TC 2.4 Particulate Air Contaminants/Removal Equipment
Main Committee Meeting

Draft Minutes

Friday January 29, 2021
2:00-5:00 pm Eastern Time
Virtual Conference
https://ashrae-org.zoom.us/j/97537083985?pwd=a01mR0N1amlrRk9VTzVjcmZCYWF5dz09

Today's Theme
BB King - Jazz

1. Call to order…… Zied Driss
2. Introductions
3. Roll call ……..…… Dara Feddersen

Name	Position	Present	ABS			
Zied Driss	Chair	X		Len Duello	x	
Jeffrey Siegel	Vice Chair	X		Kathleen Owen	x	
Dara Feddersen	Secretary	X		James Parris	x	
Geoff Crosby		x		Jonathan Rajala	x	Program
Brandon Boor		x		Christine Sun	x	
Paul Francisco		x		Paolo Tronville	x	
Timothy Johnson		x		Jennifer Wong	x	
Carolyn Kerr		x		Marilyn Listvan	x	Publications
Kevin Kwong		x		Chrystal Jolliffe	x	
Non-voting officers				**Total Present**	**18**	
Brian Krafthefer	Handbook			**Total Members**	18	
Bobby Singer	Standards					
Jonathan Rajala	Program					
Bob Burkhead	Webmaster					
Barney Burroughs	ALI					
Stephen Nicolas	MTG					

4. ASHRAE Code of Ethics Commitment ..…. Zied Driss
   In this and all other ASHRAE meetings, we will act with
   a. honesty,
   b. fairness,
   c. courtesy,
   d. competence,
   e. integrity,
   f. and respect for others,
   g. and we shall avoid all real or perceived conflicts of interests. (See full Code of Ethics: https://www.ashrae.org/about-ashrae/ashrae-code-of-ethics.)
5. Chair Comments

Please write your name, email, and affiliation in the chat session

a. Summer Conferences – We do not know Yet
b. RAC – Christopher Wilkings: Research Funding is reduced,
    i. Commitments to pay previous Grants!
    ii. $2.6 Million in Grants
    iii. 12 to 15 projects per year
    iv. Still accepting RTARs and WSs (Better Be the best they are very very very selective)
    v. For now accepting project but not released for Bid
    vi. Publication Projects (not related to research) can be funded through tech council.
c. Base Camp Karine LeBlanc (ASHRAE website search for Basecamp)
    i. Accepts Members and outsiders (no rules i.e. chair rules)
    ii. Base Camp has merit – it is not a word shared editing program it is better - ZD.
d. YEA Members: Get involved this is priceless VISIBILITY and Career advancement opportunity

6. Liaison Report
7. Particle Party……..…. Keith Chesson
    a. Its Really-Virtual!

Please write your name, email, and affiliation in the chat session

8. Approval of Winter Virtual Minutes…….. Dara Feddersen
    a. 3 minutes

        Len motion to accept the minutes of the last meeting, Jeni 2nd (17=Y, N=0, A=0, CNV)

9. Record of votes taken since VM …… Dara Feddersen
    a. Co-sponsor WS: "Study of the Level of Filtration Required to Maintain Electronic Equipment Reliability in Regions of High Sea Salt Concentrations"
    b. Co-sponsor TC2.1 WS: "IAQ Big Database"

Please write your name, email, and affiliation in the chat session

10. Subcommittee Reports
    a. Planning Subcommittee Report…….. Jeff Siegle
        10 minutes briefing
    b. Membership Subcommittee Report…… Jeni Wong
        10 minutes briefing
    c. Research Subcommittee Report……. Brent Stephens
        10 minutes briefing
        Appendix C

Please write your name, email, and affiliation in the chat session

    d. Program Subcommittee Report……..…. Jon Rajala
        10 minutes briefing

Appendix B

e. Standards Subcommittee Report……. Bobby Singer
   10 minutes briefing
   52.2 (Kathleen might not be able to talk, Todd Texas and Matt will elaborate)
   Appendix D
f. Publications Subcommittee Report……. Marilyn Listvan
   10 minutes briefing
g. Web Master……..… Bob Burkhead
   10 minutes briefing
h. Handbook…… Brian Krafthefer
   10 minutes briefing
   Appendix A - See notes for important DEADLINES

11. Old Business
    Brian K: 2.3 and 2.4 should understand the interphase between Gas and Particle. Formation of particles from gases and likely mechanism for particle formation and how that affects IAQ. Or better call it 2.35. Task Group: Peter McKinney, Bruce, Brian, Gemma

Please write your name, email, and affiliation in the chat session

12. New Business
    Misc Announcements (Conferences, Awards, etc.)

Save the attendance file before adjourn

13. Adjournment
    Marilyn motioned to adjourn, Jeni 2nd

Appendix A - TC 2.4 Particulate Air Contaminants/Removal Equipment
Handbook Subcommittee Minutes
Chapter 29, Air Cleaners for Particulate Contaminants, HVAC Systems and Equipment Volume - 2024
Tuesday, January 26, 2021

14. Call to order at 11:36
15. Noted who was present and had Christine take minutes.
16. Attendees:

Himanshu Jasuja
Kathleen Owen
Jeffrey Siegel
Gemma Kerr
Brian Krafthefer
Christine Sun
Len Duello
Geoff Crosby
Don Thornburg
Jon Rajala
Sanjeev Hingorani
Jim Rosenthal
Tim Johnson
Bruce McDonald
Peter McKinney
Paolo Tronville
Paul Francisco
Caitlin Naske
Kyung Ju Choi
Jordan Clark
Chrystal Jolliffe
Matt Middlebrooks
Rahul Bharadwaj
Richard Chesson
Jeni Wong
Scott Parris
Joel Davis

17. There were no ASHRAE Liaisons for 2.4 present.

18. Discussed chapter 29 which needs to be into ASHRAE by about July 2023
    a. Brian will lead the chapter review, with Bob Burkhead as backup for Brian & Brendon Boor
    b. Discussed selecting chapter reviewers inside and outside ASHRAE. KJ will ask AFS and KFS; Zied will ask AHRI: and Gemma will ask AHAM Sections. The sections need to be reviewed by the entire committee and volunteers were asked to select which sections they want to review. This selection should be done by March. The sections in the current chapter are given below.

        1) *Terminology*
        2) *Acronyms*
        3) *Atmospheric Aerosol*
        4) *Aerosol Characteristics*
        5) *Air-Cleaning Applications*
        6) *Mechanisms of Particle Collection*
        7) *Evaluating Air Cleaners*
        8) *Air Cleaner Test Methods*
        9) *Types of Air Cleaners*
        10) *.Filter Types and Performance*
        11) *Selection and Maintenance*
        12) *Air Cleaner Installation*
        13) *Safety Considerations*
        14) *References*
        15) Bibliography
        16) Index and Keywords

c. Brian will lead the effort to update the references and Bibliography with help from Zied, Paolo, Christine, Bob and KJ.

d. Asked for volunteers who will look at the tables and graphs for updates and renewal of any permissions Brian will contact Heather and lead the efforts if any permissions are needed. Bob and Paolo mentioned that the ASHRAE staff should be the resource to address this issue. Gemma mentioned that permission may not be needed if the is amended.

   Kathleen asked if there is any where we cover the indoor air cleaners. Gemma is willing to help address the issue. KJ suggest contacting Randy on this subject

e. Brian will send out Word version of chapter by February.

19. Conference calls or Zoom meetings. Possible dates in March and May.
    a. Week of March 1st
    b. Week of May 1st
    c. Brian will have a Doodle Poll that will be sent out by Mike Vaughn.

