

Draft Minutes
TC 2.4 Particulate Contaminants/Removal Equipment
Main Committee Meeting
Long Beach Convention Center 101B, Tuesday June 27, 2017
3:30-6:00 pm

1. Call to order..... Gemma Kerr
2. Introductions – 12 YEA Members
3. Roll call Zied Driss

Voting Member	Position	Present	Absent	Voting Member	Position	Present	Absent
Gemma Kerr	Chair			Brian Krafthefer			
Mike Corbat	Vice Chair			Bruce McDonald			
Zied Driss	Secretary			Kathleen Owen			
Todd McGrath				John Simenson	Standards Chair		
Rahul Bharadwaj				Brent Stephens	Research Chair		
John Zhang				Mike Waring			
Eric Brodsky	Handbook			Keith Chesson			
Bob Burkhead	Webmaster			Dara Fedderson	Program Chair		
Geoff Crosby				Matt Middlebrooks			

Total Present	18
Total Absent	0
Total Voting Members	18

Note: One voting member joined the meeting after the first vote

Non-Voting Officers		
Name	Subcommittee	Role
Anja Coenen	Standards	Vice Chair
Donna Sullivan	Program	Co-Chair
Jenni Wong	Membership	Chair
Marilyn Listvan	Publication	Chair
Rahul Bharadwaj	Research	Vice Chair
Tom Justice	Membership	Vice Chair

4. Welcome and opening comments Gemma Kerr
 - a. See **Addendum A** for ASHRAE Code of Ethics
 - b. Action Items
 - i. For Budgetary reasons ASHRAE asked committees to cut down on subcommittee meeting times (room rates are going up).

1. We cut down on Standards Time going from 2hrs to 1hr (Subcommittee chair confirmed no issues with 1hr)
2. We eliminated Publication subcommittee
3. If committee need time to hold a program, then the program could be held at the main TC meeting
- ii. Gemma attended **Basecamp** training, signed up the committee for it and sent an invite to all voting member and officers. Basecamp could be set up to handle subgroups within total group and manage access levels such as voting members for letter ballots.
- iii. Eric Brodsky signed up the committee for the authoring portal which could be used to manage the Handbook
- iv. Updated the information sheet for new comers (Jenny has the copy for distribution)
- v. Updated and shared Road Map for governance, planning and direction for the whole committee
- c. At the chair breakfast they introduced the TC badge which allows access to TCs but not for programs.
- d. Liaisons.
 - i. Bert Philips Section head from TAC stopped by. Nothing to report
 - ii. Pawel Wargocki from RAC:
 1. TC 2.4 one of the best performing Committees. After long beach we will have 3 active projects
 2. Please nominate student for Awards. Homer ADDAMS Awards deadline is December 15
<https://www.ashrae.org/membership--conferences/honors--awards>
 3. Parham Azimi, a student of Brent Stephens is the winner of Homer ADDAMS awards
 4. Grant-in-Aid Award, Deadline for submission March 1
 5. Deadline for submission of RTARs, WS, August 15, December 15 ... when in doubt contact Pawel
 6. Innovative Research Grant
<https://www.ashrae.org/standards-research--technology/research/innovative-research-grant-program>
 7. Some companies do not allow the usage of programs such as Skype, Basecamp, etc...
 8. Link Sent by Pawel for the committee
<https://www.ashrae.org/standards-research--technology/research>
 - e. Announcement: Pawel got a distinguished service award from ASHRAE.
5. Approval of Las Vegas Minutes Zied Driss

Motion to approve the minutes from Las Vegas – 1st Mike Corbat. 2nd Eric Brodsky 15-0-2-1: 18 (CNV)

6. Record of votes taken since Las Vegas Zied Driss
Nothing to Report, no votes were taken
7. Subcommittee Reports
 - a. Planning Subcommittee Report.....
 - Planning reviewed the RoadMap and will go for vote on a letter ballot.

- The 1 hr for standards subcommittee seem to be working well.
- Publications meeting will be no longer held
- Programs requested a change of the time slot to Monday from 3:15 to 4:15. To try it on Chicago Meeting 2018.
- Talk to move Handbook to once a year, subcommittee chair is ok with idea with a request to schedule it for the winter meetings.
- Subcommittee Chair Agenda must be up one month in advance of meetings
- Minutes posted from Main TC no later than 60 days after the meeting

See Addendum F for full report of upcoming proposals

b. Membership Subcommittee Report..... Jenni Wong

After the summer meeting

- i. Rolling off: 4 members: Eric Brodsky, Gemma Kerr, Kathleen Owen, Mike Waring
- ii. Rolling In: Anja Coenen, Jeff Seigel, Marilyn Listvan, Paolo Tronville
- iii. Board Change: Jeff Siegel (Secretary), Mike Corbat (Chair), Zied Driss (Vice Chair).
- iv. Anyone who is not a voting member could still participate as subcommittee chair
- v. Someone need to be a corresponding member to qualify as voting member
- vi. There is a tab on the ASHRAE website where interested people could register themselves as provisional members and then become corresponding members.

c. Research Subcommittee Report..... Brent Stephens

Meeting Sunday 41 attendees

- i. 7 RTARs were considered by RAC 1 accepted, 3 accepted with comment, 3 rejected.
- ii. 11 Work Statements were considered by RAC 1 was accepted, 7 accepted with comments, 3 rejected.
- iii. 1649, active project, Impact of Higher Efficiency Filtration on IAQ in Residential Environments with Central HVAC. Led by Jeff Siegel. PMS: Tom Justice, Gemma Kerr, Rahul Bharadwaj, John Zhang, Bruce McDonald. Amy Li presented at the Research subcommittee. The project is progressing well.
- iv. 1734, active project, Reproducing the Typical Urban Atmospheric Aerosol In Laboratory for Air Filter Loading. Project was awarded at the last meeting to Purdue University. Led by Brandon Boor. PMS: Paolo Tronville, Geoff Crosby, Tom Justice, Brian Krafthefer, Bruce McDonald. PMS will conduct a site visit in the fall. The project will officially start August 1, 2017
- v. 1756, Evaluation of Low-Cost Particle Sensors for Indoor Air Quality Monitoring in Smart Building Systems. WS Led by Brent Stevens, co-sponsored by TC7.5 Smart Building Systems. Estimated finish time is 1.5 years and estimated cost is \$150,000. Waiting to finalize PMS including TC7.5 members.

