

motion



Shaping Tomorrow's
Built Environment Today

MINUTES (DRAFT)
Environmental Health Committee (EHC)
January 22, 2024 - Winter Meeting

These minutes have not been approved and are not the official, approved record until approved by this committee

MEMBERS PRESENT:

Bill Bahnwfleth, Chair
Marwa Zaatari, Vice-Chair
Dimitris Charalambopoulos
Dru Crawley, BOD Ex-O
Benjamin Jones
Linda Lee
Ken Mead
Corey Metzger
Connor Murray
Kathleen Owen
Ashish Rakheja, *Coordinating Officer*
Max Sherman

MEMBERS NOT PRESENT:

Mark Ereth
Howard Kipen
Farhad Memarzadeh
Lisa Ng
Donald Weekes

ASHRAE STAFF:

Alice Yates, *DGA*
Steve Hammerling, *MOTS*

GUESTS:

Costas Balaras
Charlene Bayer
Hoy Bohanon
Richard Bruns
Brendan Burley
Jordan Clark
Yidan Cui
Darryl Deangelis
Martin Dehlinger
Nolan Demos
Pat Fritz
Elliott Horner
Kazukiyo Kumagai
Alex Mavrelis
Nancy McClellan
John McKeon
John Nix
Andy Persily
Felipe Sobevon
Larry Schoen
Chandra Sekhar
Lawrence Sloan
Charles Seyffer
Larry Smith
Stephanie Taylor
Pawel Wargocki
Vassilis Zoukes

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MOTIONS

No.	Motion	STATUS
1	that revisions to the EHC MOP and EHC Reference Manual be approved.	PASSED
2	that Chris Pyke be replaced by Seema Bhangar as a committee member on the HHWBE PD committee.	PASSED
3	to approve Recent Trends in Environmental Health report and send to Tech Council	PASSED
4	that EHC submit a program on Standard 241 impact on ASHRAE ventilation standards for Chicago Meeting.	PASSED
5	that EHC co-sponsor program titled "Occupant Health Must be Considered in Building Design, Operations and Maintenance"	PASSED
6	That EHC support seminar titled "Overview of IEQ at ASHRAE: Committees, Guidelines, and Standards" for Chicago meeting.	PASSED
7	that EHC co-sponsor WS 1928	PASSED

LIST OF ATTACHMENTS

No.	Attachment
A	23-24 EHC MBOs
B	PEAC Presentation
C	EIB Indoor Reactive Oxygen and Nitrogen Species

LIST OF ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
AHAM	American Home Appliance Manufacturers
AiCARR	Italian Association of Air Conditioning, Ventilation and Refrigeration
AIHA	American Industrial Hygiene
AIVC	Air Infiltration and Ventilation Centre
ASA	Acoustical Society of America
ASHRAE	American Society of Heating, Refrigerating and Air-conditioning Engineers
BOD	Board of Directors
CEC	Conferences & Expositions Committee
CNV	Chair Not Voting
CO	Coordinating Officer
CO2	Carbon Dioxide
CTTC	Chapter Technology Transfer Committee
DEI	Diversity, Equity and Inclusion
DRSC	Document Review Subcommittee
EHC	Environmental Health Committee
EIB	Emerging Issue Brief
ENDS	Electronic Nicotine Delivery Systems
ETF	Epidemic Task Force
ExCom	Executive Committee
ExO	Ex-Officio
ETS	Environmental Tobacco Smoke
H&A	Honors and Awards
HHWBE	Human Health & Wellness in the Built Environment

IAQ	Indoor Air Quality
IAQA	Indoor Air Quality Association
IEQ	Indoor Environmental Quality
IEQ-GA	Indoor Environmental Quality Global Alliance
IICRC	Institute of Inspection Cleaning and Restoration Certification
ISHRAE	Indian Society of Heating, Refrigerating and Air Conditioning Engineers
ISIAQ	International Society of Indoor Air Quality and Climate
MBO	Management by Objectives
PD	Position Document
PEAC	Presidential Elect Advisory Committee
REHVA	Representatives of European Heating and
ROB	Rules of the Board
ROS	Reactive Oxidation Species
SIE	Society for Indoor Environment
SGPC	Standing Guideline Project Committee
TFBD	Task Force for Building Decarbonization
WHO	World Health Organization

ACTION ITEMS FROM CHICAGO MEETING

No.	Responsibility	Action Item	Status
CH1	Metzger, Schoen, Jones	Lead the revision of the Electronic Nicotine Delivery Systems (ENDS) in Indoor Environments EIB	
CH2	Jones	Get in contact with DTU team working <i>Indoor Passive Panel Technologies for Air Cleaning in Buildings</i> and make recommendation on EIB	
CH3	Burley/Clark	Review template and consider drafting EIB on IEQ sensors and building automation systems	
CH4	Bayer	Send program proposal to EHC for review	
CH5	EHC	Offer ideas for environmental health report on gaps and emerging trends	
CH6	Policy Subcommittee, Clements, Bohanon, Charalambopoulos	Develop proposal (TPS) and chair for an ASHRAE PD on Ozone/Indoor Chemistry	
CH7	Education Subcommittee	Education Subcommittee asked to review current EH Award procedures and recommend changes	

OPEN ACTION ITEMS FROM PAST MEETINGS

No.	Responsibility	Action Item	Status
#1 (Jan. 11)	Staff	Verify IAQ PD posted on website is current	Complete
#2 (Jan. 11)	Staff	List archived EIBs as such on EHC webpage	Complete
#3 (Jan. 11)	Staff/EHC	Staff would send list of EIBs to EHC members that need review ahead of the Chicago meeting to discuss the appropriate action	Complete
#4 (Jan. 11)	EHC	Review latest EIB ROS version to consider approval in CHI	Complete
#5 (Jan. 11)	EHC	Send ideas for Annual EHS Trends and Research Gaps report to Kipen	Ongoing
#6 (Jan. 11)	Staff	Reballot top 3 scorers to EHC with request to rank in order	Complete
#7 (Jan. 11)	Staff	Update EHC Reference Manual and post to EHC webpage	Complete

No.	Responsibility	Action Item	Status
TB2	Weekes, Sherman, Burley, Bahnfleth	Develop proposed changes to ROB 1.201.004.9	Complete
TB4	EHC	Review draft EIB on <i>Indoor Reactive Oxygen and Nitrogen Species</i> before next meeting	Complete

1. CALL TO ORDER & WELCOME

Chair Bahnfleth called meeting to after 8 AM CST welcoming members and guests. Those in room introduced themselves. There were nine voting members from EHC in attendance at the start of the meeting and quorum was confirmed.

