



**Draft Minutes - ASHRAE MEETING – Virtual, Summer 2020  
TC 2.3 - Gaseous Air Contaminants/Removal Equipment  
TC Meeting**

Friday (07/17/20), 1:00 pm - 3:00 pm  
Zoom Meeting

**Meeting membership attendee list is as follows:**

Last Name	Name	Member Status	Position	Present
14 out of 16 Voting Members in attendance				
Abate	Mr. Anthony Abate	VM	Member	P
Agopian	Mr. Nick Agopian	VM	Member	P
Bayer	Dr. Charlene W. Bayer, PhD	VM	Member	P
Choi	Dr. KJ Choi, PhD	VM	Program Chair	P
Haas	Mr. Daniel Haas	VM	Member	P
Hingorani	Dr. Sanjeev Hingorani, PhD	VM	Chair	P
Kerr	Dr. Gemma Kerr, PhD	VM	Member	P
Krafthefer	Mr. Brian Krafthefer	VM	Handbook Chair	P
Kwong	Mr. Kevin Kwong	VM	Secretary	P
Lee	Dr. Chang-Seo Lee, PhD	VM-NQ	Member	P
Mason	Mr. Dan Mason	VM	Member	-
Middlebrooks	Mr. Matt Middlebrooks	VM	Membership Chair	P
Roseberry	Mr. Jeffrey Roseberry	VM	Member	P
Sun	Dr. Christine Sun, PhD	VM-NQ	Member	P
Tronville	Dr. Paolo M. Tronville, PhD	VM	Member	-
Zaatari	Dr. Marwa Zaatari, PhD	VM	Vice Chair	P

**Summary of Motions**

#	Motion	Vote (For-Against-Abstain-Absent-Chair Voting Status)
1	Motion to approve TC 2.3 minutes from Orlando with revisions 1 <sup>st</sup> – Gemma Kerr, 2 <sup>nd</sup> – Matt Middlebrooks	12-0-2-2-CNV
2	Motion to have Zoom capabilities available at all face-to-face meetings of ASHRAE Technical Committees, Subcommittees, and Standards Committees 1 <sup>st</sup> – Gemma Kerr, 2 <sup>nd</sup> – Brian Krafthefer	12-0-0-4-CV
3	Motion to accept the Handbook Subcommittee recommendation to accept Chapter 11 “Air Contaminants” of the ASHRAE Handbook Fundamentals and forward it to ASHRAE for publication. 1 <sup>st</sup> – Jeff Roseberry, 2 <sup>nd</sup> – Chang-Seo Lee	13-0-1-2-CNV
4	Motion to approve a 6-month no cost extension of ASHRAE RP-1579 “Testing and Evaluation of Ozone Removal Air Cleaning Devices for Improving IAQ”. 1 <sup>st</sup> – Marwa Zaatari, 2 <sup>nd</sup> – Tony Abate	13-0-1-2-CNV



5	Motion to approve a 1-year no cost extension of ASHRAE RP-1720 “Validation of gas-phase air cleaner performance test method (Standard 145.2) by laboratory testing of commercially available filtration devices”. 1 <sup>st</sup> – Gemma Kerr, 2 <sup>nd</sup> – Charlene Bayer	13-0-1-2-CNV
6	Motion to approve sponsoring and sending to RAC WS-1858 “Evaluation of HVAC ventilation effectiveness in reducing semi-volatile organic compounds (SVOCs) in indoor spaces”. 1 <sup>st</sup> – Gemma Kerr, 2 <sup>nd</sup> – Brian Krafthefer	13-0-1-2-CNV