Vote will be taken this meeting to approve the PES bid winner decision. Chair asked guests, bidders, subcontractors and potential conflict of interest people to leave the room.

Motion to accept the PES recommendation on the winning bidder for WS 1756 – 1st Bob Burkhead. 2nd Bruce McDonald 16-0-1-1: 18 (CNV)

One voting member is a bidder and left the room during the vote - recorded as absent

- vi. Soon we will have 3 funded projects.
- vii. 1626 RTAR TC 5.1 will be cosponsor
- viii. 1784 Final draft WS is underway, 2.4 is the sponsor, and 52.2 is the co-sponsor. Will send a copy to Pawel and New Chair will send a letter ballot to vote on the Work Statement.
- ix. Announcement Indoor Air 2018 in Philly July 23rd to 27th. Mike Waring will be the Chair. Brent Stephens will be the Technical Chair

For full Report see Addendum B

- d. Standards Subcommittee Report..... John Simenson
Meeting Monday went for 1 hr instead of 2hrs. 29 Attendees
 - i. Discussion about 16890 and impact on 52.2. Christine Sun will run a volunteered approach Round Robin.
 - ii. Mike Corbat term as chair of 52.2 is over and Kathleen Owen will take over as a chair.
 - iii. 62.2 drafted an addendum proposal to enable filters to be tested in accordance to 16890 in addition to 52.2 and AHRI 680. They will circulate a letter ballot to vote on it.
 - iv. GPC 35 a finalized draft is underway. An inter-meeting telecon will be held.
 - v. TC 5.4 standard 199 was published last year.
 - vi. US TAG ISO TC 142. Rahul: Met Saturday from 2:30 to 3:30 36 people in attendance with 17 committee members no quorum:

See Addendum G for full report of upcoming proposals

- 1. Panel 1: Made some modification to the terminology document, went for vote and approved by US TAG. Request to reduce work item activity with at least 50% of members participate on any new work item
- 2. Panel 2: 15714 Method to evaluate the UV dose of in-duct UVGI, sent out for vote and approved by the US TAG.
- 3. Panel 4: ISO 29463.1 HELP/ULPA standard (will be replacing EN1822), voted on and unanimously approved final draft with minor changes. Europe will adopt the new standard once it is published within 1 year. .2, .3, .4, .5 of the standard were sent for re-authorization.
- 4. Panel 5: ISO 16313.1 (equivalent to Standard 199) request for new work item failed to pass for the lack of countries agreeing to participate.
- 5. Panel 11: Looking for new convener. Tim Johnson was nominated and will be the new convener.
- 6. Panel 13: New working group “Biological Equipment for gas phase treatment” looking for new chair, US members. Contact

Rahul if interested. First meeting will be September at the ISO
Plenary meeting in September 25 from 11 to 1pm)
Next ISO 13 Meeting will be held in Paris, from September 25 to 28.

- vii. Bob Burkhead gave an update on activities of MTG-ACR (Air Change Rate). With Steve Nicholas retiring, Bob was appointed Delegate to this MTG, and Mike Corbat as Alternate.
For full report see *Addendum C*
- e. Program Subcommittee Report..... Dara
Meeting Tuesday 13 attendees
Sponsored or Co-sponsored 5 programs for long beach and 2 were accepted
 - i. Seminar 22: Russ Taylor
 - ii. Seminar 61: KJ Choi
 - iii. Seminar 10: Eric Brodsky (not co-sponsored by 2.4)
 - iv. The call for conference papers for Chicago is closed. 96 papers are under review.
 - v. The Chicago deadline for Workshop, seminars, panel discussions ... is August 1st.
 - vi. Brainstormed 9 ideas for Chicago and 5 other beyond.
 - vii. See *Addendum D* for full report of upcoming proposals
- f. Publications Subcommittee Report..... Marilyn Listvan
 - i. The Publications meeting is canceled.
 - ii. Marilyn is collecting bibliography, articles.
 - iii. The idea is to get the hard work done the committee out there.
- g. Web Master..... Bob Burkhead
 - i. Website is up date with mins and agendas
 - ii. Working with Marilyn to get Publications & Links uploaded.
- h. Handbook..... Eric Brodsky
 - i. Meeting Saturday 7 attendees
 - ii. Chapter 29 was published in 2016, next publication is 2020.
 - iii. ASHRAE developed authoring portal for co-editing. Editors have to be in the roster, not necessarily TC 2.4 members, to be able to use the authoring portal.
 - iv. Brian Krafthefer volunteered to be the vice chair of the Handbook subcommittee
 - v. For full report see *Addendum E*
- 8. Reports from other TC, SSPC etc. liaisons
 - a. 62.1 – Marwa Zaatari:
The group met from Friday 8am to Sunday 7pm. Correct 3 days
There are 5 subcommittees, 3 subcommittees are relevant to TC2.4
 - i. IAQ Guide Subcommittee: Tasked to create a guide, the purpose of the guide is IAQ measure that go above and beyond minimum requirement of 62.1. The benefit is that subcommittee is trying to disseminate a lot of research that is not easily understood by everyone. Get involved please!
 - ii. Research and Education Subcommittee: Proposed 2 submissions for the next conference

1. Electronic Air Cleaner (health topic)
 2. Mis-application of IAQ Procedure
 - a. The committee voted to changes some appendixes that have PM2.5 or particles related topics.
 - b. Discussion about the Air Quality Procedure. One is to have a requirement to use Standard 52.2 to test air cleaning device also suggestion to add Standard 145.2
 - iii. Natural Ventilation Subcommittee
Discussion about particles infiltration
 - b. EHC: Jeff Seigel is rolling off. Not too much about particles. Filtration and Air cleaning position document was published in 2014. Desire to revise document to address some needs to 62.1. Action item is to find a new chair. Explicit motion that the chair from TC2.3 or TC2.4 be approached. EHC is responsible for running the specialty IAQ conferences. Their next meeting is 2019.
 - c. Geoff: MTG, IAST (Impact of ASHRAE Standard and Technology on Energy Savings Performance), the main goal is to show everything ASHRAE has done in terms of saving energy in particular apply some metrics to it and quantify it. Some difficulty to understand what's been asked from us. The chair met with members of ASHRAE executives committee to clarify the goals of the MTG and the path forward. The expectation is that we will be asked how any of our contributions, TC2.4, 52.2, GPC26, or GPC35 how we impacted performance energy ratings and indoor air quality.
 - d. SSPC-189: Nothing to report – No update
 - e. ISO TC 142 WG3 – Don Thornburg. Will meet in Paris in September to discuss any changes
 - f. ISO TC 142 WG12 – Geoff Crosby: Still looking for funding for the Round Robin for the European filter testing.
9. Old Business
No old business
10. New Business
Announcements:
- Few word about and memorial about Brad Stanley.
 - Phil Winters was awarded the "Distinguished Service Award".
11. Adjournment

Addendum A

ASHRAE Code Of Ethics (Approved by ASHRAE Board of Directors January 30, 2013)

1.140.001.1 As members of ASHRAE or participants in ASHRAE committees, we pledge to act with honesty, fairness, courtesy, competence, integrity and respect for others in our conduct.

