

**TC 2.4 Particulate Air Contaminants/Removal Equipment
Main Committee Meeting
Draft Minutes**

**Tuesday February 4, 2020
3:30-6:00 pm
Room Orange A, Hilton
Orlando, FL
<http://tc0204.ashraets.org/>**

1. Call to order..... Jeff Siegel
2. Introductions 53 attending, including 6 YEA members
3. Roll call Dara Feddersen

Name	Position	Present	Not Present			
Zied Driss	Chair		X	Matt Middlebrooks	X	
Jeffrey Siegel	Vice Chair	X		Kathleen Owen	X	
Dara Feddersen	Secretary	X		James Parris	X	
Rahul Bharadwaj		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		Total Present	16	
Non-voting officers				Total Members	17	
Brian Krafthefer	Handbook	X				
John Simenson	Standards		X			
Donna Sullivan	Program		X			
Bob Burkhead	Webmaster	X				
Barney Burroughs	ALI		X			
Stephen Nicolas	MTG Liaison		X			

4. ASHRAE Code of Ethics Commitment Jeff Siegel
In this and all other ASHRAE meetings, we will act with honesty, fairness, courtesy, competence, integrity and respect for others, 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. Welcome and opening comments Jeff Siegel
 - a. Program and Standards to alternate meetings
 - b. Recommendation to reduce meetings
6. Liaison Report
Jon Cohen - Tech Council Section 2 Head
TC Collaboration room will be available in Austin
Residential Committee mission to help ASHRAE have a greater impact in the residential sector – they are looking for liaisons
7. Particle Party..... Keith Chesson
8. Approval of Kansas City Minutes..... Jeff Siegel

Marilyn Listvan (move) Christine Sun (second) 14-0-0-2-CNV

9. Record of votes taken since Kansas City Dara Feddersen
 - a. Do you approve the acceptance of TC2.4 Handbook updates to Chapter 29? - Passed 12-0-4-0 (CNV)
 - b. Do you approve the PMS decision to accept the final draft report to 1649-RP? - Passed 14-0-1-1 (CNV)

10. Subcommittee Reports

- a. Planning Subcommittee Report..... Jeff Siegel
- b. Membership Subcommittee Report..... Jeni Wong
- c. Research Subcommittee Report..... Rahul Bhardwaj
Minutes in Appendix A
 - i. Approve CoSponsorship of Work Statement 1858: *Evaluation of HVAC ventilation effectiveness in reducing SVOCs in indoor spaces*

Gemma Kerr (moved) Jon Rajala (second) 14-0-0-2-CNV

- ii. Approve CoSponsorship of new RTAR: *Effect of particle loading on the performance of gas filters*

Matt Middlebrooks (moved) Jeni Wong (second) 14-0-0-2-CNV

- d. Standards Subcommittee Report..... Bobby Singer
Minutes in Appendix B
 - e. Program Subcommittee Report..... Jon Rajala
Minutes in Appendix C
 - i. Co-Sponsor "How does the type of filter affect energy consumption" seminar for Austin

Gemma Kerr (moved) Tim Johnson (second) 15-0-0-1-CNV

(Scott Parris came into the room)

- ii. Co-Sponsor "Data-driven air quality control in buildings: how close are we and what do we still need?" seminar for Austin

Matt Middlebrooks (moved) Paolo Tronville (second) 15-0-0-1-CNV

- iii. Sponsor "Biological threat detection" Conference Paper Session for Austin

Marilyn Listvan (moved) Rahul Bharadwaj (second) 15-0-0-1-CNV

- f. Publications Subcommittee Report..... Marilyn Listvan
 - g. Web Master..... Bob Burkhead
 - h. Handbook..... Brian Krafthefer

11. Old Business

12. New Business

- a. Misc Announcements (Conferences, Awards, etc.)

