



ASHRAE Meeting Agenda

TC 9.6 Health Care Facilities

Phoenix, AZ Hybrid Annual Conference

Main Meeting: Sunday, Jun 22, 2025, 5:00 to 7:00 PM MST

Location : Sheraton Phoenix Downtown, Valley of the Sun C (Level 2)

(Mead, Chair; Eldridge, Vice-Chair; Granzow; Secretary)

Virtual (MS Teams):

Join on your computer, mobile app or room device

[Click here to Join the meeting now](#)

Meeting ID: 220 353 647 093

Passcode: Vi9VF2F3

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[+1 513-458-7170,,301838020#](#) United States, Cincinnati

[\(888\) 994-4478,,301838020#](#) United States (Toll-free)

[Find a local number](#)

Phone conference ID: 301 838 020#

SUBCOMMITTEE MEETINGS will be held in person AND virtually on Sunday Jun 22.

Location: Sheraton Phoenix Downtown, Valley of the Sun C (Level 2)

Virtual instructions: See MS Teams link and information below on the virtual portion of our meeting. The same link is being used for all subcommittee meetings. All times are MST.

Join on your computer, mobile app or room device

[Click here to Join the meeting now](#)

Meeting ID: 247 667 680 550

Passcode: BK3yS9q9

[Download Teams](#) | [Join on the web](#)

Or call in (audio only)

[+1 513-458-7170,,323483320#](#) United States, Cincinnati

[\(888\) 994-4478,,323483320#](#) United States (Toll-free)

[Find a local number](#)

Phone conference ID: 323 483 320#

TC 9.6 Handbook	(English, Chair)	12:30-1:00pm
TC 9.6 Energy	(Leach, Chair)	1:00-2:00pm
TC 9.6 Program	(Parker, Chair)	2:00-2:30 pm
TC 9.6 Infectious Diseases	(Neu, Chair)	2:30-3:30 pm
TC 9.6 Research*	(Thomsen, Chair)	3:30-4:30 pm

* Being held jointly with SSPC 170 Research Subcommittee

Attendance: See instructions in footnote. Note that you only need to log in once for entire TC 9.6 day's business, just indicate which meetings you participate in.

Attendance: Please document your attendance using the link below. You only need to do this one time for main TC meeting as well as all subcommittees you are also attending:

<https://form.jotform.com/231753647820156>

Call to Order & Welcome

a) ASHRAE Value Statement – In ASHRAE meetings, we will act with honesty, fairness, courtesy, competence, inclusiveness and respect for others, which exemplify our core values of excellence, commitment, integrity, collaboration, volunteerism and diversity, and shall avoid all real or perceived conflicts of interest. Our culture is one of inclusiveness, acknowledging the inherent value and dignity of each individual. We 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.

b) [Code of Ethics](#) – Please review prior to meeting

c) [Core Values](#) - Please review prior to meeting

d) Diversity Statement – Please review prior to meeting

Item	Description	Person	Time (min)
1	Introductions, agenda, conference call and attendance documentation instructions	Mead	5
2	Roll call, quorum check. Mead, Kenneth X Granzow, Frederich X Thomsen, David X George Augustini X Burley, Brendon X Kondrat, Paul X Mousavi, Ehsan Phelps, Erick X Gina Semerad X Wilson, Laurence X Lemire, Nicolas X	Granzow	2
3	Minutes Acceptance of minutes moved by George Augustini, second by Brendon Burley –	Granzow/Eldridge	5

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	Passed 10/0/0/1		
4	Membership Chair Report, Roster Changes, Welcome PCM's • See attached report. • Three members rolling off including the Chair. Thank you all for your service. • Three members rolling on including new secretary Jeremy Fauber.	Westbrook	5
5	Chair's Report TAC Breakfast Meeting • Joy Altweis provided the report. • New strategic plan starting July 1 for '25-'28. • GTIC is looking for volunteers. • CEBD has a new free publication for decarb planning. • New roster takes effect July 1. • Working to automate the reporting form for TCs. • August 1 is the deadline for the Winter meeting presentation proposals. • New section head.	Mead	3
7	Handbook Subcommittee Report • Met earlier today and have been meeting on Tuesday mornings. • New outline and working on populating sections. • Will be reviewing first draft in October. • Anyone who would like to help should contact Travis.	English	5
8	Energy Subcommittee Report • Discussed publications and resources for decarbonization and energy. Looking to update or replace the AEDG. • Will approach CEBD regarding a liaison. • Had a good discussion on resources during the "think tank" portion of the meeting. • If you would like to be on the distribution list, contact Jennifer.	Leach	5
9	Programs Subcommittee Report • One sponsored program – Epidemic Task Force presentation. • Discussed 10 programs for the Las Vegas conference including several case studies. • Also explored future topics for	Parker	5