20. Other updates and topics were:

    Paolo mentioned including more on bio-aerosols in the chapter. He provided a references in the form of a position paper:
    https://www.info.gaef.de/positionspapier
    https://doi.org/10.5281/zenodo.4350494

    Gemma mentioned that the committee should provide their comments on the latest version of the chapter. Documents need to be distribute to the committee so they can provide their comments.

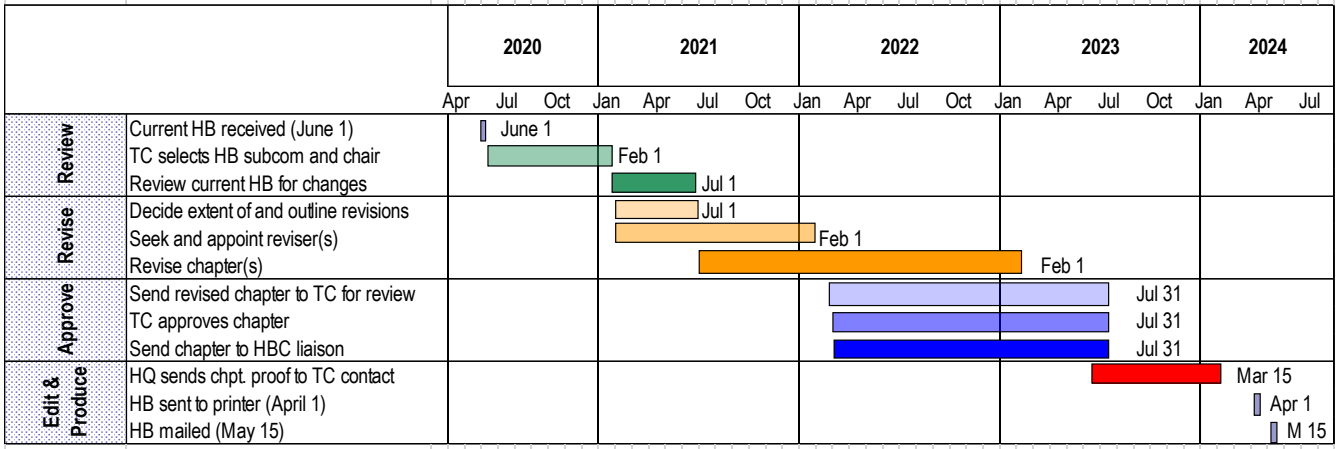
    Brian mentioned that he will remind the main TC of the dates for the chapter schedule and ask all the voting TC members to review the handbook chapter and provide their comments to the Handbook Subcommittee by the date of July, 2021. If they feel strongly about commenting on the chapter they should attend the Handbook Subcommittee meeting.

    Brian will ask Heather Kennedy if the pdf of the current 2020 chapter can be distributes to TC voting members.

21. Adjourn

Below is a schedule for the handbook chapter.

2024 HVAC Systems and Equipment



HBC = Society Handbook Committee
HB = Handbook volume
HQ = ASHRAE Headquarters editorial staff

TC 2.4 planning meeting 12/9/2020
Call to order and introductions
Meeting to make TC 2.4 run better
Process focused more than content focused
Usually happens in summer meeting, but didn't happen, so we wanted to do before winter meeting
Marilyn – Last meeting minutes from Kansas City? Yes
Zied – Meeting conflicts
Bob – Virtual meeting minutes are on website – but there was no planning meeting last time
Bob – Wants to add to agenda – Functions tab – nothing on website for planning subcommittee so we might want to add.
Gemma – Planning is not a standard subcommittee within ASHRAE TC's, so that may be why it disappeared.
Jeff – We should put text up – easy solution – along with link to roadmap
Planning Subcommittee

- How can we make TC 2.4 work better in virtual world and where will we be post-pandemic?
- Is it worthwhile to think about attending once per year in person and once per year virtual?
    - Gemma agrees it might be worth considering virtual once per year
    - Less productive virtual because more difficult to separate work from meetings
    - Voting is an issue virtual, and difficult to see ASHRAE decide to switch to ½ time virtual
    - Can we pull subcommittee meeting away from in person meeting time to go to virtual?
    - Poll the TC 2.4 membership to understand the feeling of the larger committee on the topic if meeting in person/virtual is better. Meet once per year or twice in person?
    - We need to make sure we are effectively using the time we have, if in person or virtual
    - Bob – ASHRAE is discussing and deciding how to handle this as well
    - Jeff – ASHRAE will do what they do, but we should still figure out how our TC feels about this and share the info we gather
- How do we increase the value of virtual meetings?
    - Need to make things shorter for virtual
    - Zied – smaller groups are more effective in getting things done
    - Gemma – Be prepared before the meeting with a well-planned agenda
    - Marilyn – Keep constant communication outside virtual meetings. Work in smaller chunks
    - Tom – 95% of the correspondence happens within 2 weeks of meeting
    - Need to send tasks ahead of time, more than just agenda
    - ASHRAE has some guideline on how to run virtual meetings too
- Networking opportunities especially for newer or younger members
    - We lose a lot in virtual meetings

- The particle party is an important part of the meetings we lose for networking
- Difficult to see how we can replace this networking in a virtual context
    - Because of this it is difficult to see how we can completely replace in person
- We can do better than just saying it doesn't work
- We can have a way in the meeting agenda to assign new members a mentor

Appendix B: TC 2.4 Program Subcommittee Meeting Minutes

January 27, 2020 – 2:00pm-3:00pm

Subcommittee Chair: Jon Rajala

1. Call to Order

2. ASHRAE Code of Ethics

   Introduction: "As members of ASHRAE or participants in ASHRAE activities, we pledge to act with honesty, fairness, courtesy, competence, integrity and respect for others in our conduct. We will avoid conflicts of interest, and behavior that is discriminatory and/or harassing." For more, read here:

   https://www.ashrae.org/about/governance/code-of-ethics

3. Introductions – Not happening because we are virtual and part of main meeting

4. Submissions?

Seminar 2	**Air Cleaning for the Indoor Air Quality Procedure**	**SSPC 62.1**		**Feb 9 – 12:00pm – 1:20pm**
Seminar 6	**Fighting the Unseen Killers: Gas-Phase Air Cleaners**	**TC 2.3**	**KJ Choi**	**Feb 9 – 1:30pm – 2:30pm**
Seminar 27	**MERV 13, HEPA and UVC: What Did Buildings Do During this Pandemic and How to Make your Buildings More Resilient for the Next Outbreak**	**TC 2.9, TC 2.10**	**Kathleen Owen**	**Feb 11 – 10:00am – 11:30am**
Seminar 35	**Gaseous Air Contaminants and Gas Contaminant Removal Equipment**	**TC 2.3**	**Brian Krafthefer**	**Feb 11 – 3:00pm – 4:20pm**

   a. Nothing officially listed for TC 2.4 in the program, but I think we voted to cosponsor one of the TC 2.3 submissions.

5. Next conferences:

   2021 ASHRAE Annual Conference Phoenix, AZ June 26 – 30, 2021
   Conference Program Chair:
   Debate, Forum, Workshop, Panel Discussion, and Seminar Proposals
   - **Program Submissions Due on Monday Feb 18, 2021**

   More info at https://www.ashrae.org/conferences/2021-annual-conference-phoenix

2022 ASHRAE Winter Conference Las Vegas, NV Jan 29 – Feb 2, 2022

- I don't have any additional info on this now, but I can update the minutes and send when it gets posted.