**1. Meeting was called to order by Chair @ 1:00pm**

- a. The ASHRAE Code of Ethics was reviewed.
  - i. The ASHRAE Code of Ethics is to be adhered to by those doing ASHRAE business whether or not they are an ASHRAE member. The Code of Ethics can be reviewed at the below link.
  - ii. <https://www.ashrae.org/about-ashrae/ashrae-code-of-ethics>
- b. Members and guests were encouraged to use the Zoom chat feature to enter their Name, Affiliation, Email Address, and YEA designation (if applicable) for meeting attendance records.
- c. It was determined that there was a Quorum with 13 of 16 voting members present at roll call. Nick Agopian was not present at roll call but joined shortly afterwards for a total of 14 of 16 voting members present for the meeting.
  - i. Voting Members for this meeting: Anthony Abate, Nick Agopian, Charlene Bayer, KJ Choi, Daniel Haas, Sanjeev Hingorani, Gemma Kerr, Brian Krafthefer, Kevin Kwong, Chang-Seo Lee V-NQ, Daniel Mason, Matt Middlebrooks, Jeff Roseberry, Christine Sun V-NQ, Paolo Tronville, Marwa Zaatari
  - ii. 16 Voting Members and 2 NQM
  - iii. > ½ Voting Members Present (9) (Yes – 14/16)
    - a. Absent: Daniel Mason, Paolo Tronville
- d. Chair’s Report
  - i. The Chair thanked the TC2.3 Leadership team (Brian, Kathleen, KJ, Kevin, Matt, Marwa, Marilyn, Michael, Paula, and Tony) and all members & participants for making this a successful virtual meeting.
  - ii. The Chair thanked ASHRAE Staff (Lilas Pratt, Ragan McHan, and Tara Thomas) for scheduling the TC 2.3 virtual meetings.
  - iii. The Winter ASHRAE Conference is still currently scheduled for Chicago from January 23–27, 2021. No new update was provided by ASHRAE regarding the effects of Covid-19 on in-person meetings.
  - iv. TAC has approved four TC mergers:
    - 1. 3.2 (Refrigeration System Chemistry) & 3.3 (Refrigerant Contaminant Control)
    - 2. 7.3 (Operation and Maintenance Management) & 7.8 (Owning and Operating Cost)
    - 3. 8.10 (Mechanical Dehumidification Equipment and Heat Pipes) & 8.12 (Desiccant Dehumidification Equipment & Components)
    - 4. 9.4 (Justice Facilities) & 9.8 (Large Building Air-Conditioning Applications)
  - v. September 1<sup>st</sup> is the due date for nominations for the ASHRAE George B. Hightower Technical Achievement Award. The Chair encouraged nominations of TC 2.3 members for this award.
  - vi. TC interim meetings should be posted two weeks before the scheduled date of meeting by emailing [TCmeetings@ashrae.net](mailto:TCmeetings@ashrae.net) with the call-in phone numbers or web meeting links.



1. The listing of interim meetings can be found on the Technical Committees webpage <https://www.ashrae.org/technical-resources/technical-committees>
  2. ASHRAE will add a notice in the ASHRAE Journal Newsletter (bimonthly) to remind our members to check the listing and to provide a link to the list
- e. Reporting from ASHRAE liaisons.
- i. No ASHRAE liaisons present

**2. Review and Approval of previous meeting minutes from Orlando.**

- a. Gemma noted an error in the Orlando meeting minutes in Section of 5.i.ii of the Subcommittee Reports.
  - i. “You need written **presentations** from the author for ASHRAE presentations.”
  - ii. ‘Presentations’ should be amended to ‘permission’.
- b. Gemma Kerr motioned to approve the TC 2.3 minutes from Orlando with revisions.
  - i. 2<sup>nd</sup> – Matt Middlebrooks
  - ii. 12-0-2-2-CNV (For-Against-Abstain-Absent-Chair Voting Status)
  - iii. Abstain: Charlene Bayer (Not present in Orlando), Sanjeev Hingorani (CNV)
  - iv. Absent: Paolo Tronville, Daniel Mason

**3. Summary of votes between meetings:**

- a. No votes between meetings

**4. Review of Action Items from Last Meeting**

#	Action Item	Owner	Meeting Initiated	Update from Summer 2020 (Virtual Meeting)	Status
1	Workshop on performance rating system summary to be sent out.	Ashish Mathur	Atlanta	<p>Ashish will send a request to ASHRAE by the August 7<sup>th</sup> deadline.</p> <p>This could also be an RTAR idea. Titled “To study the contribution of different technologies to the overall performance of the system”. Chang-Seo volunteered to help Ashish with the RTAR.</p> <p>Matt mentioned a related article in the July 2020 ASHRAE Journal titled “Evaluating Virus Containment Efficiency of Air-Handling Systems” by Renat Manassypov.</p>	Open
2	Collection of TC member bibliography papers for website posting	Marilyn Listvan	Atlanta	<p>This remains an ongoing project. Marilyn requests TC 2.3 members to write articles and submit to <a href="mailto:mlistvan@yahoo.com">mlistvan@yahoo.com</a>.</p> <p>Gemma volunteered to look into</p>	Ongoing