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	conferences beyond Vegas. • Deadline for Vegas presentations is August 1.		
10	Infectious Disease Subcommittee Report • Review of current news including measles. • Discussed mobile hvac applications. • If there is interest in specific presentations, please reach out to Dylan.	Neu	5
11	Research Subcommittee Report • One recently published project. • One nearly complete project. • Three ongoing. • Two bid and ready for award. • Two work statements under way. • A quick review of the specific projects was provided.	Thomsen	5
12	Webmaster Report • Working to post back information on meeting minutes and agenda. • Missing approved versions for the 2022 meetings. Chair requested voting members to review the drafts and be prepared to vote for approval via letter ballot.	Augustini	3
13	Section Head Comments • See Chair's Report TAC Breakfast Meeting for Joy's report.	Joy Altwies	5
14	ALI • Class was taught on Saturday. • Spring online was March 19. • Looking to do a "lunch and learn" version in the future.	Burroughs	3
15	Liaison Reports -Std 241 • Brendan Burley provided a report. • Many comments and commenters. • Looking for an ISC or 2nd PPR in '26 -Std. 170 • Meets Monday from 3-6 and Tuesday 9-12 in same room as TC 9.6 • Guideline 43 is published. • 170 publication will begin as soon as one final addenda is through Standard. • Addendum y will be out for review in July. • Addendum x will be out in late July or	?? Fauber	2 2

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	early August. - Committee will be working on responses to CMPs. - Monday afternoon will include a presentation on OR sensor location research.		
	-Std. 189.3 - Doug provided an update. - It has been published. - Ashley will be the new chair as of July 1. - Working with ASHE on cost benefit analysis based on ASHE membership feedback. Mostly a ranking effort for no, low, medium, high cost impact.	Vernon	2
	-Std 90.1 - Doug reported. 90.1 is working towards publication later this year. - Focused on laboratory and commissioning requirements.	Darwich	2
	-Std 55 Brendon Burley reported that the committee has a concern with people gaming the CFD requirements and the committee will be working to remedy this.	Poots	2
	-Std 62 Brendon Burley reported that the committee is working on publication as well with final 6 addenda voted out.	Burley	2
	-Environmental Health - Meets Monday morning. - Voting on extending the Position Document. - Working to a potential IEQ standard.	Taylor	2
	-ACH MTG - No meeting in Phoenix. - RP has been bid and is awaiting approval. - Sponsored panel discussion which was on Sunday morning. - Kishor indicated there is a proposal for a position document on ACH. - Developing several programs and presentations.	Lautz	2
	-others not listed - NFPA 99 - Major update for 2026. - Chapters 8 and 9 fully updated.	??	2

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	○ References Guideline 43.		
16	HVAC Design Manual V3 • Have received approval from publications to move forward with version 3. • Meeting Monday at 9 to start the process. • Any others interested should contact Nicholas or Crystal. Some specialists are needed for specific topics and others are also welcome. ○ Frank Mills asked “Can this be made more global? Currently US focused.” ○ Larry Wilson indicated there are topics from the handbook chapter update that would be beneficial for the design guide. • TC 9.6 will need to establish a subcommittee for the effort. • Nicholas Lemier moved to establish a subcommittee for the development of V3 of the Design Guide. Seconded by Larry Wilson. Motion passed 10/0/0/1	Lemire/Burroughs	10
17	Special Presentation & Discussion: Optimization of Ventilation Design for the Hospital Post-Anesthesia Care Unit • Refer to ASHRAE Journal article with the same topic if interested. • Kishor asked the committee to consider a working group to further explore and find a way to integrate this into standards and guidelines. • General discussion following the presentation was centered around validation and how to reinforce the CFD so that the evidence is compelling enough to make a change. ○ If interested in a working group, send an email to Ken Mead’s gmail account.	Kishor Khankari	20
18	Announcements • Sign in on Jotform • TC dinner at Phoenix Bourbon room after the meeting.	open	2
19	Vice-Chair Remarks • Thanks to Ken for the efforts as chair.	Eldridge	2