2. ASHRAE CODE OF ETHICS COMMITMENT

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.

ASHRAE DIVERSITY AND INCLUSION COMMITMENT

ASHRAE is committed to providing a welcoming environment. Our culture is one of inclusiveness, acknowledging the inherent value and dignity of everyone. We proactively pursue and celebrate diverse and inclusive communities understanding that doing so fuels better, more creative, and more thoughtful ideas, solutions and strategies for the Society and the communities our Society serves. We respect and welcome all people regardless of age, gender, ethnicity, physical appearance, thought styles, religion, nationality, socioeconomic status, belief systems, sexual orientation or education.

3. APPROVAL OF MINUTES

- January 11, 2024 Meeting (posted to Teams Jan 11)
No changes or corrections were made to last EHC meeting minutes and they were approved unanimously.

4. REVIEW OF AGENDA

A section 6.0 BOD Ex-O and CO report was added to the agenda. Bahnfleth asked for New Business under section 9.0 New Business (no new business was noted at this time).

5. CHAIR'S REPORT

A. Motions from Past Meetings requiring higher approval

- Motion to initiate revision to *Unvented Combustion Devices and Indoor Air Quality* PD *[on DRSC agenda for Chicago]*
- Motion to appoint *Unvented Combustion Devices and Indoor Air Quality* PD committee *[on DRSC agenda for Chicago]*

B. Review of Action Items (see summary)

C. MBOs and MBO Assignments

MBOs will be updated in reports to follow. An update on EHC MBOs (**Attachment A**) will be reported to Tech Council's Operations Subcommittee.

6. BOD EX-O / COORDINATING OFFICER REPORTS

Tech Council chair Rakheja thanked EHC for work related to infectious aerosols and 241 standard which is being used throughout the world.

Crawley gave PEAC Presentation (**Attachment B**). Highlights include:

- Asked all to comment on ASHRAE 25-28 strategic plan (<https://strategicplanfeedback.ashrae.org/>)
- ASHRAE TFBD (www.ashrae.org/about/ashrae-task-force-for-building-decarbonization) is wrapping up initial work with two publications and six more in coming year. This group is transitioning into a Center of Excellence on Decarbonization.
- The ASHRAE BOD voted to include DEI statement at every meeting to showcase DEI commitment. Will be edited from what we have now.
- Recent publications:
 - Standard 241: establishes minimum requirements aimed at reducing the risk of disease transmission through exposure to infectious aerosols in new buildings, existing buildings, and major renovations.
 - Standard 228: sets requirements for evaluating whether a building or group of buildings meets a definition of “zero net energy” or a definition of “zero net carbon” during building operation.
 - Standard 100-2024: This essential ASHRAE resource offers over 100 typical energy efficiency measures (EEMs) that can be applied to enable buildings to meet set energy targets, identifying commonly applied elements that can improve building performance.

7. SUBCOMMITTEE REPORTS

A. Policy (Metzger)

- Position Document Updates (if available)
 - Human Health and Wellness in the Built Environment
PD chair Bayer reported that the PD committee was meeting monthly, making great progress and invited all to attend their meeting later today in Chicago (4 PM - Algebra). Current focus is focusing on what ASHRAE can do in this area, IEQ vs. IAQ. They are using WHO definition of health and wellness and propose health and wellness as a metric. The PD committee is now focused on shortening, moving background to an appendix to prepare a draft for outside review.

It was noted AIHA and IEQ-GA will want to review and comment as well.

- Filtration and Air Cleaning (Zaatari)
The Filtration and Air Cleaning PD committee is responding to review comments and not ready to be considered for approval at this time. They aim to have completed by end of February 2024.

(1) It was moved (Metzger) and seconded (Sherman) that EHC recommends that DRSC recommend to Tech Council that they reaffirm the Filtration and Air Cleaning position document (PD).

BACKGROUND: This PD is being revised but the current PD expires Feb. 2, 2024. EHC recommends reaffirming until the revised PD is approved so the information is not lost.

EHC 1 MOTION PASSED: 9-0-0 CNV

(2) It was moved (Sherman) and seconded (Metzger) that EHC recommends that DRSC recommend that Tech Council recommend to BOD ExCom that the title of the *Filtration and Air Cleaning* position document (PD) currently being revised be changed to *Air Cleaning*.

BACKGROUND: This change would be consistent with Standard 241 definitions. Air filtration, disinfection, sanitization, and other technologies and techniques are all considered air cleaning. Changes to PD title, purpose and scope (TPS) requires ExCom approval.

EHC 2 MOTION PASSED: 4-3-1 CNV

- Indoor CO₂ (Persily)
PD committee chair Andy Persily reported that his committee has been appointed but has not met yet. Their focus will be on including or updating new science on the subject and getting into new PD format.
- Unvented Combustion Devices and IAQ
Motions to revise and appoint this PD committee were passed by EHC in November and are on DRSC agenda for Chicago.
- Combustion of Solid Fuels and Indoor Air Quality in Primarily Developing Countries
A reformatted version of the *Combustion of Solid Fuels and Indoor Air Quality in Primarily Developing Countries* PD was sent to the former PD chair to consider reaffirmation with editorial changes.
- Emerging Issue Briefs (EIB) – posted [here](#)
 - A Full EHC review of the following EIBs is suggested by the Policy Subcommittee:
 - Electronic Nicotine Delivery Systems (ENDS) in Indoor Environments
EHC discussed and felt this topic was still deemed emerging, but could be expanded in scope.