- A. Efforts of the Society, its members, and its bodies shall be directed at all times to enhancing the public health, safety and welfare.
- B. Members and organized bodies of the Society shall be good stewards of the world's resources including energy, natural, human and financial resources.
- C. Our products and services shall be offered only in areas where our competence and expertise can satisfy the public need.
- D. We shall act with care and competence in all activities, using and developing up-to-date knowledge and skills.
- E. We shall avoid real or perceived conflicts of interest whenever possible, and disclose them to affected parties when they do exist.
- F. The confidentiality of business affairs, proprietary information, intellectual property, procedures, and restricted Society discussions and materials shall be respected.
- G. Each member is expected and encouraged to be committed to the code of ethics of his or her own professional or trade association in their nation and area of work.
- H. Activities crossing national and cultural boundaries shall respect the ethical codes of the seat of the principal activity.

Addendum B
ASHRAE RESEARCH SUBCOMMITTEE MEETING MINUTES
TC2.4 – Particulate Air Contaminants/Removal Equipment

Long Beach, CA
Summer 2017

Sunday, June 25, 2017
3:00 – 5:00 PM
Location: LBCC 202AB

1. Brent Stephens (chair) called the meeting to order at 3:05 pm.
2. Introductions. 41 people were present according to the sign-in sheet.
3. Chair reviewed the agenda
4. Research chair's comments
 - a. Goals of TC 2.4 research subcommittee:
 - i. Always have one funded project
 - ii. Consider particulate air filtration as well as the “nature of particulate contaminants” broadly
 - b. Reminders from last meeting:
 - i. RAC deadlines (Get “M-A-D” at RAC: May, August, December 15)
 - ii. ASHRAE has research money to spend and RAC wants to fund more applied research
 - iii. Updated research manual posted online
 - iv. Changes to URP, NIA, and GIA
 1. GIAs now due March 1 instead of December
 2. URPs are back with more complete criteria and instructions online
 3. Innovative research projects are back
 - v. RAC statistics update from last meeting (Vegas)
 1. 3 RTARS considered; 3 accepted
 2. 4 WS considered; 1 conditionally accepted (TC 2.4's); 3 returned
5. Chair briefly updated on active projects (there is currently one project in progress):
 - a. 1649-TRP Impact of Higher Efficiency Filtration on IAQ in Residential Environments with Central HVAC. PI: Jeff Siegel, University of Toronto. PMS: Tom Justice, Rahul Bharadwaj, Bruce McDonald, John Zhang, Brian Krafthefer, and Gemma Kerr.
 - i. PMS met Saturday June 24, 1:30 – 2:30 pm in LBCC 202AB. PI's student Amy Li presented a summary of the project to date. PMS will conduct a site visit this fall.
 - ii. Some noteworthy points from the preliminary data so far:
 1. Noteworthy comparison between MERV 14 E site 13 and 03 shows significant difference in efficiency.
 2. Noteworthy point: There is no strong correlation between effectiveness and MERV rating
 - b. 1734-TRP, Reproducing the Typical Urban Atmospheric Aerosol in Laboratory for Air Filter Loading

- i. Project awarded to Purdue University (PI: Brandon Boor) last meeting. PMS: Paolo Tronville (chair), Geoff Crosby, Tom Justice, Brian Krafthefer, Bruce McDonald. PMS did not meet because the official start date of the project is August 1, 2017. PMS will conduct a site visit this fall.
- c. 1756-WS, Evaluation of Low-Cost Particle Sensors for Indoor Air Quality Monitoring in Smart Building Systems. Cosponsored by TC 7.5 Smart Building Systems.
 - i. Project went out to bid with a deadline of May 15 2017. 10 bids were received.
 - ii. PES: Brent Stephens (chair), R. Vijayakumar (Vijay), Paolo Tronville, Glenn Remington (TC 7.5), Liping Wang (TC 7.5)
 - iii. Proposal evaluations are due Tuesday, June 27, 2017
 - iv. PES scheduled to meet Sunday night to agree upon a winning bidder.

6. RAC Liaison update

Pawel Wargocki provided a few updates from RAC: (1) Homer Addams Award - \$5,000 grant for students who participated in an ASHRAE RP or GIA – accepting nominations annually (due December 1); (2) you can now get a badge and program book if you only attend TC meetings and don't register for the conference. Homer Addams Award was awarded to Brent Stephens' former student Dr. Parham Azimi in 2017.

7. Work Statement (WS) activity between meetings

- a. 1784-RTAR on Round Robin with 52.2
 - i. Champion: Thad Ptak replaced Anja Coenen at the Vegas meeting
 - ii. Status: Accepted with comments. Authors are now working on WS. Keith Chesson sent a recent WS draft with the goal of meeting Fri June 23 with co-authors (Thad Ptak, Rahul, Bob Burkhead, Gemma, Tandeep, Leslie S, and Jim Rosenthal); must be submitted by August 15 2017 or will be dropped from RAC research and implementation plan. Thad has completed first draft; will run question by Pawel and the rest of the group. Plan to submit by August is in place.

8. RTAR activity between meetings

- a. 1626-RTAR Energy Implications of Air Filtration in Commercial Buildings
 - i. Current co-champions: Brent Stephens, Brian Krafthefer, Jeff Siegel, Zied Driss, Paolo Tronville, Geoff Crosby, and Michael Waring. Paolo and Geoff scheduled to attend TC 5.1 Fans and seek co-sponsorship and co-authoring. We may choose to drop this from the list and change the title and scope entirely and submit as a new RTAR, but will decide after learning more about interest from TC 5.1.