13. Adjournment Motion

Gemma Kerr (moved) Paolo Tronville (second) 15-0-0-1-CNV

Appendix A
ASHRAE RESEARCH SUBCOMMITTEE MEETING MINUTES
TC2.4 – Particulate Air Contaminants/Removal Equipment

Orlando, FL
Winter 2020

Sunday, February 2, 2020
3:00 – 5:00 PM Local Time
Location: Hilton Orlando, Lake Nona A

Minutes in Red

1. Call to order - at 3:00 pm
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 from last meeting(s):
 - i. RAC deadlines for RTAR/WS submission (Get “M-M-A-D” at RAC: March, May, August, December 15)
 - ii. RAC statistics update from last meeting (from November 2019 report: https://www.ashrae.org/File%20Library/Technical%20Resources/Research/RT_REPORT_F19.Release-1.pdf)
 1. 3 new projects awarded; 1 funded project extension approved
 2. 8 projects went out to bid in Fall 2019
 3. 12 tentative research projects (TRPs) to be considered for bid or re-bid in Spring 2020
 4. 4 WS submitted and 4 approved (1 as is and 3 with conditional acceptance)
 5. 9 RTARs submitted and reviewed; 8 were accepted (1 as is and 7 with comments) and 1 rejected
 6. None from TC 2.4
 - c. RAC liaison update
 - i. New liaison effective July 1, 2019: Bill Hutzel; update whenever time allows
 - ii. **Bill did not come to this meeting**
6. Active project updates (**aim for ~10 minutes per project update; recommend attending PMS meeting for more detailed updates**):

- a. 1649-RP Impact of Higher Efficiency Filtration on IAQ in Residential Environments with Central HVAC
 - i. PI: Jeff Siegel, University of Toronto
 - ii. PMS: Tom Justice (Chair), Rahul Bharadwaj, Bruce McDonald, John Zhang, Brian Krafthefer, and Gemma Kerr
 - iii. **PMS will not meet this meeting; project has completed**
 - iv. PI and PMS to provide brief final summary of project to close out
 - v. Summary from Jeff: project is completed; residential filter performance was highly variable between homes; on average higher MERV filters performed better than lower MERV filters, but the difference was much smaller than the variation; MERV is not at all correlated with pressure drop across the project; indoor particle concentrations were not correlated with MERV (using low-cost monitors); in short: filters didn't matter that much (low runtimes, a mild year for heating and cooling; median runtime of ~10%). The report has been submitted to ASHRAE and approved and should be available on the ASHRAE website soon (member section). Interesting note: volume median diameter of dust is ~30 μm captured on filters. Future directions: standards address the filter, not the system. People need to be told how to use filters, especially for the residential marketplace. The project has resulted in several papers as well.
 - vi. Tom Justice provided a separate summary of the project which included a potential logical next step as developing a design guide for residential filtration (not a guideline but a design guide similar to the residential IAQ guide). It would involve individuals outside of 2.4 as well (e.g. fans, systems, buildings).

- b. 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. **PMS to meet Sunday 12:30-1:30 pm in Hilton Orlando, Lake Nona A**
 - iv. PI and PMS to provide brief summary of project to date
 - v. Brandon Boor presented a summary to date. One paper has been published and one is in review currently. In-situ filter test rig has been completed at Purdue and in-situ aging experiments will begin by March 2020, running for 1 year.
 - vi. Paolo update: the amount of work is going beyond expectations of the PMS, although progress was delayed some with the construction of the in-situ test rig. PMS is overall very pleased. TC 2.4 still needs to approve the phase 1 report. And a no-cost extension will eventually be needed by July 2020 and require TC 2.4 approval (will wait until next meeting, in summer 2020, to formally ask).