(3) it was moved (Sherman) and seconded (Metzger) to retain this EIB and start a revision.

Background: The ETS PD mentions ENDS but the breadth of research on ETS is much greater so a separate document on vaping is appropriate. The current ENDS EIB is limited to nicotine devices which should be expanded. Governments and AHJs are seeking guidance.

EHC 3 MOTION PASSED: 9-0-0 CNV

Corey Metzger, Benjamin Jones, and Larry Schoen agreed to help lead the revision (**Action Item 1**).

- Indoor Passive Panel Technologies for Air Cleaning in Buildings
Benjamin Jones agreed to get in contact with DTU team working on this topic to see what should be done with this EIB (**Action Item 2**).

- Ozone and Indoor Chemistry (recommend updating)
(4) it was moved (Sherman) and seconded (Jones) that EHC retire the Ozone and Indoor Chemistry EIB.

Background: The new ROS EIB was just published and includes some guidance. If this topic is no longer emerging, a PD on the topic may be appropriate.

EHC 4 MOTION PASSED: 9-0-0 CNV

- Biological Agents and Airborne Transmission
(5) it was moved (Sherman) and seconded (Metzger) that EHC retire the Biological Agents and Airborne Transmission EIB.

Background: This brief is from 2011 and much of information is covered now by the Standard 241 and Infectious Aerosols PD. EIB will be archived on EHC page of ASHRAE website.

EHC 5 MOTION PASSED: 9-0-0 CNV

- Ideas for new EIBs
 - IEQ sensors and building automation systems (working title). Would summarize state of art, impact. Burley and Clark agreed to look at template and draft (**Action Item 3**).
- Draft EIB Indoor Reactive Oxygen and Nitrogen Species (**Attachment C**)
 - Motion to approve

(6) it was moved (Metzger) and seconded (Sherman) that the EIB on Reactive Oxygen and Nitrogen Species be approved.

EHC 6 MOTION PASSED: 9-0-0 CNV

- Develop proposed changes to ROB 1.201.004.9
 - Policy Subcommittee to oversee with participation from Weekes, Sherman, Burley, Bahnfleth, Crawley

(7) it was moved (Metzger) and seconded (Sherman) that EHC recommends to Technology Council, that they recommend to the Board of Directors, that the Rules of the Board be revised as follows:

~~1.201.004.9 Indoor Air Quality or Ventilation Standards. Any existing and all future ASHRAE indoor air quality or ventilation code intended standards must meet the following requirements:~~

~~A. The standard shall specify concentration limits of only those specific contaminants for which a nationally or internationally recognized authority (such as US EPA, OSHA or the World Health Organization) has established a maximum permissible concentration limit and for which standardized test procedures have been established. Nationally or internationally recognized authorities and procedures may be those developed by ANSI consensus~~

~~procedures for private standards-setting organizations, those established by statute, or those duly adopted regulations issued by governmental agencies.~~

- ~~B. The standard may specify means and methods for limiting concentration of pollutants, provided they are related to contaminants normally considered in the design of HVAC systems serving the relevant space type.~~
- ~~C. The standard shall not require the measurement of contaminant or other airborne concentrations except those that can be measured using standardized test equipment and procedures in accordance with ASHRAE Standard 111 (or its successor) or other consensus Methods of Test. Standardized test equipment is defined as equipment normally available in the HVAC&R industry to test and balance technicians or that is common in building ventilation assessment.~~
- ~~D. The standard shall not make any claims or guarantees that compliance will provide health, comfort or occupant acceptability, but shall strive for those objectives, consistent with ASHRAE policy.~~
- ~~E. The standard may contain factors for use in design of calculations such as mixing efficiencies and air change effectiveness, as long as it is the consensus of the standards writing body that these factors are important to providing acceptable indoor air quality.~~

Background: This Rule of the Board (approved in 2009) was developed following a member petition referencing the revision of ASHRAE Standard 62-1989, approved in 1999, and a subsequent BOD-developed position approved by the membership that attempted to clarify the issues raised in the petition. Among other issues, the original petition expressed concern regarding the ability to meet the requirements of the standard, stating: "Many of the requirements of the current standard are beyond public interests creating burdensome requirements, incurring excessive expenses, and defying field verification." The latter set of question developed by the BOD attempted to clarify these issues consistent with ASHRAE policies on standards development and health considerations therein.

Nevertheless, the restrictions included in this rule conflict with a key ANSI principle that the consensus body responsible for developing a standard be solely responsible for the content of a standard. Several portions of the rule have also created concerns or conflicts with standard development resulting from the SARS-CoV-2/COVID-19 pandemic. Other issues, such as wildfire and a focus on building resilience, reinforce the need for leadership from ASHRAE in the area of indoor air quality.

It appears that portions of the rule (B, D, E) are unnecessary or redundant and that other portions (A, C) appear to create obstacles to developing necessary standards related to indoor air quality. Society Rules Committee has reviewed the potential for a change to this Rule of the Board and indicated that it can be made by a vote of the Board of Directors and does not require a vote of the Membership. Given this information, it is recommended that the rule be deleted in its entirety.

EHC 7 MOTION PASSED: 9-0-0 CNV

- Incorporation of IEQ-GA motions passed at BOD into EHC ROB, MOP, etc.
No actions taken at this time.

B. Education (Lee)

Lee noted the Education subcommittee is meeting monthly.