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20	Closing Remarks	Mead	2
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TC 9.6 Membership

June 22, 2025

- 266 overall members
 - 13 Voting members
 - 153 Corresponding members
- 102 Provisional Corresponding Members
 - 41 YEA members

Executive team

TC Officers (Through June 30, 2025)

- TC Chair: Ken Mead
- Vice Chair: David Eldridge
- Secretary: Erik Granzow

Roster changes
2025 Society year

Expiring positions

Ken Mead, Chairman

Lawrence Wilson, Voting member

Ehsan Moussavi, Voting Member

Thank you for your service.

TC 9.6 Roster Changes for 2025-2026

Officers

David Eldridge, Chairman

Erik Granzow, Vice Chairman

Jeremy Fauber, Secretary

New Voting Members effective July 1, 2025

David Eldridge

Pavel Likhonin

Tom Parker

Voting Members

2025 Society year

Eric Granzow (2026)
Ken Mead (2026)
Erick Phelps (2026)
Brendon Burley (2027)
David Thomsen (2027)
Travis English (2027)
Paul Kondrat (2027)
George Augustini (2028)
Jennifer Leach (2028)
Gina Semarad (2028)
David Eldridge (2029)
Pavel Likhonin (2029)
Thomas Parker (2029)

Nicolas Lemire (Member-Non Quorum)

Subcommittee chair and officers

2025-2026 Society year

- Handbook (Applications, Chap. 8): Travis English
 - Research: David Thomsen
 - Standards: Jeremy Fauber
 - Programs: Thomas Parker
 - Membership: Brendan Dingman
- Healthcare Energy subcommittee: Jennifer Leach
 - Infectious Diseases subcommittee: Dylan Neu
 - Webmaster: George Augustini
 - ALI Coordinator: Crystal Burroughs
- TC associated MTG (MTG-ACR, Air exchange rates): Roger Lautz

MEETING DETAILS:

May 6, 2025

Virtual

AGENDA:

1. International Alignment
 1. RHEVA Guide Update (Frank)
 2. European Ventilation Standard (Wim)
 3. IFHCE (Walt)
2. ASHRAE Pubs/Resources
 1. AEDG's (Jen) Large Hospitals 50%, Small Hospitals 30%
 2. Decarbonizing Hospital Buildings (Walt)
 3. HVAC Design Manual for Hospitals & Clinics (Nicolas)
3. Think Tank (Energy Usage in Healthcare)
 1. What do we need to know?
 2. Who should we be working with?
 3. How can we maximize technology?

ATTENDEES:

Jen Leach, Sub-com Chair
Raajesh Murguesan
Thomas Firsich
Wim Maassen
David Eldridge
Brendan Redington
Travis English

John Martin
Tom Parker
Louis Lercara
George Abdelmalek
Chris Miller
Ben Russell
Frank Mills

NOTES:

1. International Alignment
 - a. ASHRAE/RHEVA Guide Update (Frank)
 - i. Wim confirmed they're reviewing all text and sending out approvals
 - ii. Frank and Wim plan to submit the guidebook for publication on **June 16, 2025**, the week before the Phoenix conference