- c. 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. **PMS to meet Sunday 1:45-2:45 pm in Hilton Orlando, Lake Nona A**

- iv. PI and PMS to provide brief summary of project to date
 - v. Andy May presented a summary to date. Two publications to date (one in STBE and one in Indoor Air). Latest updates included investigations of size and composition affecting sensor performance. Project has generated a large amount of useful data that can also be used to generalize some conclusions (e.g. 1 hour averaging time improves performance; humidity effects occur after about 70% RH; most sensors could “see” down to 100 nm, surprisingly; accuracy generally improved with particle size; composition effects appeared smaller; three general groups of BAS integration currently, i.e., ready to work with BACnet, BACnet via API, or none at all/requiring manual setup). Draft final report is planned for submission to PMS in February 2020 and project is expected to complete in March 2020. Closing thoughts: the utility of low-cost sensors may depend on application.
- d. 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. **PMS to meet Monday 1:00-2:00 pm in the TC Collaboration Area (not listed on the formal schedule online; Orange D on LL of Hilton)**
 - iv. PI and PMS to provide brief summary of project to date
 - v. Kathleen Owen provided a summary to date. 14 labs still involved in testing. 3 are done; 1 still testing; 1 has filters and ready to go; 4 making good progress; 5 “working on it.” Some problems with QA/equipment so far: some negative pressure test rigs; not using reference filters to check or reference filters out of spec; no OPC checks between annual checks; no ion generator check other than manufacturers; leak test confusion; overload tests are either missing, done wrong, or had data QC problems. Started with 15 labs and have 4 providing data following the procedure. Tests so far are suggesting better repeatability after recent 52.2 addenda than there was in testing several years ago. Testing is ongoing.
 - vi. Matt M: suggested a web meeting in between meetings for updates

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 this meeting: Jordan Clark is leading WS development. Kathleen received a draft last week. Might need another volunteer longer-term for PES/PMS.**
- 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. **Volunteers: Brandon B, Jim R, Brent S**

8. Work Statement (WS) activity between meetings

- a. None; no RTARs currently accepted

9. RTAR activity between meetings

- a. RTAR-1880: “Characterizing Indoor Particle Size Distributions to Inform Air Filtration Standards and Guidelines”
 - i. 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. **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.**
- b. Energy Implications of Air Filtration in Commercial Buildings (now 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
- iii. Updates from last meeting(s):
 - a. Geoff submitted past RTAR to 5.1 for review
 - b. Jeff suggested the more specific title “Fan Energy and Airflow Implications of Air Filtration in Commercial Buildings”
 - c. Brent suggested further changing to “Fan Energy and Airflow Implications of Air Filtration in Commercial HVAC Systems”
 - d. Kansas City update: No activity. Geoff Crosby and Jeff Siegel to discuss path forward, set up meeting with Armin Hauer (TC 5.1) and folks from AMCA.
 - e. 5.1 meets at the same time as 2.4 research; Geoff promised to meet with Armin this meeting
- a. 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.

10. Liaison reports - None

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

- a. Standard 52.3 based on PM mass
 - i. Champion: Vijay, Mike Corbat
 - ii. Discussion: Mike Corbat volunteered to assist, but not Champion.
 - iii. Update: None
- b. How do you do high efficiency filtration in new residential systems like VRFs and mini splits, also mechanical ventilation?
 - i. Champion: Tom Justice
 - ii. Brent spoke briefly with Tom Justice two meetings ago and is ready to move forward with the idea. Brent also spoke to Eric Berg (8.11 research

chair) who reached out on the idea too. Brent and Eric met at research chair's breakfast two meetings ago and discussed the potential for this to include measurements and/or modeling of the impact that these systems can have on IAQ even if high efficiency filters are used (issues with air distribution). Potential for 6.3 and 4.10 as well.