6. Proposals in Progress – Working list notes

Type	Title	CoSponsor	Chair
Chicago Paper Session	Biological threat detection *** No update – I still haven't heard anything from Russ**	2.4 co-sponsor	Russ Taylor
Future idea	Particles in Outer Space … Contact NASA ***Mike contacted Vijay. Unsure of when Vijay will get information.** **Lot of interest on moon particulate – just need to find the right contact working in this subject.** **Marilyn – will help contact** **Morris – can assist as needed**		**Vijay**, Mike Corbat (NASA)
Las Vegas	Climate and particulates: filtration, loading, entrainment 2 other people with Brian – Kathleen maybe? Brandon Boor (maybe phase 1 report) **Brandon Boor Phase 1 report is available now, but probably not the right time for him to work on this with project delays.**	2.4, 2.9?	Brian Krafthefer
Phoenix Seminar	**COVID-19 particle removal by air filter devices** **Single vs multiple masks as a topic?** **Infection related, HVAC related, mask related – combine** **Paolo talk? Show test data comparing masks/respirators** **Bobby Singer has some info too** **Broader than just air cleaning devices** **Biological aerosols** **Karin Foarde – Marilyn contacting for speaking**		**KJ, Christine**
Maybe Las Vegas	Particles above 10 um – still need to talk and find speakers *** Jeff has some good large particle paper items, looking for other interest.** *** Kathleen – droplets? Medical? COVID related Lindsay Maher (?)** *** Brian – has some people to check with** *** Marilyn – Sneeze particle information online – need to see if people have measured this** *** Tim might be able to help with contacts** *** Zied – research at MIT – slow motion camera** **Brian needs contacts to speak on this**		Brian, Brandon, Jeff
***Not likely for Austin. Keep on**	INDA IAQ Regulations (Rahul speak to INDA) ***Christine – Probably fine to ignore this topic.**		Rahul

list for later.	***Marilyn – Ask Rahul at TC 2.4 Main and see if he is interested.** ***Rahul – No meeting since October/November 2018. Person leading this has left INDA. Bob had volunteered to lead the committee, but unknown of progress after 2018. Rahul will check with INDA. Is this killed or planning on pursuing?** • **Rahul – can you provide update? Is this dead?** **Jon can reach out to Rahul to get an update**		
After Austin Workshop ***Potential After Austin**	Back to Basics – Aerosol chemistry and testing Health effects, contamination, measurements ***Keep topic on list. Tim and Dara still interested.** *** Zied suggests talking to Brent can coordinate efforts** **No update this meeting, but leave on list. How involved will Dara be moving forward?**		Dara/Tim
***Definitely after Las Vegas**	You bet your life: Particulate matter matters!! EHC/UV – hospitals *** Marilyn - No update, but leave on list**	2.5, EHC?, IEQ-GA	Marilyn Listvan – Bill Bahnfleth, C Seyffer
Future	Smart Filters (Sensors & Filter Operations), Smart Fibers No one wants to talk about smart filters – Jeff has volunteered, others have not ***Leave this on the list. Jeff is still interested.** ***Check with Brian. If Brian is not interested, take this off the list.** ***Christine – Leave on list. Topic is interesting, emerging. *Marketing people would be interested in this topic.** ***Jon – Can contribute to this topic** **No update this meeting, but leave on list**	2.4, 2.3	Brian Krafthefer – Brent, Seigel, Chuan He KJ – textile speaker
Chicago or after	Effects of Forest Fires on IAQ ***Jeff – EPA has done a lot of work that is publicly available. EPA did a 2-day workshop on this topic.** ***Jeff thinks there isn't a need for this in ASHRAE.** ***Marilyn – Will check with Brian.** **Brian - TC (?) looking into forest fire withing ashrae**		Jeff S, Brian K
Conf Paper and … ???	Urban Aerosols … wait for RP1734 ***Waiting for research projects to finish.**		Brandon, Zied
Conf Paper and … ???	Local Sensors … wait for RP1756 ***Waiting for research projects to finish**		Jordan Clark, Zied

7. Subcommittee meeting scheduling?

- **We had a productive meeting that took the full allotted time. This shows the value of having a separate Programs meeting outside**

the main meeting, and no reason to change while we are doing this virtually.

- **Can revisit if there are issues with room availability when we go back to in-person, but could possibly schedule virtually if needed in-between ASHRAE conferences?**

8. Anything else?

9. Adjournment

Chat log from the meeting:

14:01:20 From Gemma Kerr to Everyone : Gemma Kerr -

14:01:34 From Kyung Ju Choi to Everyone : K-J Choi -

14:01:38 From Kevin Kwong to Everyone : Kevin Kwong -

14:02:05 From Kathleen Owen to Everyone :

14:02:26 From Len Duello to Everyone : Len Duello

14:02:38 From Bobby Singer to Everyone :

14:02:46 From Brian Krafthefer to Everyone : Brian Krafthefer -

14:03:07 From Michael Birnkrant to Everyone : Michael Birnkrant, Carrier

14:03:43 From Rahul Bharadwaj to Everyone : Rahul Bharadwaj, Lydall

14:03:48 From Zied Driss to Everyone : zied driss

14:04:06 From Morris R. (Johns Manville) to Everyone :

14:04:34 From Morris R. (Johns Manville) to Everyone : having audio problem

14:04:36 From Morris R. (Johns Manville) to Everyone : one seec

14:07:42 From Don Thornburg/ANSI/WG3 Convenor to Everyone : Don Thornburg, Camfil

14:16:03 From Christine Sun to Everyone : Christine Sun, Waterloo Filtration Institute,

14:16:19 From Christine Sun to Everyone : WFI 2020 Annual Conference, Dec. 15-16, 2020, IAQ Health and Safety Solutions Associated with COVID-19
WFI next webinar: Cleaning Air Solutions During a Global Pandemic, 8:00 am - 10:00 am, ET, February 23, 2021, Zoom Online
WFI CFSS 2021 Education Program, will be kicked on March 9. 2021

14:16:48 From Paolo it to Everyone : Paolo Tronville - Politecnico di Torino;

14:17:55 From Morris R. (Johns Manville) to Everyone : ill volunteer to assist as needed on the NASA project

14:18:43 From Marilyn Listvan to Everyone : Marilyn Listvan.

14:28:42 From Tim Johnson to Everyone : Tim Johnson TSI

14:30:53 From Rahul Bharadwaj to Everyone : Sorry I have to drop off for another call. See you all in Standards meeting.

14:33:12 From to Everyone : : Assessing the performance of community face coverings
Abstract: Current standards test methods to assess the performance of medical masks (EN 14683) and PPE for the respiratory tract (EN 149) prescribe complicated and lengthy test methods using measuring equipment hard to find on the market. The Bacterial Filtration Efficiency (EN 14683) takes at least two days to be measured, and it requires the use of the pathogenic Staphylococcus aureus. Moreover, the uncertainty of the reported data of these two standards is not clearly defined.
We developed an innovative test method to measure the filtration performance of the “community masks.” This method provides a more useful and complete performance assessments, in a much shorter time, and providing data uncertainty.
We compare the data obtained by testing the three categories of protective devices mentioned above (medical masks, PPE for the respiratory tract, and “community masks”).

14:45:47 From Morris R. (Johns Manville) to Everyone : quick question

14:56:19 From Zied Driss to Everyone : Marilyn I think I have Bills email.

14:57:02 From Marilyn Listvan to Everyone : great, Zied — please send it to me

14:57:21 From Marilyn Listvan to Everyone : thx Kathleen!!