9. Liaison reports

- a. Addendum k to ASHRAE Standard 62.2-2016 was passed last meeting. It creates a compliance path based on the use of filtered recirculated air to reduce indoor exposures to PM2.5. When filtration requirements of the addendum are satisfied (MERV 11 and above, with decreasing requirements for system runtimes with increasing MERV), a 20% reduction in the required amount of whole-building ventilation is allowed

- b. New RTAR coming from 62.1 and/or 4.3: “Outdoor particulate matter penetration and indoor PM deposition rates in naturally ventilated commercial buildings” (Mike Waring expressed interest)

10. Work time on any existing RTAR, WS, and other proposals

- a. Impact on performance (efficiency and pressure drop) of air filters in high humidity and free moisture conditions
 - i. Stated interested parties: Bob Burkhead, Dave Matier, Paolo Tronville, Kathleen Owen, Rahul, added Jeff Siegel
- b. Embedded sensors in filters
 - i. Champion: Brian Krafthefer, added Paolo Tronville
- c. Develop a test method to evaluate the longevity efficiency of electrostatically charged media as an alternative to IPA discharge method
 - i. Champion: Rahul Bharadwaj with help from Al Vatine, John Zhang, Thad Ptak, Dan, John Horns, Vijay, and Zid. Rahul had put together a rough draft and it needs a lot of work as of Vegas meeting. Rahul sent Brent a draft RTAR that needs some work. Group met immediately before 2.4 research meeting to discuss and worked on some ways to improve the language and scope.
- d. Adding filtration into the guidelines for new MTGs for system design in (a) cold climates and (b) hot, dry climates. Also interested in bringing in TC 2.3. Wants to do a literature review. Would be low cost.
 - i. Champion: Tom Justice; not a research project; call for involvement
- e. Beginning of the end of MERV (new room-level test procedure)
 - i. Champion: Bob Burkhead (not discussed)
- f. Typical (ranges, variability in) indoor particle size distributions (literature review)
 - i. Champion: Paolo Tronville
 - ii. Group discussed how to approach this briefly.
- g. Standard 52.3 based on PM mass
 - i. Champion: Vijay, added Mike Corbat
- h. Complicated nature of ASHRAE Standards
 - i. Champion: Vijay (not discussed)

11. Group discussed new ideas for the rest of the meeting

- a. Jeff Siegel: Perceptions of filtration (do people perceive different IAQ when different filters are installed?) – would be a controlled environment study. Perhaps other physiological indicators (e.g. blood pressure, cardio biomarkers). EHC would probably lead; 2.4 would co-sponsor. TC 2.1? Q: Include electronic air cleaners? (A: maybe). Other interested parties in 2.4: Rahul, Brent. Interest attendee from Delos as well (did not catch name).
- b. Tom Justice: VRF systems and how do they filter? How fast are VRF systems growing in North America. How high MERV filtration could be? Literature review.

TC 8.11 Unitary And Room Air Conditioners And Heat Pumps. Maybe bring in mechanical outdoor supply ventilation systems (ERV/HRV). Brent/Jeff to seek section 8 at chair's breakfast.

- c. Brian Krafthefer: combination gas and particle filters in series. Suggest coming out of 2.3 with help from 2.4.

Adjourned at 4:58 pm

Addendum C
TC 2.4 STANDARDS SUBCOMMITTEE
MEETING MINUTES

Monday 4:15PM – 5:15PM, June 26, 2017
Renaissance / Wilmore (2)
Long Beach, CA

1. CALL TO ORDER

A. Introductions

B. Chair's comments

- Suggested meeting time change for Chicago to 3:15-4:15PM, in place of TC 2.3/2.4 Publications Subcommittee meeting and immediately following TC2.3 Standards Subcommittee meeting
- Several attendees cited a conflict with TC 5.4 meeting as a reason to maintain current timeslot – so, no change planned.

C. Review proposed agenda

2. UPDATE ON STANDARDS, GUIDELINES, AND MTGS WITHIN SCOPE OF TC 2.4

A. SSPC 52.2 - Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size (Michael Corbat)

- Long discussion about ISO 16890 and its impact on ASHRAE 52.2
- Informal round robin for ISO 16890 is being coordinated by Christine Sun / FTI
- 52.2 Research: Work Statement (for RTAR-1784, ASHRAE 52.2 round robin) going out for formal approval.
- SSPC 62.2 declined to wait on SSPC 52.2's written recommendation regarding addendum proposal (to enable filters tested under ISO Standard 16980-2016 to be used to meet the requirements of section 4.1.4, in addition to filters rated under ASHRAE Standard 52.2 and AHRI Standard 680). They will do a letter ballot and vote on this amendment.
- If approved, as expected, the amendment will then will go out for public review (in about a month) and everyone can make comments.
- John Simenson will monitor Standards actions announcements and notify interested parties to comment, as SSPC 52.2 recognizes some

issues with adopting this amendment (filters not meeting criteria for ePM_{2.5} rating)

B. GPC 35P - Method for Determining the Energy Consumption Caused By Air-Cleaning and Filtration Devices (Geoff Crosby)

- Research project (TRP-1734) is moving forward – start date of 1-Aug-2017
- Working draft is under way
- Work Plan was revised
- Interim meeting scheduled for October.

3. ASHRAE LIAISONS

A. TC 2.3 Gaseous Air Contaminants And Gas Contaminant Removal Equipment (~~Kathleen Owen~~ Matt Middlebrooks)

i. SSPC 145.1 - Laboratory Test Method for Assessing the Performance of Gas-Phase Air Cleaning Systems: Loose Granular Media

- Nothing to report

ii. SSPC 145.2 - Laboratory Test Method for Assessing the Performance of Gas-Phase Air Cleaning Systems: Air Cleaning Devices

- Working to address things that need to be changed to eliminate the restrictions that apply to electronic types of air cleaners. Title, purpose and scope change will move forward.
- Interest in chamber test, which is not part of SSPC 145.2, and would be a new standard.