- iii. Frank noted the RIVA guidebook will help boost ASHRAE's standing in Europe
 - b. European Ventilation Standard (Wim)
 - i. Wim confirmed they're reviewing all text and sending out approvals
 - ii. Frank and Wim plan to submit the guidebook for publication on June 16, 2025, the week before the Phoenix conference
 - iii. Frank noted the RIVA guidebook will help boost ASHRAE's standing in Europe
 - iv. Brendan will forward Yaric's contact information to determine if there is an opportunity for alignment with ASHRAE.
 - c. IFHCE (Walt) – No report
 - d. ASHRAE considering local guides, including a ventilation guide for UK.
2. ASHRAE Pubs/Resources
- a. AEDG's (Jen) Large Hospitals 50%, Small Hospitals 30%
 - i. Jennifer noted existing AEDGs include 50% reduction guide for large hospitals and 30% reduction guide for small hospitals, both over a decade old
 - ii. David explained the AEDG partnership has stopped making new versions but TC could create a healthcare-specific document
 - iii. David suggested a more flexible approach than the original AEDGs, allowing users to select different strategies rather than requiring all measures
 - b. Decarbonizing Hospital Buildings (Walt) – no report
 - i. Decarbonizing Hospital Buildings
 - ii. Decarbonizing Building Thermal Systems: A Guide for Applying Heat Pumps and Beyond
 - iii. Whole Life Carbon Guide for Building Systems
 - iv. Guide to Strategic Decarbonization Planning
 - c. HVAC Design Manual for Hospitals & Clinics (Nicolas) – no report
 - d. ASHE – [Electrifying Heat in Existing Hospitals](#)
3. Think Tank (Energy Usage in Healthcare)
- a. **Hospital load calculation methodologies**
 - i. Travis shared that Kaiser Permanente has connected hospitals to enterprise fault detection systems that log temperature and airflow data over **3-5 year** periods
 - ii. Travis explained they've analyzed historical cooling loads and created internal load calculation guidelines for consulting engineers
 - iii. Thomas noted ASHRAE Handbook Fundamentals Chapter 18 includes tables for medical equipment with peak and average heat gain data
 - iv. Chris mentioned using rules of thumb like sizing zones for **60 degree** supply air to enable supply temperature resets

b. Medical equipment load research

- i. Travis explained Mazzetti is currently working on an ASHRAE project studying imaging equipment loads
- ii. Travis noted research shows vendor-provided peak loads are much higher than measured peaks and actual peaks are very short duration
- iii. Travis emphasized that sizing for published peaks results in oversizing zone equipment by a factor of **3-4**

c. Hospital decarbonization challenges

- i. Frank shared that UK NHS published a net zero standard in February 2023 with goal to be net zero by **2030**
- ii. Frank reported a new net zero hospital budget increased from **£1.2 billion to £2 billion**
- iii. Jennifer noted Maryland recently amended legislation to exclude hospitals from building energy performance standards requiring decarbonization by 2030
- iv. Chris emphasized decarbonization should be thoughtful rather than "ludicrous" and focus on high-temperature loads

d. Beneficial electrification approach

- i. Travis referenced Providence study on beneficial electrification showing importance of rightsizing systems first
- ii. Travis explained their approach for three new all-electric, net zero hospitals without budget increases by rightsizing zones, air handlers, and accounting for diversity
- iii. Chris suggested focusing on heat recovery from **400 degree** flue gases for existing hospitals
- iv. Travis emphasized decarbonization shouldn't be solved with money or copper (larger electrical services)



TC 9.6 Healthcare Facilities – Programs Subcommittee

Sunday 06/22/2025, Sheraton Phoenix Downtown, Valley of the Sun C (Level 2)

[https://events.rdmobile.com/Asset/Download/a3b9c6d5-4db3-4cc5-972b-](https://events.rdmobile.com/Asset/Download/a3b9c6d5-4db3-4cc5-972b-702ff1936f04)

[702ff1936f04](https://events.rdmobile.com/Asset/Download/a3b9c6d5-4db3-4cc5-972b-702ff1936f04)

I. Introductions

Sign In Sheet: <https://form.jotform.com/231753647820156>

II. TC 9.6 Sponsored Programs/Courses at 2025 Annual Meeting (1)

Technical Program	Topic	Date	Time	Location	Presenter
Seminar 44	The Epidemic Task Force, Infectious Aerosol Control and Beyond!	June 24	8:00 AM – 9:30 AM EST	Phoenix Convention Center North Building , Level 2, 228AB	Linda Lee, DrPH

III. Other Programs/Courses of Interest at 2025 Winter Meeting (5)

Technical Programs	Topic	Date	Time	Location	Presenter
Paper Session 7	AI in HVAC Industry	Jun-22	1:30 PM – 3:00 PM MST	Phoenix Convention Center North Building , Level 2, 225AB	John Dunlop
Seminar 17	Presentation 4: Enhancing Air Sanitization through Directed Airflow in Healthcare Environments	Jun-22	2:30 PM – 2:50 PM MST	Phoenix Convention Center North Building , Level 2, 226A	Tom Dunbar
Seminar 21	Decarbonization And Water Do Mix	Jun-22	3:15 PM – 4:45 PM MST	Phoenix Convention Center North Building , Level 2, 224B	Brandon Gross
Panel 3	Harmonization of ASHRAE Standards Approach to Infectious Aerosols	Jun-23	9:45 AM – 10:45 AM MST	Phoenix Convention Center North Building , Level 2, 229A	Brandon Burley, Michael Sheerin
Panel 1	Role of Air Change Rates in IAQ Codes and Standards	Jun-22	11:00 AM – 12:30 PM MST	Phoenix Convention Center North Building , Level 2, 229A	Kishor Khankari