#	Action Item	Owner	Meeting Initiated	Update from Summer 2020 (Virtual Meeting)	Status
				<p>ASHRAE Transactions Papers from research projects sponsored by TC 2.3.</p> <p>Similarly, Marilyn will look at ASHRAE Transactions Papers from TC 2.4 and EHC research projects.</p> <p>Paula noted that articles must be peer-reviewed and presented at ASHRAE meetings in order to be posted on the TC 2.3 website. ASHRAE is strict on listing titles or references on the website if they were not presented at ASHRAE.</p>	
3	Development of a course on gas phase filtration to be part of ASHRAE supported classes and send to chapters	<del>Brian Krafthefer</del> Paula Levasseur	Atlanta	<p>Change the owner of this Action Item from Brian to Paula.</p> <p>Paula, Kathleen, and Marwa have pulled up presentations from previous ASHRAE meetings and presentations to ASHRAE Chapters. Paula will send these presentations to Sanjeev to circulate to TC 2.3 members for review and comments.</p>	In-Process
4	Title/purpose /Scope for MTG or GPC on how to implement combined filtration systems	Matt Middlebrooks	Houston	<p>Matt wants to keep this topic on the list however no action has been taken so far.</p> <p>Brian volunteered to help Matt.</p>	Open
5	<del>PowerPoint presentation to describe T.C. 2.3</del>	<del>Marilyn Listvan, Kevin Kwong, Nick Agopian</del>	<del>Houston</del>	This Action Item should be deleted and combined with Action Item #3.	<del>Open</del>
6	Twitter account	Marwa Zaatari	Long Beach	<p>Marilyn has posted items to the TC 2.3 LinkedIn Outreach page.</p> <p>Nick encouraged all TC 2.3 members to follow the TC 2.3 Twitter account and join the TC 2.3 LinkedIn Outreach page.</p> <p>Marwa requested to be kept in-the-loop for all on-going research projects for posting updates on Twitter.</p>	Ongoing
7	ASHRAE Certification Program	Christine Sun	Orlando	Christine reported that ASHRAE has many certification programs and shared	Ongoing



#	Action Item	Owner	Meeting Initiated	Update from Summer 2020 (Virtual Meeting)	Status
				<p>the following ASHRAE link:  <a href="https://www.ashrae.org/file%20library/professional%20development/ashrae%20certification/ashrae-certification-brochure.pdf">https://www.ashrae.org/file%20library/professional%20development/ashrae%20certification/ashrae-certification-brochure.pdf</a></p> <p>Ashish suggested TC 2.3 could offer courses as part of ASHRAE’s Career Enhancement Curriculum program. An example is Dr. Bill Bahnfleth’s short course on UVGI.</p> <p>Should this be a joint venture between TC 2.3/2.4 (IAQ is a combination of 2.3/2.4) or standalone (specialize, people may only be interested in one subject)?</p>	

**5. Subcommittee Reports**

- a. Handbook - Subcommittee Chair -- Brian Krafthefer
  - i. Another subcommittee meeting will be held for Chapter 11 “Air Contaminants” in ASHRAE Fundamentals before the upcoming deadline.
    - 1. Gemma will lead the next revision of Chapter 11 “Air Contaminants” in Fundamentals.
  - ii. Chapter 47 “Air Cleaners for Gaseous Contaminants” of ASHRAE HVAC Applications is due in 2022.
    - 1. Michael Sherber will lead Chapter 47 revisions.
  