- EHC programs for Chicago
 - *Seminar 42: Occupant Health Must be Considered in Building Design, Operations and Maintenance, on Tuesday, Jan. 23, 9:45 AM – 10:45 AM CST*
- Program proposals for Indianapolis
 - Tracks and information can be [here](#). The subcommittee is planning to discuss programs at their meeting in February.
 - Feb. 26 deadline for Debate, Panel, Seminar, Forum, Workshop, and Debate Proposals
Bayer has a request to co-sponsor seminar program and would distribute after meeting (**Action Item 4**). EHC can letter ballot before deadline.
- Discuss Triennial IEQ Conference with CEC – MOP Changes
 - Meeting w/ CEC to discuss IEQ Conference planning and responsibilities, partners
Lee met with Giometti and CEC in Chicago and will schedule meeting shortly after Winter Meeting.
 - Change references to IAQ Conference in ROB, MOP, Reference Manual
No changes planned now but can consider after meeting with CEC.
 - CTTC webinars
EHC polled members for possible CTTC webinars. The following were identified as top priorities:
 - Sensors and Role in Healthy Buildings
Mead, Schoen, AIHA had possible speakers.
 - What does it Mean to be 241 Compliant?
- IEQ Column Updates
Burley is seeking May and June commitments. He currently has a list of six authors with topic ideas but needs firm commitments. It was noted there will be a Standard 241 article in February.

Martin Dehlinger noted AIHA would be interest in an article for column.

- Handbook chapter status
Lisa Ng is leading this work group and has a sheet with assignments. The plan to develop a draft for June is accelerated now with a draft now expected for March to meeting Handbook committee deadlines.

C. Outreach & Coordination (Weekes)

- IEQ2025 Conference update
Jennifer Isenbeck & Iain Walker will co-chair the ASHRAE's IEQ2025 Conference scheduled for September 2025 in Montreal Quebec with a theme of "*Rising to New Challenges: Connecting IEQ with Sustainable Buildings*". AIVC, ISIAQ, and IEQ-GA are involved. EHC has multiple members on conference steering committee.
- Discussion on ASHRAE IAQ Standards – Marwa Zaatari
This is EHC MBO#5 related to the influence of 241 on other standards. Zaatari has reached out to SSPC 62.1 chair and is on their agenda for Chicago to discuss the 24 methodology. SSPC 62.1 formed an ad hoc to discuss on 241 concepts can be incorporated into 62.1.

A 62.2 task group is writing an appendix on 241 implementations for dwellings. This would be an informative annex written in mandatory language to give AHJ option to reference, essentially incorporating 241 into 62.2.

A seminar for Indianapolis to discuss these issues is planned and will include members from 62.1, 62.2, 170.

Related to EHC MBO#6 for an IEQ Standard, Zaatari reached out to the HHWBE PD chair Charlene Bayer discuss an for action plan. SGPC 10 interested as well.

- Annual EHS Trends and Research Gaps report
 - Action Item #5 – EHC members to offer ideas for this report
Kipen and subcommittee is generating list of 10 items that need attention for reporting at Annual Meeting. Please let Weekes know if you have an item/topic to be included (**Action Item 5**).

A recent ASHRAE Journal article reported on environmental health trends and gaps as well.

- Long Term Plan for IEQ Conferences
 - *ROB 2.406.003.1 General Requirements This committee shall maintain a long-range plan for Indoor Air Quality conferences and submit this plan to Technology Council at the Annual Meeting.*
- Liaison Updates
 - IEQ-GA
ASHRAE continues to participate in the IEQ-GA with Corey Metzger as the ASHRAE representative. Donald Weekes is President and William Bahnfleth is Vice-President. The IEQ-GA is now finalized as a legal entity and operates with 12 full member organizations (ACGIH, AICARR, AIHA, AIVC, ASA, ASHRAE, FAIAR, FEDECAI, IES, IICRC, ISHRAE, REHVA). The IEQ-GA has held webinars, podcasts and is planning a publication. All are invited to listen and participate.

8. ETF TRANSITION REPORT (Bahnfleth)

This effort is ongoing.

9. NEW BUSINESS

- Ozone/Indoor Chemistry PD discussion
EHC's Policy subcommittee was asked to consider drafting a proposal for a new position

document on Ozone/Indoor Chemistry. A title, purpose and scope (TPS) and recommended chair can be proposed at a future meeting (**Action Item 6**). Clements, Bohanon, Charalambopoulos were listed as interested. Bohanon suggested that the scope be limited to ozone with a short, simple document.

- Rating system for a building's environmental health performance
Charalambopoulos suggested this for the scientific community and general public. There are some programs along these lines like WELL, LEED. ASHRAE Strategic Plan notes ASHRAE should develop comprehensive IAQ guidance. There are research proposals for a national IAQ database. Guideline 45 is on existing building measurement of IAQ factors (among other measureables) may be structure this sort of effort could be based on. EHC can discuss further in the future.
- EHC support of Guideline 42, Advanced IAQ Guideline
Focus of guidelines is for going beyond minimum IAQ in 62.1. EHC was asked to support but EHC would seek guidance from Weekes on what specifically is being asked.

10. OLD BUSINESS

- Donald Bahnfleth Environmental Health Award
 - Summary of ballot
EHC re-balloted top candidates the initial ballot and will recommend candidate with most number one votes and best average rank to H&A for their formal consideration later today.
 - Eligibility Requirements in EHC Reference Manual
An exemption was granted for this year to allow current Tech Council members to be eligible for the award. EHC changed their Reference Manual to make this rule permanent.
 - More changes to eligibility/award procedure?
Education Subcommittee asked to review current procedures and recommend changes (**Action Item 7**)

11. NEXT MEETING

- Interim and Subcommittee meetings
EHC would plan for bi-monthly committee meetings. Subcommittee chairs were asked to schedule monthly subcommittee meetings.
- ASHRAE Annual Meeting
EHC would meet in Indianapolis, Indiana on Monday, June 24th 8am-12pm EDT