15:00:03 From Scott Parris to Everyone : Scott Parris, scott.parris@freudenberg-filter.com

Appendix C: ASHRAE RESEARCH SUBCOMMITTEE MEETING
TC2.4 – Particulate Air Contaminants/Removal Equipment

Winter 2021
Virtual Conference

Tuesday, January 26, 2021
4:30 – 6:30 PM Eastern Time
Zoom: https://ashrae-org.zoom.us/j/93415867703?pwd=bmt6MExEbWtZTXFKc2RBZzNXWUVXQT09

1. Call to order

2. Introductions

3. Review of agenda

4. ASHRAE Code of Ethics

    a. Introduction: "As members of ASHRAE or participants in ASHRAE activities, we pledge to act with honesty, fairness, courtesy, competence, integrity and respect for others in our conduct. We will avoid conflicts of interest, and behavior that is discriminatory and/or harassing." For more, read here: https://www.ashrae.org/about/governance/code-of-ethics

5. 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"
    b. Reminders:
        i. RAC deadlines for RTAR/WS submission (Get "M-M-A-D" at RAC: March, May, August, December 15)
    c. No RAC statistics update from last meeting (since February 2020)
    d. Reminders from Chair's update from the last Section 2 "chairs breakfast" (July 13, 2020):
        i. COVID-19 funding disruptions and moving forward:
            1. Cut back in Grant in Aids (may be as few as 3 awarded)
            2. Not funding URPs
            3. Still encouraging TCs to keep submitting RTARs and WSs although there is some uncertainty there depending on AHR Expo in Chicago and other consequences for fundraising ("business as usual")
            4. Kathleen mentioned that COVID-related topics may be of interest to RAC and/or directly through the epidemic task force (ETF)
    e. RAC liaison update
        i. New liaison effective July 1, 2019: Bill Hutzel; update whenever time allows
        ii. Update from Bill: next round of work statements to go out for solicitation is hopefully late 2021; still actively encouraging RTARs/WSs to be submitted; February 8 is when all the Section 2 Research Chairs will meet and discuss ideas; 2.4 has a lot of projects that are relatively recent, but not a lot of new submissions.

6. Active project updates (**aim for ~5 minutes per project update; no presentations; recommend attending PMS meeting for more detailed updates**):

    a. 1734-RP, Reproducing the Typical Urban Atmospheric Aerosol in Laboratory for Air Filter Loading
        i. PI: Brandon Boor, Purdue University
        ii. PMS: Paolo Tronville (Chair), Geoff Crosby, Tom Justice, Brian Krafthefer, Bruce McDonald
        iii. Update from last meeting: work impacted by building a new test rig and laboratory shutdown for COVID-19; extended timeframe for completion
        iv. **PMS meeting scheduled for Monday, January 25, 2021, 1:00-3:00 PM EST**
        v. PI and PMS to provide brief summary of project to date
        vi. Paolo updated: aging work has continued; had a presentation to PMS on Nov 18 2020; PMS was expecting some update on test duct aerosol generation (to provide tools to GPC 35 to move on with more realistic aerosol for aging tests). PI Brandon Boor informed PMS of fire safety issues that were raised (which had been discussed previously); PMS had requested some adjustments, which were provided in summer 2020, but the PMS hasn't seen any advancement in the production of ultrafine KCl for the purpose of loading. Brandon and his student have done a wonderful job setting up a test rig to measure efficiency every week in the aging studies; PMS is concerned of a lack of progress on the generation component. Blue Heaven Tech and Paolo's lab have also characterized some filters for the project. Quality is outstanding; the work just seems to have gotten out of alignment with the scope of the project.
        vii. Geoff: had several working sessions this summer 2020 to help get them on track, PMS doesn't seem to have enough information from the PI to know what the path forward is. PI (and student) did present to the PMS meeting yesterday. PMS has some options, will continue discussions, and summarize next steps.

    b. 1756-RP, Evaluation of Low-Cost Particle Sensors for Indoor Air Quality Monitoring in Smart Building Systems
        i. PI: Andy May, co-PI: Jordan Clark, Ohio State University
        ii. PMS: Brent Stephens (Chair), Paolo Tronville, Vijay, Glenn Remington (TC 7.5), and Liping Wang (TC 7.5)
        iii. Update from last meeting: finished experimental work; still working on publications and final report
        iv. **PMS meeting scheduled for Monday, January 25, 2021, 9:30-11:30 AM EST**
        v. PI and PMS to provide brief summary of project to date
        vi. Brent: Jordan and Andy presented a wrap-up summary of their project at the PMS meeting. Anatomy of a low-cost particle sensor. Bare sensors and integrated devices. Field (house) and lab testing (T/RH control). Performance metrics: event detection/response (all tested sensors had some kind of response to all of the emission sources they tested); functional range; quantifying lower limits ("good" and "not as good" on a running R2 metric); linearity; effect of averaging time. Highly varying responses with different PM sources for many instruments. Averaging time had a big effect; minimum of about 1-hour averaging time (above 1 hour good performance; below 1 hour not very good). Intra-model consistency (5 models had good

R2>0.9; 2 models much lower consistency). No real effects of temperature. Large impacts of RH (~4 possible reasons); explained about 20% of variance in typical emission events; can largely be corrected with co-located RH sensor (integrated devices are now measuring RH and correcting it seems). Size effects: magnitude of response and correlation to reference instrument varied by size (e.g., peak correlation around 1-2.5 µm size range; declining to R2 ~0.5 around 0.2-0.5 µm). Red LED rather than IR (lower wavelength) seem to show better performance at smaller particle sizes.

vii. Summary of publications: 3 accepted; 1 under review; and 1 "10 questions" paper is in preparation

viii. Final report status: should be completed within a month or so;

c. 1784-RP, Repeatability and Reproducibility Assessment of ASHRAE Standard 52.2 as currently Amended

i. PI: Kathleen Owen, Owen Air Filtration Consulting, LLC

ii. PMS: Matt Middlebrooks (Chair), Gemma Kerr, Rahul Bharadwaj, Thad Ptak, Keith Chesson

iii. Update from last meeting: progressing well, a few labs lagging behind; certainty of method appeared to be improving since the first round-robin

iv. **PMS meeting scheduled for Monday, January 25, 2021, 3:00-5:00 PM EST**

v. PI and PMS to provide brief summary of project to date

vi. Matt: still experiencing some delays, a lot of it COVID related (limiting the number of labs who have provided testing and data and slowing down those who are participating); a lot of missing information from some of the labs; some issues with 52.2 vs. non-52.2 labs and data quality; PMS to meet with PI in a few weeks to discuss next steps; already asked for an NCE which would be up June 1 2021 (Kathleen says this might be tight), so PMS is brainstorming asking for another extension if it will gather additional requested data. One key area missing is only 2 labs that have done Appendix J testing; not enough to draw conclusions.