- b. Membership - Subcommittee Chair -- Matt Middlebrooks
  - i. Two Ashish Mathur’s are listed on the roster. One Ashish will be rolling on as a voting member and Matt will verify ASHRAE Member IDs so the correct membership change is made.
  - ii. Currently 16 Voting Members.
    - 1. Three Voting Members rolling off on August 1<sup>st</sup>: Nick Agopian, Dan Haas, Marwa Zaatari
    - 2. Four Voting Members rolling on: Mick Flom, Ashish Mathur, Vivek Gaur, Jensen Zhang
  - iii. 119 corresponding members.
    - 1. 24 YEA members
  - iv. Brian asked how international Voting Members are counted.
    - 1. Matt replied that international Voting Members are typically considered non-quorum due to meeting attendance and travel.
    - 2. Paolo is not a non-quorum Voting Member since he usually attends all meetings.
  - v. Brian asked the Chair if any discussions were underway at ASHRAE to have Zoom meetings as a supplement to in-person meetings.
    - 1. Matt commented that ASHRAE will provide equipment needed to facilitate electronic meetings at in-person ASHRAE meetings. ASHRAE requires the TC to dedicate someone to monitor the equipment.

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2. Gemma Kerr motioned to have Zoom capabilities available at all face-to-face meetings of ASHRAE Technical Committees, Subcommittees, and Standards Committees.
    - a. 2<sup>nd</sup> – Brian Krafthefer
    - b. 12-0-0-4-CV (For-Against-Abstain-Absent-Chair Voting Status)
    - c. Absent: Nick Agopian, Charlene Bayer, Paolo Tronville, Daniel Mason
  3. The Chair will write to ASHRAE to encourage the use of Zoom meetings at all in-person meetings.
- c. Planning - Subcommittee Chair – Marwa Zaatari
    - i. The planning subcommittee discussed RTAR's, MTG's, and GPC's pertaining to TC 2.3.
    - ii. Three new items were discussed:
      1. CO<sub>2</sub> Position Document
      2. Enhanced IAQ Guide
      3. TRG4-IAQP
    - iii. Kevin will lead work on the TC 2.3 roadmap.
    - iv. Sanjeev provided an update on ASHRAE certifications.
    - v. TC 2.3 members (Kathleen and Matt) are serving on ASHRAE's Epidemic Task Force (ETF).
  - d. Program - Subcommittee Chair -- KJ Choi
    - i. Three seminars were submitted for Chicago.
      1. Fighting the Unseen Killers in the Environment: Gas-Phase Air Cleaners
      2. Sensors in IAQ
      3. Supplementing Ventilation with Gas-Phase Air Cleaning and Energy Implications
    - ii. KJ acknowledged Marwa's TC 2.3 sponsored seminar at the Virtual Conference.
  - e. Professional Development Coordinator -- Barney Burroughs
    1. Barney was not in attendance
    2. Marilyn will check on this group for updates. It sounds like the ASHRAE Learning Institute (ALI).
      - a. Brian offered to help Marilyn.
  - f. Publications - Subcommittee Chair -- Marilyn Listvan
    - i. Send paper references to Marilyn at [mlistvan@yahoo.com](mailto:mlistvan@yahoo.com).
    - ii. Marilyn will look into the issue of putting titles on the TC 2.3 website.
  - g. Research - Subcommittee Chair – Paula Levasseur
    - i. 3 active research projects
      1. 2 research projects asking for extensions
    - ii. New RTAR-1895 on the effects of particle loading on gas-phase filtration.
    - iii. Several proposed RTARs including a chamber test.
    - iv. Updates from the Research Subcommittee Chair's Virtual "Breakfast"
      1. Link to see this meeting:  
<https://www.ashrae.org/file%20library/technical%20resources/research/rac-breakfast.mp4>
      2. New Investigator Award and Innovative Research Grant are delayed due to Covid-19.
      3. Grant-In-Aid will be minimized to approximately 3 awards. Usually 20-25 are issued in a year.
      4. Covid-19 is affecting ASHRAE research funds.
        - a. AHR Expo is a big contributor to funding.
        - b. Research funding priority will be towards Covid-19 related topics.