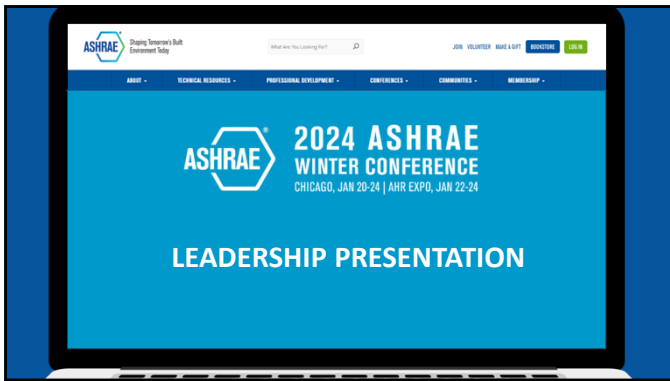
12. ADJOURNMENT

Bahnfleth thanked all for their attendance and participation and adjourned the meeting at approximately 10:45 AM CST.

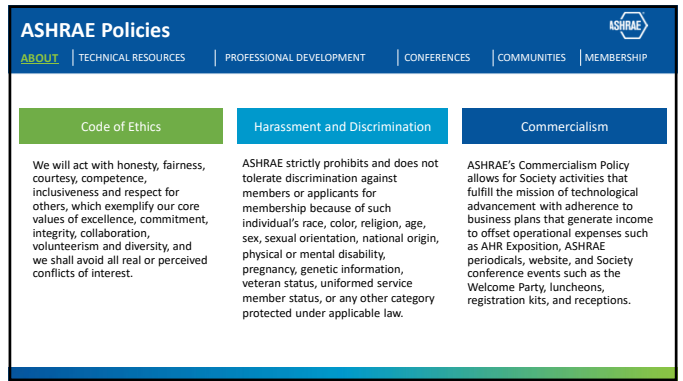
Council: Technology
 Committee: Environmental Health

Chair: William Bahnfleth
 Vice-chair: Marwa Zaatari

MBO #	Description	Metric <small>(how do we determine success?)</small>	Initiative #	Goal #	Completion % /Date	Financial Assist Req'd?	MBO Comments	Strategic Plan Tally											
								Initiative #				Goal 1		Goal 2			Goal 3		
								1	2	3	4	a	b	a	b	c	a	b	c
1	Revisions to ROB 1.201.004.9	Proposed ROB change submitted	3	3a, 3b	100% 2024 WM	No	EHC proposed changes to ROB in CHI. Completion will improve speed and flexibility of IAQ standard development			X							X	X	
2	Rule updates related to IEQ-GA	Proposed rules approved, budget support approved	2, 3	1b, 2b, 3b	5% 2024 AM	Yes	Procedures approved by the board in its Nov. 2018 meeting regarding appointments and other aspects of management are not being followed because rules and procedures do not reflect content of the motions that were passed. Effort is ongoing.		X	X			X		X				X
3	Transition IAQ conference to IEQ focus	Approved process updates, commitment to ongoing support	2,3	1b, 2b, 3a, 3b	5% 2024 AM	Yes	The IAQ conference needs to change to reflect a more integrated approach to IEQ. Recent conferences have emphasised expanded partnerships. Multiple changes are needed to successfully implement the new format. CEC has recognized this change to IEQ conference. The last two conferences have been CEC.		X	X			X		X		X	X	
4	Complete Epidemic Task Force report	Report submitted to TechC and disseminated as needed	2	1a, 2c	90% 2024 WM	No	Report serves as a reference on main findings and recommendations at sunset of ETF.Ongoing.		X			X				X			
5	Convene discussion on future of IAQ standards	Discussions held and recommendations summarized	2, 3	1a, 3b	1% 2024 AM	Possibly (if in-person meeting is held)	ASHRAE Standard 241 introduces a number of significant changes to how IAQ standards are designed (e.g., the use of equivalent clean air as the basis). The board envisioned other ASHRAE IAQ standards incorporating 241. Discussions to develop a way forward are needed. Topic on CHI 62.1 agenda. Aim to work with 62.2 and 170 as well.		X	X			X						X
6	IEQ standard action plan discussion	Completed report	2	1a, 2b	1% 2024 AM	No	The current strategic plan, under initiative 2, has the outcome "Develop an IEQ standard based on health and productivity objectives that addresses air quality, thermal environment, light, sound, and vibration in an integrated way." A scoping document is needed to discuss what it will take to achieve this, starting from the report of the MTG on health and wellness. Working with HHWBE PD chair Bayer and SGPC 10		X				X		X				
7																			
8																			
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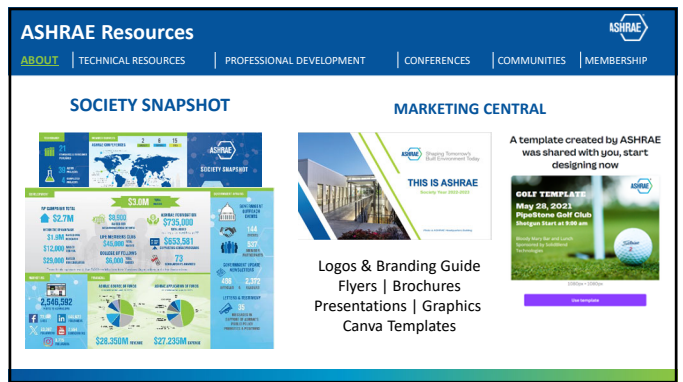
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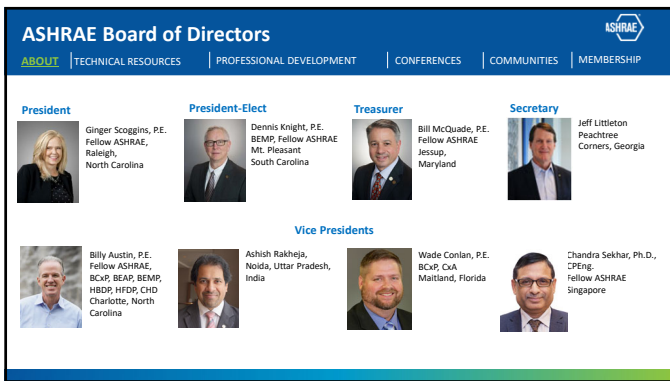
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5



