Standard Test Method for Determination of the Accelerated Hydrogen Sulfide Breakthrough Capacity of Granular and Pelletized Activated Carbon”
 - ii) D5742 (2010) “Butane Activity”
No Update
- d) CEN/TC144 “Tractors and machinery for agriculture and forestry” – *Paolo Tronville*
 - i) EN 15695-2:2009 “Agricultural tractors and self-propelled sprayers - Protection of the operator (driver) against hazardous substances - Part 2: Filters, requirements and test procedures”
No Update
- e) CEN/TC 195 “Air filters for general air cleaning” WG 5 “Gas phase filters” – *Paolo Tronville*
No Update
 - i) EN ISO 10121-1 “Test methods for assessing the performance of gas-phase air cleaning media and devices for general ventilation - Part 1: Gas Phase Air Cleaning Media (GPACM)”;
 - ii) EN ISO 10121-2 “Test methods for assessing the performance of gas-phase air cleaning media and devices for general ventilation - Part 2: Gas Phase Air Cleaning Devices (GPACD)”
- f) CEN/TC 346 “Conservation of cultural property” WG 4 “Environment” – *Chris Muller*
No Update
- g) CEN/TC 386 “Photocatalysis” – WG2 “Air Purification” – *Paolo Tronville*
No Update
- h) ISO/TC 22/SC7/WG3 “Air and oil filters” – *Paolo Tronville*
No Update
 - i) ISO/TS 11155-2: 2009 “Road vehicles - Air filters for passenger compartments - Part 2: Test for gaseous filtration”
- i) ISO/TC 142 “Cleaning Equipment for Air and Other Gases” WG8 “Gas-phase air cleaning devices” – *Matt Middlebrooks*
Plenary meeting scheduled for Atlanta, GA, September 16-19 2013
 - i) ISO 10121-2 “Test methods for assessing the performance of gas-phase air cleaning media and devices for general ventilation - Part 2: Gas Phase Air Cleaning Devices (GPACD)”
Published.
 - ii) DIS 10121-1 “Test methods for assessing the performance of gas-phase air cleaning media and devices for general ventilation - Part 1: Gas Phase Air Cleaning Media (GPACM)” (FDIS due April 1st 2013) - No Update
 - iii) ISO/PWI 10121-3 “Test method for assessing the performance of gas-phase air cleaning media and devices for general ventilation - Part 3: Classification system for assessing the performance of gas-phase air cleaning devices for general filtration” – No Update
 - iv) ISO/PWI 10121-4 “Test method for assessing the performance of gas-phase air cleaning media and devices for general ventilation - Part 4: Field equivalent test method(s) for assessing the performance of gas-phase air cleaning devices for general ventilation” – No Update
 - v) US Technical Advisory Group (TAG) to ISO/TC 142
- j) ISO/TC146 “Air quality” /SC6 “Indoor air” - *No Update*

- k) ISO/TC 205 “Building environment design” – *No Update*
 - i) ISO 16814:2008 “Building environment design - Indoor air quality - Methods of expressing the quality of indoor air for human occupancy”
- l) ISO/TC 206 “Fine ceramics”/WG 37 “Test methods for photocatalytic materials”
No Update
 - i) ISO 22197-x:2007 “Fine ceramics (advanced ceramics, advanced technical ceramics) - Test method for air-purification performance of semiconducting photocatalytic materials
 - (1) Part 1: Removal of nitric oxide (2007)
 - (2) Part 2: Removal of acetaldehyde (2011)
 - (3) Part 3: Removal of toluene (2011)
 - (4) Part 4: Removal of formaldehyde (FDIS)
 - (5) Part 5: Removal of methyl mercaptan (FDIS)
 - ii) ISO/CD 18560-1 “Fine ceramics (advanced ceramics, advanced technical ceramics) -- Test method for air-purification performance of semiconducting photocatalytic materials by test chamber method under indoor lighting environment -- Part 1: Removal of formaldehyde”
- m) ISO/TC209 “Cleanrooms and associated controlled environments” – *Chris Muller*
 - i) ISO 14644-8:2006 “Classification of airborne molecular contamination” (under revision)
No Update
 - ii) ISO 14644-10:2013 “Cleanrooms and associated controlled environments - Part 10: Classification of surface chemical cleanliness”
No Update
- n) ITRI (Taiwan) – *Chris Muller*
No Update
- o) USGBC – *Charlene Bayer*
Voting for Version 4 LEED open until June 30. Scheduled to take affect January 2014. More of a health-based standard, more prescriptive requirements.
Pilot program including IAQP (P=Performance) based on SPC145.2 data which applies to ventilation procedure and IAQ procedure. Building monitoring must include specified list (incorporates California 1350).

4) Old Business

- a) Life Cycle Cost Calculation Guideline/Standard – included in LEED Version 4.

5) New Business

- a) Information exchange and coordination between ASHRAE SSPC 145 and ISO/TC142/WG8

6) Adjourn