7. Co-sponsorship

a. 1878-RTAR "Outdoor particulate matter penetration and indoor PM removal rates in naturally ventilated commercial buildings" (Lead: TC 4.3; co-sponsorship by SSPC 62.1)

i. Sought co-sponsorship from TC 2.4 as well (which was voted on in the main TC 2.4 meeting in January 2019; RTAR accepted by TC 2.4 12-0-0-4-1 CNV)

ii. Kathleen Owen volunteered to serve as WS author and on PES; Jordan Clark also volunteered to assist.

iii. RAC approved this RTAR with comments in KC. This can now go to the Work Statement phase, to the liaison, but must address comments.

iv. Update from last meeting: Jordan Clark is leading WS development. It was at about 80% in the summer, planned for December 15 submission.

v. Jordan: got feedback from 4.3 and Kathleen and Bill, and just needs to implement their feedback

b. 1858-WS, writing underway from TC 2.3 (Jensen Zhang, Kevin @ LMS): "Evaluation of HVAC ventilation effectiveness in reducing SVOCs in indoor

spaces." Small- and large-scale chamber testing. Looking for co-sponsors and 2.4 PMS members.

i. Lead: Sanjeev Hingorani
ii. Volunteers: Brandon B, Jim R, Brent S
iii. Updated from last meeting: Brent had provided comments. Main issues were: (1) utility of small scale chambers vs. large scale chambers; and (2) did not consider aerosols in any way. 2.4 had approved; WS submitted and returned with comments October 2020. Comments included: 1) does not address variations in air mixing within the space and how it would impact SVOC concentrations; 2) budget too high; 3) add some milestones for Task 3; 4) seems appropriate to involve TC 4.3 since it primarily addresses ventilation.
iv. Sanjeev: planning to work on it this February for March re-submission; hasn't approached 4.3 yet;

c. RTAR 1907 (Global IAQ Database)
   i. Initiated by TC 2.1; 2.4 voted (15-1-0-0-1)
   ii. RAC accepted with comments before last meeting; WS submitted in 2020, RAC returned with comments (generally positive): 1) data platform beyond the project duration; 2) too long project duration, and 3) absence of names from other potential bidders.
   iii. Dusan Licina leading a revision. Anyone from 2.4 working on it directly?
   iv. Jordan: 4.3 co-sponsored too
   v. Kathleen: regarding potential bidders, she had checked in with research chairs of each co-sponsoring committee

d. RTAR/WS (?) submission "Study of the Level of Filtration Required to Maintain Electronic Equipment Reliability in Regions of High Sea Salt Concentrations
   i. Initiated by TC 9.9; 2.4 voted (15-1-0-0-1)
   ii. WS appears to be nearing completion; anyone have updates on this?
   iii. Paolo, as RAC liaison: WS-1913; some lack of communication led to submitting this directly as a WS; RAC rejected it last meeting; Paolo had some thoughts on how to make the approach more relevant to ASHRAE, but it's unclear where they will go next. Also 1 negative vote from 2.4 was not looked upon favorably.
   iv. Zied: Mark Seymour had sent RTAR and 2.4 voted; then a WS came, letter ballot, partial results; modified WS, then went with first version, and he relayed all of the votes positive/negative.
   v. Paolo: no mistake on WS; for co-sponsorship instead of sending direct to Mike Vaughn, should return vote record to the leading TC.

8. Work Statement (WS) activity between meetings

a. Combined gas and particle filters and impact on each other when used in series (and more specifically: how does particle loading affect gas phase performance?)
   i. Champion: Brian Krafthefer
   ii. This idea was brought up by Brian K and Matt Middlebrooks to the chair at the end of the meeting. One idea is: what re the impacts of PM loading on gas phase removal? Kathleen Owen from 2.3 also has some ideas here. This seems like a promising idea.
   iii. Matt from last meeting: the idea is progressing with the intent to submit in 2019

iv. Chair's update: a draft has been completed, led by Matt Middlebrooks, and was circulated in April/May 2019, with a few individuals providing comment.
v. Update from KC: TC 2.3 will vote on it this time. Will need to be sent to TC 2.4 for discussion and a vote.
vi. Update from Orlando: GPC 35 is voting Monday morning. Uncertain of 2.3 vote outcome.
vii. Update from summer 2020: there is a conditionally approved RTAR (RTAR-1895). 2.4 not a co-sponsor right now; primarily a gas-phase project right now. Brian, Vijay, Matt, and Paula will be working on a WS on this. Kathleen volunteered as well. Already has 62.1/62.2 and 52.2 as co-sponsor. Doesn't require 2.4 necessarily, but they can keep us informed, or would be happy to have 2.4 as co-sponsor.
viii. New updates?
ix. Matt: this is already at the WS stage; started the process to write it

9. RTAR activity between meetings

a. RTAR-1880: "Characterizing Indoor Particle Size Distributions to Inform Air Filtration Standards and Guidelines" (now possibly titled: "Characterizing Physiochemical Properties of Indoor Aerosols")
i. Original goal: Literature review and measurements of indoor particle size distributions to generate typical ranges and distributions for informing filtration metrics
ii. Champions/co-authors: Jim Rosenthal, Brent Stephens, help offered by Paolo Tronville, Geoff Crosby, Brandon Boor, Satish D
iii. Action from last meeting: RTAR was submitted to 2.4 for voting and was approved 13-3-1; target budget of $195k over 24 months; RTAR was then submitted to RAC and assigned RTAR #1880 in April 2019
iv. Status: Rejected by RAC in KC. RTAR was submitted with 4 negative votes and no comments. RTARs should have comments addressed before submitting to RAC. We may be able to resubmit if we address the comments.
v. Update in Orlando: The purpose of this research project is to gain better understanding of indoor particle size distributions across a wide range of particle sizes. Brent to take lead on addressing the comments and possibly resubmit to RAC. Kathleen can help in ~3 months if Brent needs help.
vi. Update since last meeting: Brent had begun a revision last meeting; discussion led to beginning with a literature review of the state of the science on what's known about indoor aerosols (phase 1/phase 2 approach); consider bringing in 2.3 or EHC. No further updates (on Brent's to-do list)

b. New RTAR (unassigned #): 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 Zied.
ii. TC 2.4 voted on RTAR previously; did not pass. In Houston, Kathleen, Vijay, and Paolo volunteered to help Rahul. There is support for the idea, but it needs revision, including better acknowledging past research, reducing the funding amount, refining objectives, and making clear distinctions about the research need. There was no real movement on this at the Winter 2019 meeting.

iii. KC Discussion: Jim Rosenthal and Rahul Bharadwaj to co-Champion. Dan Haas volunteered to assist, Saravanan (Berry).
iv. Update this meeting: No update from Rahul and needs a new champion. RTAR is written and comments are all there from 2.4.
v. Question: Difference between this and Appendix J? Rahul: is there an analytical method (not duplicating Appendix J conditioning test) to determine the difference in media that loses charge in a short period of time versus long period of time (IPA discharge doesn't distinguish the two). Can there be a test method to evaluate electrostatic charge over time. Bob: 52.2 already tests this duration issue (but doesn't require reporting it).
vi. Perhaps this becomes a request to amend 52.2 to require this reporting.
vii. Kathleen: topic hasn't come up at 52.2 as a research topic. Some feel appendix J and IPA is sufficient
viii. Rahul: would need a new champion if there is interest; Jim showed interest but unsure if he volunteered to lead; may want to archive/eliminate this
ix. Bruce: the 1734 aerosol generator might speed up Appendix J a lot…. Might not need this research if so.

10. Liaison reports

a. Epidemic Task Force related idea on portable/stand-alone air cleaners testing/MOT
    i. Jeff Siegel, Bob Burkhead, Tom Justice, Matt Middlebrooks, Liju Eapen, John Zhang, and Michael Corbat have all provided comments
    ii. General consensus seems to be that as a society we should probably be acting in this domain, but that doing so is fraught with challenges (internally and externally)
    iii. Summer 2020 discussion: similar discussion at 2.3; begin a new 185.3; ISO/AHAM/AHRI all involved in their own efforts; 62.1 has electronic air cleaner manufacturers at the table seeking a removal efficiency factor;
    iv. Kathleen, Matt M, Kevin K, Gemma, Christine, Peter, KJ, coordinated a discussion.
    v. Updates:
    vi. Matt M: has a working title and a start to an RTAR. Group of 6-8 people willing to work on it. Focus right now would be on microbial effects of room-based devices, using a combination of chamber and duct test method; TC 2.9 (through SSPC 185) is also in the process of a chamber test method. Goal is to get the group together for the March 15. Would assess byproduct formation as well; various types of devices; microbes on surfaces and in air.