IV. Las Vegas, NV Winter Conference, January 31 – February 4, 2026

Overview of Conference Tracks:

1. Fundamentals and Applications Fundamentals are the foundation for understanding applications in engineering. Key components of ASHRAE fundamentals include thermodynamics, psychrometrics, heat transfer, and fluid flow. This track provides opportunities for papers and presentations of varying levels across a large topic base. Concepts, design elements and shared experiences for theoretical and applied concepts of HVAC&R design are included.

Track Chair: Kevin Brown | kevin@kbsquared.net

2. HVAC&R Systems and Equipment HVAC&R Systems and Equipment are constantly evolving to address the changing requirements of the built environment. Papers and programs in this track focus on the development of new systems and equipment, novel applications of existing systems and equipment, improvements to existing systems and equipment and the proper application and operation of systems and equipment.

Track Chair: Ng Yong Kong | nyk@nyk.com.my

3. Refrigeration and Refrigerants Refrigeration systems generate and use cold for a range of processes, from food production and temperature-controlled storage to vaccine preservation, to long-term protection of fragile ancient inks of historic documents and others. Differences in technologies and equipment, performance, refrigerants, etc., may hide synergies from which both industrial and commercial systems might benefit. Refrigeration systems and the refrigerants also have environmental impacts including direct and indirect GHG emissions. Papers and programs in this track will focus on refrigeration systems of all types from process cooling to comfort cooling as well as best practices for refrigerants that are used in refrigeration systems.

Track Chair: Haotian Liu | sjtulht@hotmail.com

4. Research Summit Active research, and the exchange of those research findings, are critical to the development of our HVAC&R industry and built environment. This track invites researchers to share those results, including ASHRAE-sponsored research and research of interest to the ASHRAE community. Researchers are invited to present papers, extended abstracts, seminars, forums or participate in panel discussions. The Research Summit includes a partnership with ASHRAE's archival journal, Science and Technology for the Built Environment.

Track Chair: Li Song | lsong@ou.edu

5. Energy Storage and Grid Resiliency Thermal and electrical energy storage can alleviate the mismatch between renewable energy availability and peak building energy demands, enabling the incorporation of more renewable energy into the grid. Integration of thermal energy storage (TES) with residential and commercial building envelopes or HVAC systems would reduce buildings' heating and cooling loads, level out peak energy demand, reduce HVAC size, increase energy savings, improve occupant thermal comfort and allow flexibility for shedding and shifting electricity demands associated with building loads. These benefits enable improved grid resiliency; thereby, enabling more cost-effective electrification of buildings. Papers and programs in this track focus on advances in cost-effective TES materials and systems, integration of thermal TES in building envelopes or HVAC systems and grid resiliency.

Track Chair: Jon Cohen | joncohen1@gmail.com

6. Pathways to Building Decarbonization Decarbonization is urgently needed to slow climate change that is affecting the planet. Approximately 10% of global CO₂ emissions is attributable to embodied carbon in building materials and construction processes. Energy use in buildings accounts for about 40% of energy-related carbon emissions. Therefore, to accomplish building decarbonization goals, accounting for embodied carbon and carbon emissions from operational energy use is essential. ASHRAE and its members are leading the advancement of carbon neutral, net zero energy and

decarbonization strategies in new construction, renovation and HVAC&R design for residential and commercial buildings.

This track highlights case studies and research across the globe on the methods being developed and policies being evolved to reduce carbon impacts on the global environment; tools and resources to make zero energy design and operation more easily achievable; innovative low-carbon materials and state-of-the-art technologies and strategies to achieve zero energy communities and campuses; and policies, regulations, codes, standards and utility and government programs for adoption and scale up of net zero (or net positive) energy building and community initiatives.