B. TC 2.9 Ultraviolet Air And Surface Treatment (~~Matt Middlebrooks~~ Kathleen Owen)

i. SSPC 185.1 - Method of Testing UVC Lights for Use in Air Handling Units or Air Ducts to Inactivate Airborne Microorganisms

- Test method proposals for bio-aerosols. Get more people to use the test method.
- Calculation problems make this method not practical. High variability with current calculation.
 - It's cool math - ask Kathleen.

ii. SSPC 185.2 - Method of Testing Ultraviolet Lamps for Use in HVAC&R Units or Air Ducts to Inactivate Microorganisms on Irradiated Surfaces

- See notes above
- C. TC 5.4 Industrial Process Air Cleaning (Bruce McDonald)
- Standard 199 is published.
 - Restart work on a mist eliminator/removal project that may lead to standard test method.
- ii. SPC 199 - Method of Testing the Performance of Industrial Pulse Cleaned Dust Collectors
- ASHRAE 199 was published in June 2016
- D. TC 9.6 Healthcare Facilities (Zied Driss)
- Plan to organize a forum about filtration and will address 52.2 (vague subject)
 - Will also organize another forum about air purifiers for Chicago.
 - Discussion about air change rates: want to come up with new definition about air change rates and ventilation
 - Research about ventilation – completed literature review with 770 published papers. Filtration has the most published data and highly rated data, but number of publications relatively small.
- ii. SSPC 170 - Ventilation of Health Care Facilities
- They have been meeting a lot. FGI will be republished in 2018.
 - Implication for 2.4 - have to vote on filtration table.
 - Note on MERV 7 or MERV 8 will probably go through
- E. SSPC 62.1 - Ventilation for Acceptable (Commercial) Indoor Air Quality (Charlie Seyffer)
- No update.
- F. SSPC 62.2 - Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings (Brent Stephens, Tom Justice)
- John Simenson will go to next meeting.
 - See SSPC 52.2: Upcoming vote on addendum.
- G. SSPC 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings
- No update. Need to appoint a liaison to attend.
- H. SPC 180 - Standard Practice for Inspection and Maintenance of Commercial-Building HVAC Systems (Phil Maybee)

- No update.
- I. SSPC 189.1 - ANSI/ASHRAE/USGBC/IES Standard for the Design of High-Performance, Green Buildings Except Low-Rise Residential Buildings – *inclusion of IAQ?* (Charlie Seyffer)
- No update.
- J. SPC 189.3P - Design, Construction and Operation of Sustainable High Performance Health Care Facilities
- No update.
- K. US TAG to ISO/TC 142 - Cleaning equipment for air and other gases (Rahul Bharadwaj)
- A total of 36 people in attendance, only had 17 committee members present and did not have a quorum.
 - We are drafting a proposal for the plenary ISO meeting: Vijay is going to help draft the proposal for reducing activity of work items. We would request that at least 5 working group members or at least 50% of the members whichever is lower, participate on new proposed work items.
 - AP1, terminology has made some revisions and clarifications to the terminology document to join some terms together – that was sent to vote early this year and has been approved by the TAG. 29464 document was published and the notification was received this morning.
 - AP 2, UV-C, ISO-CD15714 (Method to evaluate the UV dose of in-duct UVGI air disinfection facilities) – was sent out for voting on May 10 2017 and was Disapproved by US TAG.
 - AP 4, HEPA/ULPA. AP unanimously approved final draft of the 29463 part 1 which only had minor changes. Part 2, 3, 4, and 5 were sent for reauthorization. Europe will have 1 year to replace EN 1822 after the formal publication of 29463.
 - AP 5, Dust collectors: 16313-1 which is ASHRAE 199 in the ISO Form. This was up for vote for a new work item and vote failed due to lack of countries agreeing to participate (needed 5, received 4). This is officially closed as it did not pass.

- AP 7, Durability of cleanable media: ISO/TC 142 has issued a new proposal 22031, Sampling and test method for cleanable filter media taken from filters of systems in operation. AP7 voted to approve.
 - AP 8, Gas Phase: The only semi-active project is 10121-3 to create a rating system for gas-phase filters.
 - New Working Group 13 has been created and will focus on Biological equipment for waste gas treatment, they are looking for AP chair, US Experts and members that would like to join the WG. Their first meeting will be on 9/25/2017 from 11-1PM, in Paris
 - 13th ISO Plenary meeting – 2017: September 25th 2017 to September 28th 2017 in Paris. Schedule and hotel information has been published.
- L. GPC 23 - Guideline for the Design and Application of Heating, Ventilation and Air Conditioning Equipment for Rail Passenger Vehicles
- Drop from the agenda.
- M. Environmental Health Committee (Barney Burroughs)
- Has not had an update in a while.
 - Zied: they are publishing a position paper. Members for the position paper have been defined. TC 9.6 Interim meeting in the next few months.
 - Contact Barney via email before the next meeting for an update
- N. GPC 29 - Guideline for the Risk Management of Public Health and Safety in Buildings
- No update in a while.
 - Contact Barney Burroughs via email before next meeting for an update
- O. MTG.O&MEE, Operations And Maintenance Activities That Impact Energy Efficiency (Tom Justice)
- Is being dissolved and adsorbed into new MTG (Effective building operations) MTG.OBEO
 - Tom will send note to interested parties.
- P. MTG.ACR, Air Change rate (Bob Burkhead)
- Bob Burkhead: big committee (50 people). Steady meetings, a lot of activity, and expect input from TC 2.4.
 - Tom will send a note to interested parties.
- Q. AHRI Standard 680 (Eric Brodsky)

- i. Add to agenda for Chicago.
- 4. OLD BUSINESS**
- A. Report of Working Group Regarding: Proposal for new standard regarding residential filter test method (Tom Justice)
 - Note RP 1649 research project is halfway through. PMS will do on-site visit. Potential to make an addendum to ASHRAE 52.2.
 - B. TC 9.3 Research Project, Commercial Aircraft Cabin Air Quality Study (1262-RP): multi-year research project (\$2.4MM)
 - In political limbo.
 - C. Panel proposal for multi-technology air cleaners (gas, particle, UV) – how to measure performance of a cleaning train at the same time. TC 2.3/2.4/2.9 co-sponsorship (Donna Sullivan, Kathleen Owen)
 - No update. TC 2.9 is trying to get a panel together, but they are only looking at UVC and bi-polarization.
 - Maybe take it off of this list until they get further.
- 5. NEW BUSINESS**
- No new business
- 6. INFORMATION EXCHANGE**
- A. AFS (KJ Choi, Rahul Bharadwaj)
 - i. 2017 AFS Fall Conference
 - September 18-20, 2017, Marriott St. Louis Airport, St. Louis, MO
 - ii. 2018 AFS Spring Conference
 - April 23-25, 2018, Mystic Lake Conference Center & Resort, Minneapolis, MN
 - B. CEN/TC 195 - Air filters for general air cleaning (Paolo Tronville)
 - Proposal for Research Project on a new general ventilation air filter ageing procedure has been forwarded to the European commission – waiting for an answer
 - C. EUROVENT (Paolo Tronville)
 - Energy classification 4/21. Rating energy efficiency of kep (quality factor – accounting for efficiency and pressure drop). Loading dust is ISO Fine. Using 700 grams for ePM₁₀ filters, 400 grams for ePM_{2.5}, and 300 grams

for ePM₁ filters. Calculate an average pressure drop. Data is used to calculate kep (Key Energy Performance)