11. Work time on any new or existing RTARs, WS, and other proposals

b. Energy Implications of Air Filtration in Commercial Buildings (finally dropped as RTAR-1626 and we are focusing on rebranding/re-titling for resubmission)
    i. Champion(s): Brent Stephens, Paolo Tronville, Geoff Crosby, Brian Krafthefer, Jeff Siegel, Zied Driss, and Michael Waring (new volunteer: Jon Rajala)
    ii. Co-sponsorship ideas include TC 5.1 (Fans), TC 7.6 (Building Energy Performance), and GPC 35
        a. Updates from last meetings: suggested new titles include "Fan Energy and Airflow Implications of Air Filtration in Commercial Buildings" or "Fan Energy and Airflow Implications of Air Filtration in Commercial HVAC Systems"
        b. See below for relevant healthcare facilities project

c. How do you do high efficiency filtration in new residential systems like VRFs and mini splits, also mechanical ventilation?
    i. Champion: Tom Justice
    ii. Update in Orlando: Tom Justice provided an update via presentation "Do HVAC trends support better filtration?" VRF systems are some of the fastest growing equipment in North America; and their ability to incorporate good filtration appears to be minimal. Often MERV 2 or 3 filters, essentially screens, are used in these systems. Manufacturers anecdotally don't seem to be interested in pursuing high efficiency filtration. This might not even be a research project, but one idea could be to fund a small project (i.e., with literature review on filtration in VRF systems and perhaps some lab or in-situ testing of filtration particle removal efficiency, pressure drops, and fan power draws with different filters/media in VRF systems) that could be used to show the need for more R&D on how to improve filtration in VRF systems. (Could also add ERV/HRV mechanical ventilation systems to this).
    iii. Updates/volunteers?
    iv. Tom: the initiative might begin with a forum to identify interested parties; equipment and filtration TCs; form an MTG, who would then oversee a research project on how manufacturers are addressing these issues. Frank Mills has written two guidelines that are relevant; he's agreed to help form this MTG. May just plan to submit a new MTG proposal.

d. 3D printer emissions/control (with TC 2.3)
    i. From Paula Levasseur with interest from Gemma Kerr
    ii. Update from last meeting: Kathleen has reached out to a TC from section 9 (venting devices) and will follow up
    iii. Discussion from KC: Can't be done by 2.3 and 2.4 alone, will need input from exhaust systems folks. UL may be working on a standard for this. Gemma has no real update, may be discussed in TC 2.3. Paula has seen a few emails but has no real update.
    iv. Updates:
        1. Marilyn volunteered; Brian has been looking into UL standards on 3D printer emission testing
        2. Kathleen: current biggest issue is not having a champion to really lead it
        3. Gemma: the UL standard is an emissions standard, but what we really need is research to ID what's needed in terms of ventilation and thus need help from a committee that does this sort of thing
        4. Gemma: could ultimately become a standard for ventilation/filtration for spaces with 3D printers
        5. Brian K: interested in helping push it forward
        6. Brent: literature on emission rates is strong; could see a combination of modeling and measurements of interventions to inform recommendations for ventilation/air cleaning

e. Forest fire smoke and impact on retirement communities (Kathleen Owen, from Dave Ensor)
    i. Jeff S: Fisk and Chan paper; Health Canada project on retirement homes
    ii. EPA had a webinar last week with some really good speakers
    iii. Brian Krafthefer offers to assist, not chair, will work with Handbook Chapter 11 to see if they have interest in this area.
    iv. Updates?

v. Jeff S: ASHRAE has a committee looking at wildfire smoke (Guideline 44), Steve Emmerich is leading it
vi. Paul Francisco: EPA just had a call out for funding on wildfire smoke mitigation indoors in general; Washington state too; maybe recommend what ends up being done and what gaps if any are fillable by ASHRAE
vii. Marilyn: don't necessarily need to limit to retirement communities, could broaden

f. Impact of aerosol phase state on filtration efficiency and loading kinetics of HVAC Filters under varying humidity (Brandon Boor)
viii. Can be done on small scale; focus on organics among others
ix. Bruce McDonald has some experience here and volunteered to help.
x. Brandon would like to move forward following 1734-RP.
xi. Brian Krafthefer expressed interest.
xii. Updates?
xiii. Brian: no updates

g. Pollutant sensor rating method idea (Jordan Clark)
v. RTAR is already drafted and 4.3 is voting on lead sponsorship this meeting; might make sense to have someone from 2.4 on the WS and PES/PMS as well
vi. Trying to get Smart Buildings TC involved, but no success yet. Jordan working on this.
vii. Summer 2020 update: Jordan brought this up in PMS meeting for 1756 and will work on moving it forward
viii. Updates? No updates; probably abandon.

h. Following up on 1649-RP, Tom Justice proposed the idea of a project to fund a design guide on residential filtration to help better assist the residential designer and user on how to better understand relationships between the filter, system, building, and operation. A large number of factors affects filter effectiveness outside of filter performance rating alone. Could be a follow on to the recently published residential IAQ guide, going out to bid (rather than project PI or PMS or other volunteers doing all of the work).
i. Tom follow up this meeting: he has drafted a TPS for an MTG on this, as it seems to be how ASHRAE has generally gone out about generating guidelines; talked to some other TCs, awaiting input

i. From Bruce McDonald: Potential co-sponsorship for knowing if your aerosol neutralization system is working (or not) coming from 52.2 research.
i. Discussed at 52.2; Michael Corbat offered to help write it

12. New ideas (work time for the rest of the meeting)

a. Discussion around COVID-19 related projects from last meeting (e.g., respiratory particle modeling, disease transmission modeling)
i. Any updates?
ii. Marilyn: a paper showing a visualization of airflow/particle dispersion made a big impression on her; Zied mentioned he spoke with someone at CDC on a restaurant study

b. Geoff and Kathleen is working on an RTAR with 9.6 that would be co-sponsored by 2.4. “Cost and energy implications of increased filtration efficiency in healthcare facilities.”
    i. There is interest now; would involve field measurements at select healthcare facilities
    ii. Kathleen: Status is that it has been written once and reviewed by liaisons, needs to have some edits made and then will be shared, aiming to hit March deadline

c. Zied: 9.6 has 47 YEA members; would like to find a way to recruit newer members, in particular now given the importance of the understanding of filtration these days. What are we not doing to retain younger members?
    i. Jeni: Most of our recent YEA members are aging out!
    ii. Paolo: might be partially related to knowledge level for research vs. applications in a TC like 9.6
    iii. Jordan: gotta be some creative ideas around getting students to help write RTARs??
    iv. Kathleen: in the past, companies paid to send their experienced individuals rather than junior (Jon: varies, sometimes it goes the other way)
    v. Jeni: some of the in-person events helped more with this in the past
    vi. Marilyn: volunteered to give her history of filtration talk

13. Adjournment – 6:26 pm eastern, watch out for virtual 2.4 particle party coming Friday

Appendix D: TC 2.4 STANDARDS SUBCOMMITTEE
Minutes
Wednesday 3:00PM – 4:00PM, January 27, 2020
Virtual Conference