- iii. Last meeting: Brent emailed Eric Berg and Tom Justice to introduce them.
 - iv. KC Discussion: No update
 - v. Update: 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).
- c. How do people perceive IAQ with different particle filter types
- i. Champion: Jeff Siegel; EHC likely co-sponsor; Brent Stephens and Nick Clements interested; TC 2.3 could be co-sponsor too
 - ii. KC Discussion: No activity, but Jeff's read is that the room thinks it's a terrible idea. Jeff requested people approach him to help, and if no assistance offered, we will drop.
 - iii. Update from Jeff: suggests dropping due to lack of interest
- d. 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: GPC 35 is voting Monday morning. Uncertain of 2.3 vote outcome.
- e. 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: None

f. 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: None

g. Impact of aerosol phase state on filtration efficiency and loading kinetics of HVAC Filters under varying humidity (Brandon Boor)

- v. Can be done on small scale; focus on organics among others
- vi. Bruce McDonald has some experience here and volunteered to help.
- vii. Brandon would like to move forward following 1734-RP.
- viii. Brian Krafthefer expressed interest.

ix. Updates: none

h. Pollutant sensor rating method idea (Jordan Clark)

- i. 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
- ii. Trying to get Smart Buildings TC involved, but no success yet. Jordan working on this.
- iii. Updates: none

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

a. 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). Others interested include:

b. From Bruce McDonald: Potential co-sponsorship for knowing if your aerosol neutralization system is working (or not) coming from 52.2 research.

13. Adjournment – adjourned at 4:54 pm

APPENDIX B
TC 2.4 STANDARDS SUBCOMMITTEE

Agenda

Monday 4:15PM – 5:15PM, Feb 3, 2020
L, Conway Lake (Hilton)
Orlando, Fl

1. CALL TO ORDER

- A. Introductions
- B. Chair's comments
 - i. Mentioned the possibility of reduced subcommittee meeting and this could be an annual meeting vs. twice a year.
- 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 (Kathleen Owen)
 - i. Replied to Comment of Addendum B changing PM Efficiency nomenclature to PM_{2,5} 52.2
 - ii. Bob sent e-mails to author and Editor and no replies but Vjay was able to get replies
 - iii. Bob B will report at next meeting
- 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. Vote Approved to Co Sponsor RTAR "Effect of penetration through particle pre-filters on the performance of gas filters"
 - iii.

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 voted to approve

- 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) No update

 - 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 (Bruce McDonald)
 - i. SPC 199 - Method of Testing the Performance of Industrial Pulse Cleaned Dust Collectors
 - (1) 5 Year review will be 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) No Update

- E. SSPC 62.1 - Ventilation for Acceptable (Commercial) Indoor Air Quality (Marwa Zaatari)
 - i.

- F. SSPC 62.2 - Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings (Brent Stephens)
 - i. Considering on adding IAQP
 - ii.

- 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 (Dara Feddersen)
- i. Next Meeting – June 27th, 2020 Austin TX
 - ii. ISO 16980-2 and -4 are ready to go out as DIS revisions
 - iii. Advisory Panel 1 (Terminology) – Phil Maybee
 - (1) No Updates
 - iv. Advisory Panel 2 (UV-C) – OPEN
 - (1) No Updates
 - v. Working Group 3 (General Ventilation) – Don Thornburg
 - (1) Meeting to rewrite 16890-5 Flat sheet
 - (2) Next Meeting April 19th 2020
 - vi. Working Group 4 (HEPA/ULPA) – R. Vijayakumar Advisory Panel 4 – Andy Stillo
 - (1) 2/22/19: ISO/NP 29463-5, *High-efficiency filters and filter media for removing particles in air – Part 5: Test method for filter elements*
 - (2) Main discussions focus on changes to the discharge procedure
 - vii. Working Group 5 (Dust Collectors) – Chris Fischer
 - (1) Efforts to push ASHRAE standard 199 as an ISO
 - viii. Advisory Panel 7 (Durability of Cleanable Filter Media) – Dara Feddersen
 - (1) No Update
 - ix. Advisory Panel 8 (Gas Phase) – Matt Middlebrooks
 - (1) Web meeting set for July 2nd, 2020
 - x. Advisory Panel 9 (Gas Turbine) – Bruce McDonald
 - (1) No Update
 - xi. Advisory Panel 11 (Portable Air Cleaners) –
 - (1) Planned joint IEC meeting in Tokyo in April
 - (2) Week after ISO is an IEC meeting in Stockholm

- I. MTG.ACR, Air Change Rate (Delegate – Bob; Alternate – Michael)
 - i. Air Change Rates – Privately funded trial running.
 - ii. Could lead to the information needed if we looked at a recirculating air room test.
 - iii. Set up a room to evaluate dispersion on recirculated air. IPA vapor was the measurement element.
 - iv. Forming results of the first waves of the testing
 - v. Keith Shore Leading the committee
 - vi.