Track Chair: **Ehab Mamdouh** | ehab.mamdouh@ipec-eg.net

7. Artificial Intelligence Artificial intelligence (AI) is being adopted by many aspects in our life. As sensor systems, internet connectivity, building management software and data collection become more sophisticated and ubiquitous, substantial opportunities exist to make buildings and HVAC systems and equipment “smarter.” Implementation of AI in building automation and control systems offers the potential to improve operational energy efficiency, occupant comfort, security and maintenance, and to enhance utilization of renewable energy resources (e.g., wind, solar) and energy storage. Submissions in this track focus on applications for AI and machine learning technology in building automation and controls to enhance energy efficiency and comfort, cyber security, fault detection and diagnosis, operation of HVAC systems and equipment for load flexibility, and benefit from time-of-day energy prices.

Track Chair: **Joshua Vasudevan** | joshuavasudevan2011@gmail.com

8. Indoor Environmental Quality for Healthy Buildings Indoor environmental quality (IEQ) is a vital consideration during all phases of a building’s life because the indoor environment is closely linked to occupant comfort, satisfaction, productivity, and health. Proper fire and smoke control design is also crucial for protecting building occupants. This track explores the design, operation, and studies of ventilation, air distribution systems, and all IEQ aspects, including noise, vibration, thermal comfort, water quality, and lighting in residential and commercial buildings. Topics include aspects of ventilation and IEQ, such as filtration, changeovers, best practices for maintainability, fire ratings/dampers, detection and ventilation for toxic gases, operator safety in equipment rooms, OSHA requirements, industrial and hazardous spaces, additional occupant health and safety considerations and new building materials, lighting methods and best practices, acoustic attenuation and impacts of sound and vibration on human health and productivity, and the impacts of poor source water quality on building occupants and methods to mitigate the risk.

Track Chair: **Joe Chow** | joe.ashrae@gmail.com

9. Future Proofing the Built Environment In the face of climate change, weather extremes and energy supply disruptions and shortages, methods for designing, constructing and operating buildings and HVAC&R systems must be resilient and sustainable. In fact, resilience is a highlighted aspect of the current ASHRAE strategic plan. This track highlights innovative technologies and strategies that are evolving across the globe that reimagine our relationship with the built environment now and into the future, including design strategies for extreme climates and weather, appropriate responses to energy supply disruptions, and how all these factors are tied to resilience and energy conservation efforts.

Track Chair: **Robin Bryant** | rbryant@bandiflorida.com

Las Vegas Dates:

- **May 28: Conference Paper Abstracts Due**
- **June 18: Abstract Accept/Reject Notifications**
- **August 1: Debate, Panel, Seminar, Forum, Workshop Proposals Due**
- **September 3: Conference Papers Due**
- **September 24: Conference Paper Accept / Revise / Reject Notifications**

- **October 3: Debate, Panel, Seminar, Forum Workshop Accept / Reject Notifications**

V. Future Meetings

- Las Vegas, NV: 2026 Winter Meeting, Jan. 31 – Feb. 4
- Austin, TX: 2026 Annual Meeting, June 27 – July 1
- Chicago, IL 2027 Winter Meeting, Jan. 23 – Jan. 27
- New Orleans, LA 2027 Annual Meeting, June 12 – June 16

VI. Discussion on Potential Program Topics

- Resources for future meetings:
<https://www.ashrae.org/conferences/conference-resources/papers-and-programs>
- From Prior Meetings:
 - Canada vs USA Benchmarking – Kurt Monteiro and Ben Russell
 - David Eldridge can share some benchmarking information
 - CSA Research in OR Pressurization – Jeffrey Siegel
 - Looking for other OR pressurization research to put together a panel
 - Arup Bhattachanya – LSU has other research project and is interested
 - 100% OA Merits in Pandemic Mode – Kurt Monteiro
 - Kishor Khankari has research with George Augustini on Ventilation Rates that may be relevant.
 - Guideline 43 – Ben Russell and Jonathan Flannery
 - Decarbonization – Sierra Spitulski
 - Working with Walt Vernon
 - Crystal Burroughs may have information from ALI course that is relevant
 - Adiabatic Humidification – Ben Russell
 - Geothermal Lessons Learned – Eric Granzow, George Augustini and Kurt Monteiro
 - Recommissioning of Healthcare Facilities – Erica Powel
 - Jason Hasuka TC7.7 Vice Chair and David Eldridge may have examples
 - Energy Efficiency Project Specific Use Case Studies – Eric Powel
 - Measurement and Verification of Healthcare Facilities – Erica Powel
 - Infection Control Website – Linda Lee
 - Infection Control Use Cases – Linda Lee
 - Comparison of ASHRAE Standards with European Standards
 - Humidity Design Point
 - ASHRAE 170 Fundamentals
 - Decarbonization Case Studies
 - RP-1816 Energy Use and Heat Gain for Imaging Equipment
- Programs on Hold:
 - Flipping of Pressurization – Discussion on if this is still being requested.
 - Gina Semerad, Jennifer Leach and Jason Hasuka are still getting requests from owners, so this may be a worthwhile program