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- c. Chicago meeting and AHR Expo seems unlikely due to health mandates on in-person events.
  - 5. Our Research Liaison (Bill Hutzel) reported that TC 2.3 is the most active research committee.
- h. Standards - Subcommittee Chair – Michael Sherber
    - 1. Michael was not in attendance
    - 2. Gemma reported that the Standards meeting was fairly typical with discussion on updates to various ASHRAE, ISO, and ASTM standards.
  - i. Website - Subcommittee Chair -- Paula Levasseur
    - i. Caitlin Naske will consider taking over updates for the TC 2.3 website.
    - ii. In the meantime, keep on sending meeting minutes to Paula to upload until Caitlin is trained in.
    - iii. The committee acknowledged Bruce's efforts on maintaining the website.
  - j. SPC145 – Committee Chair – Tony Abate
    - i. 21 attendees for the SPC 145 meeting.
    - ii. The Standard 145.2 TPS changes to allow for the inclusion of testing electronic air cleaners was previously voted on by the committee and sent out for Publication Public Review. Some non-supportive comments were received and commented/rejected by SPC 145.
      - 1. Tony will submit this TPS change request to SPLS
      - 2. Bob, new Chair of PPIS, commented that he has not seen this item on their agenda.
    - iii. 1838-RP will produce a major rewrite of Standard 145.2.
      - 1. Many discussions of Standard 145.2 changes were shelved in anticipation of the 1838-RP deliverables.
      - 2. The SPLS liaison (Larry Kouma) informed the committee that SPC 145 may access the results of 1838-RP before ASHRAE approves the final report.
    - iv. Addendum A of Standard 145.2 was approved for PPR.

## 6. Report from TC liaisons

- a. Hank Greist – TC 2.9
  - i. SSPC 185 discussed adding a 185.3 bioaerosol test procedure which will involve a combination test duct and chamber.
    - 1. Initial request was from Kathleen and the ASHRAE ETF to broaden the scope of 185.1 from UVC technologies to all air cleaners. SSPC 185 chose to keep 185.1 as-is and voted to start a new 185.3.
    - 2. SSPC 185 will hold a web meeting to work on drafting the TPS for 185.3. Meeting will likely take place on August 5<sup>th</sup>.
    - 3. Bioaerosols are the main concern but there is a possibility for including particulates and gaseous contaminants.
  - ii. Matt added that this topic came up in the Research Subcommittees for both TC 2.3 and TC 2.4. Those subcommittees chose to start with an RTAR. Matt is coordinating efforts across groups and will be meeting with Linda Lee of SSPC 185 and representatives from AHAM on their work to expand their chamber test method. Matt is also working with ASHRAE's Mike Vaughn to schedule a meeting with the 12-14 member RTAR group.
- b. Nick Agopian – 62.2

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- i. Nick suggested TC 2.3 should work with 62.2 on a research project (Unvented Combustion Devices Within the Built Environment). This project will be a large (\$1M+) research study with funding from the gas industry.
  
  - c. Nick Agopian – TRG-IAQP
    - i. This group met earlier today. Marwa is rolling off as Chair. Nick is rolling on as Chair. Dean Tompkins is rolling on as Vice Chair.
  
  - d. Nick Agopian - 62.1
    - i. Nick recommends TC 2.3 to keep on supporting 62.1. 62.1 is a major player in influencing the direction of the global industry.
    - ii. 62.1 is creating task groups around each of the 62.1 Addendums as a form of restructuring.
  
  - e. Jensen Zhang – EHC
    - i. Jensen was not able to attend the EHC meeting.
    - ii. Jensen is involved with an editorial regarding the importance of air cleaning which will appear in the September issue of Science and Technology for the Built Environment.
  
  - f. Brian Krafthefer – TC 4.10
    - i. Developing indoor environmental model for chambers. This is of interest to TC 2.3 if we are considering an AHAM-type chamber method.
  
  - g. Tony Abate – TC 4.3
    - i. Sponsored a seminar (“Data Driven Air Quality in Buildings”) at the Virtual Conference.
    - ii. Active RTAR-1878 on outdoor PM and penetration in naturally vented commercial buildings.
    - iii. Potential RTAR on first global indoor air quality database. TC 4.3 is a co-sponsor with TC 2.1.
    - iv. 5 seminars in discussion for Chicago.
  
  - h. Dara Feddersen – TC 2.4
    - i. Updates from TC 2.4 have been discussed earlier in this meeting.
  