6

ASHRAE Directors at Large

ABOUT | TECHNICAL RESOURCES | PROFESSIONAL DEVELOPMENT | CONFERENCES | COMMUNITIES | MEMBERSHIP


 Doug Cochrane, P.Eng. Mississauga, Ontario, Canada	 Blake Ellis, P.E. Overland Park, Kansas	 Dru Crawley, Ph.D., BEMP Washington, D.C.
 Corey Metzger, P.E. Ames, Iowa	 Art Giesler Colleyville, Texas	 Wei Sun, P.E. Ann Arbor, Michigan
 Kishor Khankari, Ph.D. Ann Arbor, Michigan	 Luke Leung, P.E., BEMP Clarendon Hills, Illinois	 Heather Schopplein-Anderson, P.E. San Jose, California

7

Government Affairs


ABOUT | TECHNICAL RESOURCES | PROFESSIONAL DEVELOPMENT | CONFERENCES | COMMUNITIES | MEMBERSHIP

GOVERNMENT OUTREACH



Get Involved!


GOVERNMENT AFFAIRS UPDATE



BI-WEEKLY NEWSLETTER

Sign up online or email
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LETTERS & TESTIMONY



8

Research: Supporting ASHRAE's Mission

ABOUT | TECHNICAL RESOURCES | PROFESSIONAL DEVELOPMENT | CONFERENCES | COMMUNITIES | MEMBERSHIP

Society Year 2022-2023

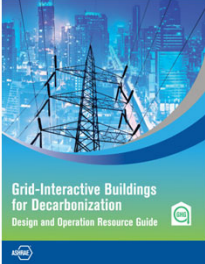
 \$800,000 Raised for Endowments	Research Promotion Campaign Total \$2.7M <i>(Research, YEA, AI, Scholarships, General)</i>
 \$298,750 Awarded through 76 Scholarships	 Within the RP Campaign \$2M Raised for Research
 \$50,000 Raised by College of Fellows and Life Members Club	 \$1M Given by ASHRAE Regions, Chapters and Sections

More than 4,000 contributions from Members, Organizations and other Associations

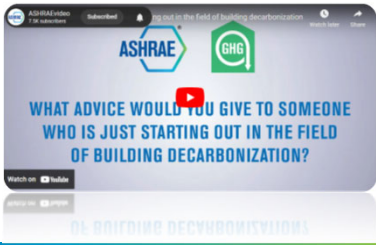
9

Task Force for Building Decarbonization

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Grid-Interactive Buildings for Decarbonization
Design and Operation Resource Guide




WHAT ADVICE WOULD YOU GIVE TO SOMEONE WHO IS JUST STARTING OUT IN THE FIELD OF BUILDING DECARBONIZATION?

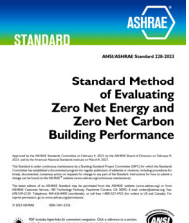
10

Standards

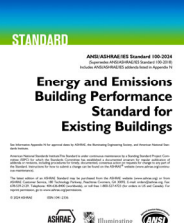
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ASHRAE Standard 154-2012
Control of Infectious Aerosols



ASHRAE Standard 218-2012
Standard Method of Evaluating Zero Net Energy and Zero Net Carbon Building Performance

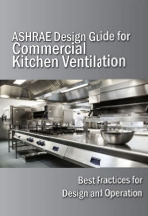


ASHRAE Standard 189-2014
Energy and Emissions Building Performance Standard for Existing Buildings


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ASHRAE Bookstore

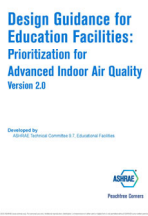
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ASHRAE Design Guide for Commercial Kitchen Ventilation
Best Practices for Design and Operation



Lucy Goes Green Book Signing!
ASHRAE Bookstore at the Marriott Marquis, Sunday, Jan. 21 at 9:00 AM.



Design Guidance for Education Facilities: Prioritization for Advanced Indoor Air Quality Version 2.0

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Recently Updated
 eLearning
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New Course
 STANDARD
Control of Infectious Aerosols

New Certification
DECARBONIZATION CDP CERTIFIED PROFESSIONAL

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2024 Topical Conferences

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- Madrid, April 17-19
2024 ASHRAE International Conference on Building Decarbonization
- Indianapolis, June 24-26
2024 ASHRAE Conference for Integrated Design, Construction & Operations
- Chicago, September 26-27
Women in ASHRAE Leadership Symposium
- New York City, October 21-23
2024 ASHRAE Decarbonization Conference: Decarbonizing Existing Tall Buildings
- Beirut, October 3-4
The Sixth International Conference on Efficient Building Design

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Events & Conferences: Tradeshows

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AHR Chicago

Meet and Greet with President Ginger Scoggins
 3:00 -4:00 PM | Monday, Jan 22
 ASHRAE Booth S6810

ASHRAE at Industry Events
cmpx Canadian Mechanical & Plumbing Exposition
 Toronto, ON | March 20-24
 Visit ASHRAE at Booth 646

ACREX India 2024
 New Delhi, India | Feb. 15-17

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Get Involved with Committees & Chapters

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Find Committees and Nominate Yourself or Others

- FEB 2024** February: Nominations for appointed committees are due **February 16, 2024**.
- JUN 2024** June: Speak with your committee ExO/CO if your current appointment/elected position ends to be nominated for another.
- SEP 2024** September: Nominations for elected positions are due. (Publications & Education Council, Tech Council, RAC, TAC, Standards, Handbook, Nominating)

Find Chapter Information Using the Chapters Map

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Membership

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 ASHRAE Guidelines added to annual membership benefit selection for new & renewing full dues paying members.