- EUROVENT will use ISO 16890 efficiency rating beginning in 2018
- Guide to air filtration has been published – see link
 - <https://eurovent.eu/sites/default/files/field/file/2017-04-03%20-%20Eurovent%20Air%20Filters%20Guidebook%20-%20web.pdf>

D. IEST – Institute of Environmental Sciences and Technology (Vijay)

- Bob Burkhead: met in Louisville 3 weeks ago, very poor attendance. Membership dropped from 20,000 to 4,000.

E. INDA – International Nonwovens Development Association (Tom Justice)

i. Filtration 2017

- October 10-12, 2017, Navy Pier, Chicago, IL

F. NAFA (Tom Justice)

- Indianapolis, IN – same week as AFS. Annual meeting, not technical conference.

G. ISO/TC 22/SC 34 - Road vehicles - Propulsion, powertrain and powertrain fluids (Paolo Tronville, Bruce McDonald)

i. WG3 – Air filters

- WG-3 also writes the dust standards (AC fine), 12103-3 generated soot as loading aerosol. Two levels based on how many hydrocarbons are in there.
- Part 3 is out for DIS vote.

ii. WG11 – Filtration performance of closed crankcase ventilation systems

- No update. Remove from agenda?

H. UL 900 (Randall Haseman)

i. Expected to get a proposal for revisions, but never got one.

I. IAQ Meetings (Jeffrey Siegel)

i. No update.

J. FILTECH Expo and Conference

i. March 13-15, 2018, Cologne, Germany

K. Indoor Air Conference

i. June 2018, Philadelphia, PA

L. American Association for Aerosol Research

- i. October 16-20, 2017, Raleigh, NC
 - ii. **Kathleen has a poster presentation.**
- M. Nano conference by NC State and INDA
- i. **No update.**
- N. Asia Filtration Show
- i. **No update.**
- O. World Filtration Congress
- i. WFC 13 has been awarded to San Diego, April 20-24, 2020
- P. World Congress of Particle Technology
- i. **Orlando, FL Apr 22-26, 2018**

7. APPENDIX – ATTENDANCE

	Name	Company/Address
1	John Simenson (Chair)	Johns Manville
2	Anja Coenen (Vice-Chair)	Freudenberg
3	Rahul Bharadwaj	AAF Flanders
4	Bob Burkhead	Blue Heaven Technologies
5	Dara Feddersen	Hollingsworth & Vose
6	Don Thornburg	Camfil
7	Jeni Wong	Johns Manville
8	Tim Johnson	TSI
9	Tom Justice	Zene
10	Monroe Britt	Green Leaf
11	Kevin Kwong	LMS Technologies
12	Randall Haseman	UL LLC
13	Ahwah Francis	F.I.M.
14	Kathleen Owen	RTI
15	Todd McGrath	Glasfloss Industries
16	Michael Corbat	Custom Filter
17	Sanjeev Hingorani	Lennox Industries
18	Keith Chesson	Parker
19	Len Duello	Georgia-Pacific
20	Steve Han	Clean & Science
21	Tim Ahn	Clean & Science
22	Kyung-Ju Choi	Clean & Science
23	Isha Sharma	ORNL
24	Mick Flom	3M
25	Daniel Mason	Bioclimatic Air Systems
26	Bruce McDonald	Retired
27	Matt Middlebrooks	Filtration Group
28	Zied Driss	Camfil
29	Joel Davis	AAF Flanders

Addendum D

**TC 2.4 Program Subcommittee Meeting June 27, 2017 10-11 AM 202C
LBCC**

Sub-Com co-chairs: Donna Sullivan and Dara Feddersen

Submitted for Long Beach:

Seminar 22 (2.4 co-sponsor)	Russell Taylor	What is the Prospect for Low-Cost Chemical and Biological Threat Detection and Response in Commercial Buildings?	Monday June 26 8-930AM Room 101B
Seminar 61 (2.4 co-sponsor)	Kyung-Ju Choi	Do you know What You are Breathing?: Indoor Air Contaminants (Resubmitted from LV)	Wednesday June 28 11-1230PM Room 201A
Forum	BrianKrafthefer	Will Climate Change Filtration in the Year 2035	Not Selected
Debate	Marilyn Listvan	Filtration Doesn't Matter	Not Selected
Workshop	Geoff Crosby	Gambling With Your Filter Costs: Considerations for Total Costs of Ownership	Not Selected

Programs to Note in Long Beach:

- New to Long Beach: 2 Panels and 3 Debates scheduled
- Seminar 10 SGPC 10 130-330 Sunday “Research Methods to Achieve Superior Comfort, Health and Well-Being in Buildings” – Chair: Eric Adams Speakers: Eric Saunders, Eric Brodsky, Frederick Marks, Nicholas Clements

Chicago: The call for papers is closed. Currently, 96 Conference Papers are currently under review.