  - i. Kevin Kwong – U.S. TAG to ISO/TC 142
    - i. WG8 - Gas-Phase Air Cleaning Devices
      - 1. ISO 10121: Test method for assessing the performance of gas-phase air cleaning media and devices for general ventilation.
        - a. 10121-3 (classification system for gas-phase air cleaning devices) is in the CD (‘committee draft’) stage
    - ii. WG11 - Portable Room Air Cleaners
      - 1. IEC 63086: Household and similar electrical air cleaning appliances – Methods for measuring the performance.
        - a. 63086-1 (general requirements) is in the FDIS (‘final draft’) stage
        - b. Work is beginning on 63086-2-1 (particulates)
        - c. 63086-2-2 (gases) and 63086-2-3 (microbials) are under consideration
  
  - j. Bob Burkhead - MTG.ACR
    - i. Bob suggested adding this MTG on Air Change Rates for future TC 2.3 Main updates.
    - ii. This involves privately funded work to study flow dynamics in buildings development.



- iii. They are using gases as the study aerosol.
- iv. Kishor Khankari is the lead on this MTG.

## 7. New Business

- a. Handbook Subcommittee has revised and approved Chapter 11 “Air Contaminants” part of ASHRAE Handbook Fundamentals. The Handbook Subcommittee is recommending that a vote be taken to accept the Chapter and approve to forward it to ASHRAE for Publication.
  - i. Jeff Roseberry motioned to accept the Handbook Subcommittee recommendation to accept Chapter 11 “Air Contaminants” of the ASHRAE Handbook Fundamentals and forward it to ASHRAE for publication.
  - ii. 2<sup>nd</sup> – Chang-Seo Lee
  - iii. 13-0-1-2-CNV (For-Against-Abstain-Absent-Chair Voting Status)
  - iv. Abstain: Sanjeev Hingorani (CNV)
  - v. Absent: Daniel Mason, Paolo Tronville
  
- b. Six month no cost extension of ASHRAE RP 1579 Project “Testing and Evaluation of Ozone Removal Air Cleaning Devices for Improving IAQ”
  - i. Marwa Zaatari motioned to approve a 6-month no cost extension of ASHRAE RP-1579 “Testing and Evaluation of Ozone Removal Air Cleaning Devices for Improving IAQ”.
  - ii. 2<sup>nd</sup> – Tony Abate
  - iii. 13-0-1-2-CNV (For-Against-Abstain-Absent-Chair Voting Status)
  - iv. Abstain: Sanjeev Hingorani (CNV)
  - v. Absent: Daniel Mason, Paolo Tronville
  
- c. One Year no cost extension of ASHRAE RP 1720 Project “Validation of gas-phase air-cleaner performance test method (Standard 145.2) by laboratory testing of commercially available filtration devices”
  - i. Gemma Kerr motioned to approve a 1-year no cost extension of ASHRAE RP-1720 “Validation of gas-phase air cleaner performance test method (Standard 145.2) by laboratory testing of commercially available filtration devices”.
  - ii. 2<sup>nd</sup> – Charlene Bayer
  - iii. 13-0-1-2-CNV (For-Against-Abstain-Absent-Chair Voting Status)
  - iv. Abstain: Sanjeev Hingorani (CNV)
  - v. Absent: Daniel Mason, Paolo Tronville
  
- d. Approval of WS-1858 “Evaluation of HVAC ventilation effectiveness in reducing semi-volatile organic compounds (SVOCs) in indoor spaces” to be sent to RAC
  - i. TC 2.4 voted to approve co-sponsorship of WS-1858.
  - ii. Gemma Kerr motioned to approve sponsoring and sending to RAC WS-1858 “Evaluation of HVAC ventilation effectiveness in reducing semi-volatile organic compounds (SVOCs) in indoor spaces”.
  - iii. 2<sup>nd</sup> – Brian Krafthefer
  - iv. 13-0-1-2-CNV (For-Against-Abstain-Absent-Chair Voting Status)
  - v. Abstain: Sanjeev Hingorani (CNV)
  - vi. Absent: Daniel Mason, Paolo Tronville
  
- e. Marilyn informed the committee that Guideline 27 is officially available on the ASHRAE bookstore. Bill Lull and Gemma helped to get this Guideline published.



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8. **Agenda suggestions for the Summer Meeting in Austin, Texas**
    - i. None

9. **The meeting was adjourned @ 3:02pm**