- eLearning Course**: 95+ to choose from
- ASHRAE Standard or Guideline**: 100+ to choose from
- ASHRAE Handbook**: PDF version of the most recent
- Handbook Online**: 4 most recent
- ASHRAE Certification Exam Study Guide**: 3 to choose from

Honors & Awards

The following award nominations have a **May 1** deadline:
 Fellow | Honorary Member | ASHRAE Hall of Fame | F. Paul Anderson Award
 ASHRAE Pioneers of the Industry | ASHRAE Award for Distinguished Public Service

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Asked to make a statement
on behalf of ASHRAE?

Please send all media
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members of the press.

Thank you!
Questions or Comments?



Environmental Health Committee (EHC) Emerging Issue Brief

January 9, 2024

Indoor Reactive Oxygen and Nitrogen Species

What is the issue?

Reactive oxygen species (ROS) and reactive nitrogen species (RNS) are unstable oxygen- and/or nitrogen-containing radicals and non-radical species. Exposure to extracellular (produced in the environment) ROS and RNS, as well as endogenous (produced inside the body) reactive species production, can result in oxidative stress in humans, which can exacerbate or lead to multiple adverse health impacts, including asthma, diabetes, chronic obstructive pulmonary disease (COPD), and cancer.¹⁻³ ROS and RNS species include superoxide ($O_2^{\cdot-}$), hydroxyl (HO^{\cdot}), hydroperoxyl (HOO^{\cdot}), alkylperoxides (ROO^{\cdot}), hydrogen peroxide (H_2O_2), organic peroxides (ROOR), hypochlorite (OCl^-), peroxyxynitrite ($ONOO^{\cdot}$),⁴⁻⁶ nitrogen oxides (NO_2 , NO ; collectively NO_x), nitrous acid (HONO)⁷, and chlorine nitrite ($ClNO_2$).⁸ Here we focus on indoor extracellular reactive species present in the particle- and gas-phase, rather than intracellular reactive species (generated endogenously).

Indoor Gaseous Reactive Oxygen and Nitrogen Species

Due in part to being a US EPA criteria pollutant (primary annual mean standard of 53 ppb), indoor NO_x is better understood than other ROS species. Ambient NO_x infiltrates into buildings, with penetration factors of about 1 for NO and 0.72 for NO_2 .⁹ In a literature review, median NO_2 concentrations in schools and offices were $26.1 \mu g/m^3$ and $22.7 \mu g/m^3$ with indoor/outdoor ratios of 0.7 and 0.8, respectively.¹⁰ Ventilating combustion appliances and using an outdoor-exhausting stove hood when cooking with natural gas are methods of reducing indoor NO_x emissions.

Gas-phase OH has been measured in a classroom (reaching up to 1.8×10^6 molecules/cm³),^{11,12} during cleaning with limonene (4×10^6 molecules/cm³),¹³ with an electronic air cleaning running (1.8×10^7 molecules/cm³),¹³ and cooking ($2-6 \times 10^6$ molecules/cm³).⁷ In comparison, outdoor OH concentrations range from $2-10 \times 10^6$ molecules/cm³ at midday.⁷ The House Observations of Microbial and Environmental Chemistry (HOMEChem) campaign conducted extensive measurements of the relationships between OH, NO_x , HONO, and O_3 , highlighting the importance of OH production by photolysis of HONO.⁷ NO_2 is a precursor species to indoor HONO formation.^{11,14-16} Combustion is a significant indoor source of NO_x and HONO, including unvented combustion appliances (e.g., gas stoves), smoking, and kerosene heaters.¹⁷ For example, NO_x and HONO concentrations increased from 15 and 4 ppb to 135 and 40 ppb, respectively, during cooking with oil on a natural gas stove.¹⁴ When cleaning with chlorine-based

solutions, reactive chlorine species can be produced through reactions with OH.⁸ Photocatalytic paints can reduce NO₂ concentrations, though significant HONO concentrations may be generated as a result.¹⁸

Indoor Particle-Bound Reactive Oxygen Species

Measurement of particle-bound ROS often employs fluorescent probes calibrated with H₂O₂, with results reported as equivalent nmol/m³ of H₂O₂.¹⁹ While studies of indoor ROS are few, Khurshid et al. (2014) measured concentrations of ROS on PM_{2.5} averaging (±standard deviation) 1.37±1.2 nmol/m³ across twelve residences, with a range of 0.18-4.01 nmol/m³. Similar averages and ranges of ROS on PM_{2.5} have been measured in six institutional buildings (1.16±0.38 nmol/m³, range of 0.63-1.68 nmol/m³), five retail buildings (1.09±0.93 nmol/m³, range of 0.02-3.36 nmol/m³), a university building (3 nmol/m³)²⁰, and six residences (0.90±0.16 nmol/m³, range of 0.40-1.50 nmol/m³)⁶. Compared to traditional approaches, advances in real-time ROS detection have improved measurement accuracy and enabled understanding the dynamics of ROS transport, production, and removal indoors.⁴ Using real-time instrumentation, ROS on PM_{2.5} averaged 2.44±0.40 nmol/m³ and gas-phase ROS averaged 1.80±0.99 nmol/m³ in an unoccupied St. Louis, MO, USA test home.⁴ Additional research is required to understand the relationship between ROS on PM_{2.5} concentrations and health outcomes.