**Debate, Forum, Workshop, Panel Discussion, and Seminar Proposals:
Due August 1, 2017**

- Track 1: Systems and Equipment
Track Chair: **Carrie Anne Crawford** Email: carriecrawford@eeace.com
Selection of equipment and systems is paramount to HVAC&R design. Papers and programs in this track will assist designers, engineers, and operators in the design, selection, and operation of HVAC&R systems and equipment.
- Track 2: Fundamentals and Applications
Track Chair: **Kevin Marple** Email: kmarple@benzco.com
Fundamentals are the foundation for understanding applications in engineering. Key components of ASHRAE fundamentals include thermodynamics, psychrometrics, fluid and mass flow, IAQ, and building envelope. This track provides opportunities for papers and presentations of varying levels across a large topic base. Concepts, design elements and shared experiences for theoretical and applied concepts of HVAC&R design are included.
- Track 3: Standards, Guidelines and Codes
Track Chair: **Corey Metzger** Email: corey.metzger@resourcece.com
ASHRAE is known for its standards and design guidelines – and they are constantly evolving with the intent on improving the built environment and its systems. Designers, Contractors, Architects and Owners must be able to

keep up with the continuing changes in the current cycle but to also be prepared for the future changes. In addition, there is a large interaction of ASHRAE with the code authorities and government to incorporate these standards and guidelines. The series of sessions in this track highlight the changes to the standards and guidelines, their projects path and optimum design techniques to meet or exceed the standards.

- Track 4: Earth, Wind & Fire

Track Chair: Ashish Rakheja Email: ashish.rakheja@aeonconsultants.in

Designing for natural elements and other possible disasters often requires specific elements of building design and construction. From materials to stabilizing elements and simulations to specifications, these options must be incorporated. This track will deliver on modern strategies to address all of these conditions. Be prepared to be blown away by industry practices to prevent disastrous results.

- Track 5: Transportation IAQ and Air Conditioning

Track Chair: Dimitris Charalambopoulos Email: dimitris@ashrae.gr

Often considered boutique engineering, both enclosed vehicular facilities and transportation design, construction, operations, and maintenance needs to be elevated to equal status with other HVAC applications. These systems require the same design approach as other system designed but usually have special technical requirements that mandate close velocity capture/control, air quality control, etc. that can be overlooked but the more traditional building system design engineer. This track will seek case studies and trouble-shooting projects highlighting the opportunities and pitfalls associated with these unique applications.

- Track 6: Tall Buildings

Track Chair: Leticia Neves Email: leneves@gmail.com

Chicago is home to one of the tallest buildings in the world. One that stood the tallest in the world for nearly 25 years. However, today, more and more tall buildings are being designed and constructed. This track will draw upon "larger than life" case studies, as well as large building HVAC systems that can be classified as "innovative and/or 21st century" that highlight the opportunities presented and achieved by the designer, builder, and operator for facility HVAC systems throughout the world.

- Track 7: Modeling Throughout the Building Life Cycle

Track Chair: Joseph Farrantello Email: j.farrantello@gmail.com

Modeling was originally concerned primarily with building and system design specifications. The demands of energy efficient operation brought about the need for modeling of part-load operation for a variety of off-design conditions. The explosion of computational capacity and data collection capability is rapidly expanding the scope, complexity and practical applications of modeling both during design, but even more so for fault detection, diagnostics and operational optimization. Thirty years ago, people were dreaming of doing some of the things that Building Information Modeling is now bringing to reality. Presentations and papers are solicited related to all aspects of building modeling, with a particular interest in successful applications that have extended modeling into operational phases of the building life cycle.

- Track 8: Heat Exchange Equipment

Track Chair: Vikrant Aute Email: vikrant@umd.edu

Given the critical importance of energy efficiencies and reliability of HVAC systems, new heat and mass transfer HVAC & R equipment and advanced systems have been developed. Bringing non-traditional technologies to the actual field is not trivial task and how to design the equipment and characterize the performance of new HVAC & R technologies under real field type conditions are still open questions. The papers and programs in this track will inform designers, engineers, building energy, simulation modelers, and energy consultants and practitioners in the use of non-traditional heat exchange equipment and advanced HVAC & R systems under real field type conditions. The track will focus on fundamentals and applied aspects, on current challenges and recent advancements for managing frost growth, water condensate, fouling, corrosion, and mitigation of mold growth and bacteria that are often encountered in heat exchange equipment when working under real field type conditions.

- Track 9: Refrigerant Mini Track @ Expo"

Track Chair: Gary C. Debes Email: gcdebes@verizon.net

*Section will determine topics, speakers, session types, etc.

- Track 10: Residential Mini Track @ Expo"

Track Chair: Gary C. Debes Email: gcdebes@verizon.net

*Topics, speakers, session types, etc. will be determined by the cognizant committee.

Winter Conference Chicago, IL January 20-24, 2018

Conference Program Chair: Michael Collarin

Email:

Michael.Collarin@parsons.com

Proposals:

Type	Title	CoSponsor	Chair
Workshop	Climate and particulates: filtration, loading, entrainment	2.4, 2.9?	Brian Krafthefer
Workshop	Gambling With Your Filter Costs: Considerations for Total Costs of Ownership	2.4	Geoff Crosby Re-submit
Debate	Filtration Doesn't Matter Moderator: Marilyn Listvan Panelists: Jeff Siegel, Denis Stanke, Don Thornburg, Matt Middlebrooks (?)	2.4, 2.3	Marilyn Listvan Re-Submit

Forum/ Workshop	Guideline 29 (Building security, Chem Bio) ?	TG2 (looking for 2.4 co sponsor)	Scott Campbell or B. Burroughs
Conf. Paper	How can filters be rated by their PM (PM1, PM2.5, PM10) performance? ... Confirm this one	52.2	Thad Ptak, Brent, Michael Waring, D. Thornburg
Workshop	Future Filtration Needs (Fines & Ultra fines/ VOCs) ... Maybe Chicago		Kathleen Owen, R. Vijayakumar, Paolo Tronville
Panel	Multi-technology air cleaners: 1. Gas 2. Particle 3. UV Bio Aerosol (2.9 may be pushing this)	2.3, 2.4, 2.9	Kathleen Owen, Ashish Mathhur, Brian Hopindort
Seminar	Smart Filters (Sensors & Filter Operations)	2.4, 2.3	Brian Krafthefer – Brent, Seigel, Chuan He
Seminar/ workshop	Combination filters (residential, commercial)	2.3, 2.4	KJ

Proposals Beyond Chicago:

Type	Title	CoSponsor	Chair
	Particles above 10 um		Brian
	Smart fibers		KJ
Seminar	You bet your life: Particulate matter matters!!	2.5, EHC?, IEQ- GA	Marilyn Listvan – Bill Bahnfleth, C Seyffer, Singer
Debate	MERV vs ePMx		Brian
Debate/ workshop	Discussion of particles in space, health effects, contamination effects, measurement		Dara/Tim