- New Programs for discussion
 - i. Energy Audits – Measures and Verification
 - 1. Larry Wilson and David Eldridge may have program in mind
 - ii. AI in Healthcare Facilities – Panel on what is AI? How is it applicable? How to be AI ready?
 - 1. Suggestion from Jennifer Leach
 - 2. Shay Rankhorn may have information and connection through Clemson that is relevant

VII. Subcommittee Membership

- Monthly Meetings – looking for those interested in joining
 - Tom Parker
 - Linda Lee
 - Kurt Monteiro
 - Sierra Spitulski
 - George Augustini
 - Ben Russell
 - Erica Powell

TC9.6 / 170 Research Sub-Committee

June 22, 2025

- Welcome!
- 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 interest.*
 - See full Code of Ethics: <https://www.ashrae.org/about/governance/code-of-ethics>
- Sign-in sheet virtual link: <https://form.jotform.com/231753647820156>
- Introductions
 - David Thomsen; david.thomsen@providence.org
 - Ken Mead; kenrmead@gmail.com
 - Brendon Burley; brendon.burley@gmail.com

1

Agenda

- Research Intro Presentation – Guangyu Cao, TC2.1
- Ongoing Research Reports
 - Research Projects (RP)
 - Approved Projects (TRP)
- Developing Research Reports
 - Work Statement (WS)
 - Research Topic Acceptance Request (RTAR)
 - Potential RTAR
 - Publication Topic Acceptance Request (PTAR)
- Other Research
- Open Floor
- Appendix
 - Links to home page and books store, flow chart of ASHRAE research process

2

Ongoing Research Reports

3

RP-1854: Database of Ultraviolet Inactivation Rate Constants (k-values) for Microorganisms Critical to System Design

- Lead TC 2.9: Steve Martin; TC9.6 Lead: Dylan Neu, Ken Mead
- Research Objective: Literature review and development of a comprehensive and standardized database of UV rate constants (susceptibility to UV) of various micro-organisms in air and surfaces in the built environment.
 - Literature review complete
 - Final report delivered; manuscript for Journal also submitted
 - PMS meeting to conclude project.
 - Final Update – Published!

4

RP-1816: Reporting the Energy Use and Heat Gain from Imaging Equipment

- Lead TC9.6: Oscar Cobb PMS Chair; TC4.1 and TC4.7 Co-sponsored
- Research Objective: This research will determine heat gain and energy use for large, often multi-component, imaging systems in the field. Results will be used to update and expand current data in multiple ASHRAE publications. It will also provide energy use metrics for energy modeling and medical equipment comparisons in HVAC designs.
 - Final Draft Report complete!
 - Update – Jim/Jacquelyn/Walt

5

RP 1864: Investigating the applicability of Standard 62.1's Ventilation Rate Procedure for Healthcare Rooms