Code of Ethics Commitment

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

1. **CALL TO ORDER**
   A. Introductions – NA due to virtual meeting
   B. Chair's comments
      i. discussion about moving into 2.4 Main meeting moot now due to virtual?
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 (Kathleen Owen)
      i. PM - 52. 2 - Addendum B Passed and is out
      ii. KJ – ASHRAE Journal Article by Gemma and Kathleen -Great Job!
      iii. Appendix Idea- More devices able to be tested against micro-organisms (Covid) – 185 methodology?
      iv. Rahul – Swine research facility modified ASHRAE 52.2 (AAF Clean Air Center as well)
   B. GPC 35P - Method for Determining the Energy Consumption Caused By Air-Cleaning and Filtration Devices (Geoff Crosby)
      i. Push out completion by about 1 year due to completion of RP 1734
      ii. Met 1-26-21 – scheduling monthly meetings. Goal draft out by 2022 Las Vegas
      iii. Advisory public review? Possible
3. **ASHRAE LIAISONS**
   A. TC 2.3 Gaseous Air Contaminants and Gas Contaminant Removal Equipment (Matt Middlebrooks)

i. SSPC 145.1 - Laboratory Test Method for Assessing the Performance of Gas-Phase Air Cleaning Systems: Loose Granular Media
   (1) No new info

ii. SSPC 145.2 - Laboratory Test Method for Assessing the Performance of Gas-Phase Air Cleaning Systems: Air Cleaning Devices
   (1) Comments on Test Method and have been voted on and replied and wait for replies from commenters
   (2) 1838 nearing completion – Electronic Air Cleaners
   (3) 2 round robins – Kathleen (ASHRAE) and ISO data should be available soon

B. TC 2.9 Ultraviolet Air and Surface Treatment (Kathleen Owen)
   i. SSPC 185.1 - Method of Testing UVC Lights for Use in Air Handling Units or Air Ducts to Inactivate Airborne Microorganisms
      (1) Kevin – voted to start 185.3 test chamber for bioaerosols
      (2) Discussion about removing restrictions from 185.1 – taking out UVC Lights- but was shelved. Decision made to move on to 185.3
      (3) Trying to get 185.3 test underway
      (4) Bob B – Rewrite title purpose and scope (Didn't like wording and phrasing)
      (5) Why gases, particulate not included was a question (TC 2.4 subject)
      (6) AHAM working on standard
      (7) Tim Johnson – work at IEC level

   ii. SSPC 185.2 - Method of Testing Ultraviolet Lamps for Use in HVAC&R Units or Air Ducts to Inactivate Microorganisms on Irradiated Surfaces
      (1) No Update

C. TC 5.4 Industrial Process Air Cleaning (Len Duello)
   i. SPC 199 - Method of Testing the Performance of Industrial Pulse Cleaned Dust Collectors

(1) 5 Year review is due in 2021

(2) Looking at reviving Mist Collector test method

D. TC 9.6 Healthcare Facilities (Zied Driss)

i. SSPC 170 - Ventilation of Health Care Facilities

(1) MERV 14 Requirement?

(2) App J requirement - No

(3) Recommend an ambassador

E. SSPC 62.1 - Ventilation for Acceptable (Commercial) Indoor Air Quality (Wane Baker)

i. New liaison – Wane Baker

ii. 2019 version published 11/19

iii. Effort now going into IAQ Guide 42P – Intent to provide guidance on how to go above minimal acceptable IAQ

F. SSPC 62.2 - Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings (Brent Stephens)

i. Considering on adding IAQP

G. SSPC 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings (Michael Corbat)

i. No update

H. US TAG to ISO/TC 142 - Cleaning equipment for air and other gases (Kevin Kwong)

1. Working Group 1 (Terminology)
    a. ISO 29464 Revision
        i. Ballot will be opened in early 2021
2. Working Group 2 (UV-C)
    a. ISO/PWI 23136 Dual band UV-C&D device - Measurement of Output of Dual band UV-lamp
        i. 12-8-2020: NP was disapproved due to only 4 P-members committing to participate (5+ needed)

3. Working Group 3 (General Ventilation)
    a. ISO 29462:2013 – DIS stage. Final comment resolution. Fall 2021 finish.
    b. ISO 16890-2:2016 – DIS stage. Final comment resolution. Fall 2021 finish.
    c. ISO 16890-4:2016 – DIS stage. Final comment resolution. Fall 2021 finish.
    d. ISO 16890-5 – NWI stage. CD underway. Fall 2023 finish.
    e. ISO 16890-3:2016 – Removal of 30g initial loading step. Ballot will be opened by Feb 2021.

4. Working Group 4 (HEPA/ULPA)
    a. Main efforts are to finalize ISO 29463-5 revisions
        i. 10-20-2020: Ballot approved to skip CD stage. Will go straight to DIS.
5. Working Group 5 (Dust Collectors) ASHRAE 199
    a. ISO 16313-1 was automatically cancelled but the document is almost complete.

6. Working Group 7 (Durability of Cleanable Filter Media)
    a. ISO/CD 22031 : Sample and test method for media taken from filters in operation
        i. 12-22-2020: FDIS ballot approved.
    b. ISO/PWI 23742 : Test method for the evaluation of permeability and filtration efficiency distribution of bag filter media.
        i. First draft was circulated to WG Experts in December. Activation vote soon.

7. Working Group 8 (Gas Phase)
    a. ISO/NP 10121-3 (Classification system for GPACDs)
        i. DIS draft should be filed soon
        ii. Lab testing is delayed due to the pandemic

8. Working Group 9 (Rotary Machine)
    a. ISO DIS 29461-1 (Static filter elements). DIS registered on 10-26-2020.
    b. ISO/NP 29461-2 (Pulse filter systems). Little progress and will be deleted.
    c. ISO/NP 29461-3 (Mechanical integrity). Accepted as AWI on 9-14-2020.
    d. ISO/PWI 29461-4 (Static filters in marine/offshore). Ballot will be opened soon.
    e. ISO/CD 29461-7 (Fog/mist endurance test). DIS ballot approved on 10-20-2020. US voted to approve.

9. Working Group 10 (Aerosol Filters For Nuclear Applications)
    a. Joint working group with TC85/SC2/WG23 (nuclear confinement and ventilation)

b. Focus is on NWIP 23137-1 "Requirements for aerosol filters used in nuclear facilities against specified severe conditions – Part 1: General requirements"
    i. Approved as a Working Draft on 10-13-2020.
c. ISO/PWI 23137-2 and ISO/PWI 23137-3 will be automatically cancelled and worked on later

10. Working Group 11 (Portable Room Air Cleaners)
    a. Joint working group with IEC/TC 59
    b. IEC has the lead on this JWG and is designated IEC/TC59/JWG17
    c. IEC 63086-1 "Household and similar electrical air cleaning appliances - Measurement of performance - Part 1: General requirements"
        i. Established plans for 12 sub working groups.

11. Working Group 12 (Sustainability)
    a. Waiting on Purdue ASHRAE Research Project

12. Working Group 13 (Biological equipment for waste gas)
    a. ISO/PWI 23138 – "Biological equipment for treating air and other gases – General Requirements"
        i. 10/21/2020: Approved as a Working Draft.
    b. ISO/PWI 23139 – "Biological equipment for treating air and other gases – Application guidance for deodorization in wastewater treatment plants"
        i. 9/30/2020: Approved as a Working Draft.