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

6. INFORMATION EXCHANGE

- A. AFS (John Rajala, Rahul Bharadwaj)
 - i. AFS
 - (1) Moved from 2 per year to annually
 - (2) Next conf Louisville April 19-21 2021
 - (3) Booth Expo Style
- 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 (??????)
- F. INDA – International Nonwovens Development Association (Tom Justice)
 - i. FiltXPO
 - (1) February 26-28, 2020, Navy Pier, Chicago, IL
- G. NAFA (Tom Justice)

- i. 2020 NAFA Technical Seminar, March 31- April 2 Phoenix, Arizona,
 - ii. 2020 NAFA Clearwater Beach FL Nov
- H. ISO/TC 22/SC 34 - Road vehicles - Propulsion, powertrain and powertrain fluids (Paolo Tronville, Bruce McDonald)
 - i. WG3 – Air filters
 - ii. Still working on soot as a loading aerosol. Having issues on repeatability.
 - iii. Out for balloting as a DIS document 12103 Part 3
- I. UL 900 (Randall Haseman)
 - i. Looking at adding Carbon Filters to standard
- J. IAQ Meetings (Jeffrey Siegel)
 - i. Sept 14-16 2020 Greece
- K. FILTECH Expo and Conference
 - i. Feb 23-25th 2021 Cologne, Germany
- L. Indoor Air Conference
 - i. Seoul Korea, July 20-24, 2020
- M. American Association for Aerosol Research
 - i. Aug 31- Sept 4th 2020 Raleigh NC
- N. International Aerosol Conference
 - i. 2022 Athens Greece
- O. Asia Filtration Show / FILTREX
 - i. Dec -11 Shanghai, China
- P. World Filtration Congress
 - i. WFC 13 San Diego, April 20-24, 2020
- Q. World Congress of Particle Technology
- R. Korean Filtration and Separation Society
 - i. Feb 17-18 2020. 3rd International
- S. WFI Annual Conference
 - i. July 29-31 2020 Waterloo, ON

APPENDIX C

Minutes

TC 2.4 Program Subcommittee Meeting

February 3, 2020 3:15-4:15PM - Hilton Orlando, L, Conway Lake

Subcommittee Chair: Jon Rajala

1. Call to Order @ 3:17pm
2. Introductions
 - a. **Chair comments: We had talked about moving Programs to Main. This room request was made anyways. Will continue to discuss further in main meeting.**

3. Submitted for Orlando:

Workshop – Rejected for Orlando	Filters Don't Use Energy (Jon Rajala and Jenny Berens) – Resubmit?	2.4, 2.3, GPC35	Geoff Crosby, Mike Corbat
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- i. **Possibly the 2nd submission and rejected.**
 - ii. **KJ asked Jeff for an abstract on a similar topic.**
 1. **Seminar sponsored by 2.3, co-sponsor by 2.4?**
- b. Any submissions for Orlando?
 - i. **History of Filtration – was not attributed to 2.4**
 1. **Paper session 7**
 - ii. **Question about how journal papers presented at ASHRAE conference are not attributed to the TC sponsoring the research**
 1. **University research values journal publications more than conference papers**

4. Next conferences:

2020 ASHRAE Annual Conference Austin, TX June 27 – July 1, 2020

Conference Program Chair: Bill Klock

The call for papers is **closed**

Debate, Forum, Workshop, Panel Discussion, and Seminar Proposals:

- **Due Monday February 10, 2020**

2021 ASHRAE Winter Conference Chicago, IL January 23 – 27, 2021

Conference Program Chair: Chad Powell

Conference Paper Abstracts, Technical Papers and Paper Session Requests

- **Due Wednesday March 18, 2020**

More info at <https://www.ashrae.org/conferences/2021-winter-conference-chicago>

5. Proposals in Progress – Working list notes

Type	Title	CoSponsor	Chair
Change to Seminar	How does type of filter affect energy consumption	Sponsored by 2.3 Ask 2.4 to cosponsor	KJ chair, Jeff S. presenter
Orlando Seminar	Particles in Outer Space ... Contact NASA *Mike contacted Vijay. Unsure of when Vijay will get information.		Vijay, Mike Corbat (NASA)
Austin Conf. Paper	How can filters be rated by their PM (PM1, PM2.5, PM10) performance? *No real action on this anymore. Remove this topic.	52.2	Thad Ptak, Brent, D. Thornburg
Austin Workshop	Climate and particulates: filtration, loading, entrainment 2 other people with Brian – Kathleen maybe? Brandon Boor (maybe phase 1 report) *Phase 1 report is due to be submitted soon. Kathleen and Brian are absent. Keep this on the list. Ask Brian for interest.	2.4, 2.9?	Brian Krafthefer
Austin Seminar	Particles above 10 um – still need to talk and find speakers *Brian is spearheading this. Jeff hasn't heard anything since Kansas City. Ask Brian for interest.		Brian, Brandon, Jeff
Austin *Not likely for Austin. Keep on list for later.	INDA IAQ Regulations (Rahul speak to INDA) *Christine – Probably fine to ignore this topic. *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
Austin Seminar	Data-driven air quality control in buildings: how close are we and what do we still need? *Jordan has speakers lined up already. *Jordan needs a 2.4 co-sponsorship vote.	Sponsored by TC 4.3, wants 2.4 as co-sponsor	Jordan Clark
Austin? Probably Chicago	Impact of high efficiency filters on HVAC energy *John sent Jon an email asking about paper abstract submission. *John would look at options and see what format to submit as. *Follow up with John to see how to proceed	?	John Zhang
After Austin Workshop	Back to Basics – Aerosol chemistry and testing Health effects, contamination, measurements		Dara/Tim

*Potential After Austin	*Keep topic on list. Tim and Dara still interested.		
Chicago Seminar *Definitely after Chicago	You bet your life: Particulate matter matters!! EHC/UV – hospitals *Marilyn – No work on this.	2.5, EHC?, IEQ-GA	Marilyn Listvan – Bill Bahnfleth, C Seyffer, Singer *Not Bobby Singer
Seminar Chicago	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	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.		Jeff S, Brian K
Conf Paper and ... ???	Urban Aerosols ... wait for RP1734 *Waiting for research projects to finish. *Jeff – Journal submissions are more important than conference papers for researchers. Journal papers aren't getting linked to the TC activity reports. *Jon will bring up the journal paper and TC activity report issue at the Main TC 2.4 meeting.		Brandon, Zied
Conf Paper and ... ???	Local Sensors ... wait for RP1756 *Waiting for research projects to finish		Jordan Clark, Zied

- **Russell Taylor – Biological threat detection. Developed a system to detect biological threats in buildings. Intelligent response to mitigate the threat. 2 or 3 papers from this research. DHS, United Technologies Research Center, Pacific Northwest National Labs involvement. Looking for sponsorship from a TC. Abstract needs to be submitted before March 18th, 2020 for Chicago. Russ should copy Jon Rajala on these submissions.**
- **Previously had a conference session at Long Beach. Was previously supported by 2.3/2.4.**
- **Add this topic to the list and discuss at the Main meeting**
- **Move Programs to Main meeting?**

- **Every other Main meeting, we could have a short update of what we're working on?**
- **Thoughts?**
- **Marilyn – Proposed scheduling the brainstorming meetings for Summer ASHRAE because of Winter attendance.**

- **Christine – Are upcoming events covered in Programs?**
 - **No, this is covered in Standards.**

6. Adjournment @4:02pm

DRAFT