Simultaneous measurements of indoor and outdoor ROS on PM_{2.5} by Khurshid et al. (2014) were not statistically significantly different in residential, institutional, or retail buildings, despite indoor PM_{2.5} mass concentrations being 60% lower than outdoor concentrations.^{1,5} Average indoor/outdoor (I/O) ratios of ROS on PM_{2.5} were 0.8±0.75 (retail), 1.02±0.55 (institutional), and 1.22±0.85 (residential). Similar observations were made using real-time instrumentation when windows were open and closed in an unoccupied residence where ROS on PM was measured to be similar indoors and outdoors, regardless of whether windows were open or closed (I/O ratio of 0.9-1.2), while PM₁ I/O ratios were 0.7 and 0.4 when the windows were open or closed, respectively.⁴ In the same study, I/O ratios of gas+particle-phase ROS concentrations differed when windows were open (0.8) and closed (0.4-0.5). The observation that outdoor gas+particle-phase ROS concentrations were higher than indoor gas+particle-phase ROS concentrations coupled with little difference between indoor particle-phase and gas+particle-phase ROS concentrations lead the authors to suggest the building was a sink for gas-phase ROS. With additional measurements of air exchange rate and ozone, sulfate, and volatile organic compound concentrations, the study hypothesizes that heterogeneous surface chemistry is a source of ROS and surfaces can act as a reservoir of ROS that partitions to indoor particles as an explanation for particle-phase ROS I/O ratios being close to 1, while PM I/O ratios are much lower.

Total suspended particulate (TSP) samples collected in eight homes indicated elevated outdoor ROS on TSP concentrations (2.35±0.57 nmol/m³) compared to indoors (1.59±0.33 nmol/m³), a result that may be impacted by differential removal of coarse particles containing ROS during particle penetration into buildings.⁶ In the same study, indoor ozone and terpene concentrations were varied in a test home when outdoor ozone concentrations were either high (>40 ppb) or low (<40 ppb). When outdoor ozone concentrations were low, it was estimated that 34% of ROS on TSP was from outdoors for the low indoor ozone and terpene condition, and outdoor ROS on TSP reduced to contributing 16% of indoor ROS on TSP for the high indoor ozone and terpene condition, suggesting significant indoor sources of particle-bound ROS. Outdoor ROS on TSP was estimated to contribute 41-51% of the measured indoor ROS on TSP under high outdoor ozone conditions, and the transport of ROS precursors into buildings was suggested to significantly influence indoor generation of particle-bound ROS.⁶

Recent measurement and modeling studies suggest semi-volatile ROS species can accumulate on surfaces and partition to particles.^{1,4,21,22} A modeling study focused on semi-volatile organic peroxides suggests a substantial amount of ROS on particles can partition from surface films.¹ Another modeling study estimated that 91-96% of ozone and H₂O₂ are deposited onto surfaces in a typical residence.²¹

Measurements of ozonolysis of a film composed of a mixture of lipids representing skin lipids and cooking oils showed depletion of about half of the ozone reacting to form ROS within the first few hours of exposure, and about half of the formed ROS persisted on the surface film. ROS production continued during the 24 hours following ozonolysis, suggesting other mechanisms for ROS production in surface films, such as autoxidation.²³

Indoor Sources and Control of ROS and RNS

Besides outdoor ROS and RNS penetrating building envelopes and partitioning of ROS from indoor surfaces onto particles, other sources of indoor reactive species include combustion (e.g., incense, cigarettes),^{20,22,24} cooking,^{7,25} oxidation of gas-phase terpenes (e.g., from surface cleaning),^{13,26} nitrous acid (HONO) photolysis,^{11,13,14,27} electronic/additive air cleaners,^{13,19,28-31} disinfectant spraying/fogging,^{31,32} laser printers,³³ and potentially through germicidal UV photolysis of ozone and volatile organic compounds.^{34,35} Chamber studies demonstrate significant ROS production resulting from limonene ozonolysis, a common indoor reaction.³⁶ Additional sources and the relative importance of the above sources may be identified in the future.

Methods to reduce indoor concentrations of particle-bound ROS and RNS include filtration and reducing organic surface film formation and/or oxidation. Compared to operating a test house without a filter installed, ROS on PM_{2.5} was reduced by 82% when a MERV16 filter was installed.⁵ Reducing the concentration of ROS on surfaces formed through oxidation, such as by reducing indoor ozone concentrations, should result in reduced partitioning of such compounds to the particle-phase. Reduction, source control, or elimination of emissions from human activities, such as cooking, smoking, incense burning, surface cleaning, and laser printer use, should also reduce indoor reactive species concentrations. It is also important to carefully select air management technologies to ensure reactive species production is not significant or can be mitigated. Additional control methods for reactive species may be identified in the future.

What does this mean for ASHRAE?

ROS and RNS are contaminants of concern due to their impact on health and can react with more benign compounds to produce contaminants of concern, such as secondary organic aerosols (SOA).¹⁴ Engineering systems can reduce the contribution of reactive species within buildings, such as installation of high performance filtration removing ROS on PM_{2.5}. Since reactive species may be generated or partition from surfaces indoors, there may be additional engineering controls that can reduce source strengths of ROS and RNS, such as stove hood exhaust systems. ASHRAE should understand the risks associated with reactive species and effective engineering interventions. In the long term, ASHRAE may need to change its existing standards or adopt new standards to provide industry guidance on addressing ROS and RNS exposure indoors.

What Actions Should ASHRAE Consider?

- Technical committees should engage with indoor chemists to better understand sources and control approaches for ROS and RNS indoors.
- Reactive species generation should be included in testing and validation of certain air quality control methodologies, such as additive air cleaner technologies and germicidal UV.³⁴ Specific attention should be paid to the concentrations and species produced, as well as how the produced reactive species may be mitigated.
- Identify knowledge gaps and support research, including but not limited to:
 - Indoor air quality monitoring and engineering controls to reduce indoor generated NO_x.

- The measurement and modeling of ROS and RNS in particles and indoor surface films.
- Physicochemical modeling of ROS and RNS production and reaction with indoor gases and surfaces.
- Assess the effectiveness of gas- and particle-phase ROS and RNS removal approaches, including filtration and adsorption.

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Authors:

Nicholas Clements
William Bahnfleth
Brendon Burley
Max Sherman

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