I. MTG. ACR, Air Change Rate (Delegate – Bob; Alternate – Michael)
    i. No meeting

4. OLD BUSINESS

A. MTG, GPC for implementing cleaning technologies in combination; collaboration between TCs 2.4, 2.3, 2.9 (Matt Middlebrooks)
    i. No updates

5. NEW BUSINESS

Need liaison for ANSI/ASHRAE/ACCA 180 – Bob Burkhead

6. INFORMATION EXCHANGE

A. AFS (John Rajala, Rahul Bharadwaj)
    i. AFS
        (1) Moved from 2 per year to annually
        (2) Virtual April 19-20 2021
        (3) Next conf Louisville 2022
        (4) Abstracts open til March 1
B. CEN/TC 195 - Air filters for general air cleaning (Paolo Tronville)
C. EUROVENT (Paolo Tronville)
D. IEST – Institute of Environmental Sciences and Technology (Vijay)
E. AHRI 680 – Performance Rating Residential Air Filter Equipment
   Vincent Hwang -Last edition published 2016 – due for republishing in 2021
F. INDA – International Nonwovens Development Association (Tom Justice)
    i. FiltXPO
        (1) Co-locate with IDEA Miami - March 28-31, 2022
G. NAFA (Tom Justice)
    i. 2021 NAFA Technical Seminar, Phoenix, Arizona – May ’21 (Is a go as of now)
    ii. 2021 NAFA Clearwater Beach FL - Fall
H. ISO/TC 22/SC 34 - Road vehicles - Propulsion, powertrain and powertrain fluids (Paolo Tronville, Bruce McDonald)
    i. WG3 – Air filters
    ii. Soot as a loading aerosol. Approved
    iii. DIS document 12103 Part 3 – Published Standard
    iv. Urban loading aerosol being developed
    v. Soot replacing ISO Fine (5011)
I. UL 900 (Randall Haseman)
    i. Looking at adding Carbon Filters to standard – No more
    ii. Pushback on new proposal – all comments have been against – all votes were against
J. IAQ Meetings (Jeffrey Siegel)
    i. Sep 13-17 2021
K. FILTECH Expo and Conference
    i. Feb 23-25th 2021 Cologne (Canceled)

L. Indoor Air Conference (ISIAQ)
   i. TBD
M. American Association for Aerosol Research
   i. Fall 2021
N. International Aerosol Conference
   i. 2022 Athens Greece
O. Asia Filtration Show / FILTREX
   i. TBD
P. World Filtration Congress
   i. WFC 13 San Diego, Sept, 20-24 2021
Q. World Congress of Particle Technology

   No info
R. Korean Filtration and Separation Society
   i. Air & Liquid Filtration Workshop April 5 2021
   ii. 6th Annual Conference Oct 11-12 2021
S. WFI Annual Conference
   i. WFI 2020 Annual Conference, Dec. 15-16, 2020, IAQ Health and Safety Solutions Associated with COVID-19 (4 sessions, around 200 attendees)
   ii. WFI next webinar: **Cleaning Air Solutions During a Global Pandemic**, 8:00 am - 10:00 am, ET, February 23, 2021, Zoom Online
   iii. WFI CFSS 2021 Education Program, will be kicked on March 9. 2021
   iv. CFSS 2021 Exam – 11/30/2021 8-10 am, ET
   v. WFI Annual Conference – 12/7-8/2021, 8am-12pm, ET

The focus of the **Standards Subcommittee** is on the writing and continued maintenance of standards and guidelines written for HVAC&R air filtration. This group not only reviews ASHRAE standard and guidelines but also keeps an active reporting system of HVAC&R standards and guidelines produced by other organizations and other countries around the world.

This TC is Cognizant for the following standards

ANSI/ASHRAE Standard 52.2: Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size
ANSI/ASHRAE Standard 185.1: Method of Testing UVC Lights for Use in Air Handling Units or Air Ducts to Inactivate Airborne Microorganisms.
This TC is CoCognizant with TC 7.3 lead for the following standard

ANSI/ASHRAE/ACCA 180: Standard Practice for Inspection and Maintenance of Commercial-Building HVAC Systems

7. ATTENDANCE – names carried over from 7/20 Virtual

	Name	Company/Address	Email
1	Bobby Singer	BHT	
2	Todd Mcgrath	Glasfloss	
3	Geoff Crosby	Lydall	
4	Matt Middlebrooks	Filtration Group	
5	Kia Kiantaj	LMS	
6	Christine Sun	Waterloo Filtration Institute	
7	Len Duello	Lincoln Electric	
8	Don Thornburg	Camfil	
9	Michael Corbat	Rensa	
10	Tim Johnson	TSI	
11	Morris Richardson	Johns Manville	
12	Dara Feddersen	H & V	
13	Jeni Wong	Johns Manville	
14	Jeffrey Siegel	U of T	
15	Justin Koczak	TSI	
16	Mick Flom	3M	
17	Bernard Olsen	U of Minn	
18	Bruce McDonald	Retired	
19	Behnat Shoar	Lydall	
20	Rahul Bharadwaj	Lydall	
21	KJ Choi	Clean & Science	
22	Keith Chesson	Parker	
23	Jon Rajala	AAF Flanders	
24	Bob Burkhead	BHT	

TC 2.4 Attendees List

1. Christine Sun: Christine Sun,
2. Geoff Crosby: Geoff Crosby
3. Don Thornburg/ANSI/WG3 Convenor: Don Thornburg, Camfil
4. Marilyn Listvan: Marilyn Listvan.
5. Caitlin Naske: Caitlin Naske Dynamic AQS
6. Peter McKinney: Peter McKinney, Carrier,
7. Mark Jackson:
8. Brandon Boor: Brandon Boor, Purdue
9. Zied Driss: zied driss
10. Charles Seyffer: Charles Seyffer
11. Sanjeev Hingorani: Sanjeev Hingorani Lennox Industries,
12. Brent Stephens: Brent Stephens,
13. Rahul Bharadwaj: Rahul Bharadwaj Lydall
14. Dara Feddersen: Dara Feddersen YEA member but not for much longer :)
15. Len Duello: Im not even one if you switch them
16. Prateek Shrestha: Prateek Shrestha -ORNL (YEA)
17. L.Song:
18. Jeffrey Siegel: Jeffrey Siegel
19. Jon Rajala: Jon Rajala - - YEA for now :)
20. Kevin Kwong: Kevin Kwong - - YEA
21. Vincent Hwang: Vincent Hwang - AHRI (YEA) -
22. Steve Welty: Steven Welty
23. Jeni Wong: Jeni Wong (Johns Manville) YEA
24. Scott Parris: Scott Parris,.
25. Gemma Kerr: Gemma Kerr -
26. Paolo: Paolo Tronville - Politecnico di Torino;; OLD
27. Henry Greist: Henry Greist, , Lennox Industries, Inc.
28. Kathleen Owen: (possibly not here for long)
29. RICHARD CHESSON: Particle Party Link
30. jbloemer:, Aprilaire/Research Products
31. pdavis: Pete Davis, , Aprilaire
32. Paul W Francisco: Paul Francisco, , UIUC
33. DANIEL HAAS: Dan Haas, , Parker-Hannifin HVAC Division
34. Timothy Ahn: Timothy Ahn
35. Ashish Gadhave: Ashish Gadhave;
36. Harry : Harry Elinsky, , Filtech, Inc.
37. Himanshu Jasuja- 3M: Himanshu Jasuja-
38. Ashish.Mathur: Ashish Mathur
39. Mick Flom: Mick Flom, 3M,
40. Mike Corbat