Debate: 1 Moderator, 60-90 minutes, 3-4 panelists, no individual presentations

Forum: 1 Moderator, 60 minutes, no presentations

Panel: 1 Moderator, 60-90 minutes, 3-6 participants, no individual presentations

Seminar: 1-2 presentations, 60 minutes; 3-4 presentations, 90 minutes

Workshop: 1 chair, 2 presenters (max), 60 minute length only (30 minutes for presentations, 30 minutes for discussion), open format

Addendum E

**ASHRAE MEETING MINUTES – Long Beach
TC 2.4 - Particulate Contaminants/Removal Equipment**

Handbook Subcommittee Meeting Draft

Sat. June 24, 2017 1:00 – 2:30

1. Call to order 1:00 PM Eric Brodsky, Chair
2. Introductions
3. Attendees (7): Gemma Kerr, Dan Haas, Brian Krafthefer, Sanjeev Hingorani, John Simenson, Dana Feddersen, Eric Brodsky
4. Session Notes
Chapter 29 was republished in 2016, the next update will be 2020

The chapter was discussed with the following comments.

- a. ASHRAE now has an authoring portal for co-editors. Eric will distribute instructions for how to use it.
- b. Eric will also distribute the most recent chapter to attendees for review and to recommend areas that need updates.
- c. From the Jan 2017 meeting - Potential areas for updating include:
 - a. Adding information about ASHRAE Research 1691 Modeling the impact of Residential HVAC filtration on indoor particles of outdoor origins
 - b. Adding information about ASHARE Research 1649 IAQ and Energy Implications of High Efficiency Filters in Residential Buildings
 - c. Changes in ISO status
 - d. Including information on industrial applications
5. Other Business- The committee is looking for a Deputy Handbook Chair.

Meeting adjourned --2:00

Prepared by Eric Brodsky,
Draft Minutes submitted: 7/6/17

TC 2.4 Planning Subcommittee – Long Beach Meeting Agenda

Tuesday, June 27, 2017

8:00 – 10:00 am

Convention Center, Room 202C, 2nd Floor

- 1) Call to order and introductions.
- 2) Scope for the Planning Subcommittee
Evaluate and propose methods for improving the operations of TC 2.4 and its subcommittees. This would include recommendations to the committees on "How" and "Why" we are operating as committees, ways to improve participation in TC 2.4 activities, and future activities and direction of the committees. The focus of the planning committee is not intended to be "What" we have done in the committees.
- 3) TC 2.4 Main committee
 - a. Gemma will update the road map per the meeting.
 - i. Michael to send out for the letter ballot for approval and post if approved.
 - b. 1 hour for Standards seemed to work well. Leave 4:15-5:15
 - c. Remove publication meeting. Move Programs to old Publications time Monday 3:15-4:15?
 - d. Move handbook to once per year? Talk to Eric B.
 - e. Minutes must go up within 2 months of the meeting.
 - f. Agenda needs to go up at least 1 month before the meeting.
 - g. Michael to look deeper into using Basecamp.
- 4) Planning Subcommittee – Add Road map as agenda item
 - a. Keep meeting as planned.
 - b. Updating road map.
 - c. Should this be TC Vice Chair responsibility?
- 5) Membership Subcommittee
 - a. Include full roster with sign in sheet
- 6) Research Subcommittee
 - a. Nothing
- 7) Standards Subcommittee
 - a. Official liaison reports done through subcommittee. Gemma to send Johns official liaison report
 - b. Who is contacting VC of 2.4 or standard sub-committee chair
 - c. Need approval for official liaisons.

- 8) Handbook Subcommittee
 - a. Move to once a year and hold web call interim.
 - b. Add a Vice Chair

- 9) Web Master
 - a. Now up to date.
 - b. Gemma to work with Bob and Kenneth to improve.

- 10) Old Business
 1. Amount of time being spent in meetings.

- 11) New Business
 1. Road Map Update. 2015 version has been circulated for review

- 12) Meeting adjourn.

Attendees – 19

Michael Corbat

Len Duello

Kathleen Owen

Kevin Kwong

Dara Feddersen

Marilyn Listvan

Keith Chesson

Paolo Tronville

Matt Middlebrooks

Tim Johnson

Gemma Kerr

Monroe Britt

John Simenson

Bobby Singer

Tom Justice

Sanjeev Hingorami

Kyung-Ju Choi

Brian Krafthefer

Ahwah Francis

Addendum G

US TAG TC 142 meeting Highlights

1. A total of 36 people in attendance, only had 17 committee members present and did not have a quorum.
2. We are drafting a proposal for the plenary ISO meeting: Vijay is going to help draft the proposal for reducing activity of work items. We would request that at least 5 working group members or at least 50% of the members whichever is lower, participate on new proposed work items.
3. AP1, terminology has made some revisions and clarifications to the terminology document to join some terms together – that was sent to vote early this year and has been approved by the TAG. 29464 document was published and the notification was received this morning.
4. AP 2, UV-C, ISO-CD15714 (Method to evaluate the UV dose of in-duct UVGI air disinfection facilities) – was sent out for voting on May 10 2017 and was Disapproved by US TAG.
5. AP 4, HEPA/ULPA. AP unanimously approved final draft of the 29463 part 1 which only had minor changes. Part 2, 3, 4, and 5 were sent for reauthorization. Europe will have 1 year to replace EN 1822 after the formal publication of 29463.
6. AP 5, Dust collectors: 16313-1 which is ASHRAE 199 in the ISO Form. This was up for vote for a new work item and vote failed due to lack of countries agreeing to participate (needed 5, received 4). This is officially closed as it did not pass.
7. AP 7, Durability of cleanable media: ISO/TC 142 has issued a new proposal 22031, Sampling and test method for cleanable filter media taken from filters of systems in operation. AP7 voted to approve.
8. AP 8, Gas Phase: The only semi-active project is 10121-3 to create a rating system for gas-phase filters.
9. Working group 11 was looking for a new working group convener and we actually have Tim Johnson who was appointed our new WG convener from US with a very close vote.
10. New Working Group 13 has been created and will focus on Biological equipment for waste gas treatment, they are looking for AP chair, US Experts and members that would like to join the WG. Their first meeting will be on 9/25/2017 from 11-1PM, in Paris
11. 13th ISO Plenary meeting – 2017: September 25th 2017 to September 28th 2017 in Paris. Schedule and hotel information has been published.