- TC9.6 Lead: Paul Ninomura; Co-Sponsor: SSPC 170, 62.1
- Team – Paul, Ken, Kathleen, Alejandro, Arun, Abdel
- Research Objective: ASHRAE Standards 62.1 and 170 seek to provide safe and acceptable indoor environments yet they employ very different approaches. This research investigates if/where the design flexibility in Standard 62.1's Ventilation Rate Procedure could be an appropriate and energy-conserving alternative to Standard 170's prescriptive air-change-per-hour approach to outdoor air ventilation requirements.
 - *Mazzetti has recently received the first batch of results from Stanford Healthcare's thorough literature review and are assessing the database of summarized data from the articles, a massive spreadsheet with over 1000 columns of data for each article. We have also developed a preliminary set of calculations to compare ventilation minimums for 170 spaces with 62.1 VRP calculation method. We have researched and determined generation criteria and acceptable exposure limits for some of the potential contaminants, mostly chemicals or gases with MSDS exposure limits, and we are using the literature review results to advise on the remaining contaminants.*
 - *We plan to complete the calculations and develop recommended VRP criteria for the 170 spaces by the end of July, and at which time we would like to hold a meeting with the committee and peer reviewers to gather feedback and discuss the final stages of the project.*

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RP 1889: Graywater use in Healthcare Facilities; determining risk and appropriate design responses

- Lead 189.3 ; TC9.6 Lead: Erica Eskins, Eric Granzow, Tyler Anderson
- Research Objective: Determine if any negative impacts to patient safety may exist from use of non-potable water.
 - Awarded
 - The literature review and technical review has been extensive. Hospitals are already doing greywater reuse, pathogen control is manageable, water resources are indeed a rising concern, but regulatory barriers still exist.
 - Draft report due in September
 - Update - Eric/Erica/Tyler

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RP 1928: Air Cleaner Efficiency in Combination Chamber Duct System

- Lead TC 2.9: Chrystal Jolliffe; TC9.6 Lead: Linda Lee
- Research Objective: Improving test methods to measure air cleaner performance against airborne pathogens.
 - Testing with devices underway
 - Meeting shortly to review data
 - Update – Chrystal, Kevin, Kathleen

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Tentative Research Reports

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1873 TRP: UVGI Design Applications for Large Volume Spaces

- Lead TC 2.9: Steve Martin; TC9.6 Lead: Dylan Neu
- Research Objective: Current system design guidance is based on room square footage. High-ceiling rooms are thus penalized causing potential over-design and inflated first and operating costs. Objective is to conduct research to ID if floor area design approach would be equally effective at airborne pathogen deactivation
 - Updates completed; re-vote successful.
 - Went out for bid – 3 received, PES reviewed, recommendation made
 - Update – Ken, Dylan

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1936/CO-TRP-8: Evaluating the relationship of air change rate (ACR) and ventilation performance in laboratories, clean rooms, and industrial spaces

- ACR MTG led
- Price Industries has agreed to co-fund
- Phoenix Valves also co-funding
- Went out for bid – 6 received, PES reviewed, recommendation made
- Update - Kishor, Roger, Roland

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Developing Research Reports

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Work Statement

- 1955 WS: Anteroom ventilation rate, temperature range, pressure relationship, and boundary conditions
 - Ted, Ehsan, Erick
 - Resubmitted to RAC
 - RAC Returned with comments; team addressing
 - Update - Ted

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1931 WS: Determination of the Metabolic Rates and CO₂ and Aerosol Generation of Occupants in Offices, Medical Settings and Commercial Kitchens

- TC2.1 Lead: Meng; TC9.6 Lead: Sierra
- Co-Sponsor with TC2.1, TC 2.3, 2.4, 5.10, 9.6 and SSPC 55
- Approved for WS
- Draft complete; Sierra reviewing
- TC input in meeting, follow-up required
- TC vote soon; aiming for August submission to RAC
- Update – Sierra/Meng

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RTAR

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RTAR

- Empty!!!

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Potential RTAR

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Potential RTAR - Priority

- XXXX RTAR: Patient Bathroom ventilation needs
 - To gain insight on the following research questions:
 - Are there ventilation rates, diffuser placements, or other ventilation measures which markedly reduce the aerosol plume phenomena?
 - How long after use should restroom exhaust fans run, under different ventilation scenarios, to achieve a sufficient reduction in bioaerosols?
 - Ken/Travis/Larry/Arup
 - Several meetings have occurred
 - Toilet plumes highlighted at ID subcommittee meeting
 - Travis started draft RTAR, Larry provided updated version with input from Ken
 - Update – Larry

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Potential RTAR

- XXXX RTAR: Ventilation for Mobile Dental Trailers
 - Paul, Al
 - Draft RTAR underway
 - Update – Paul

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Potential RTAR

- XXXX RTAR: 1780 Update
 - TC9.10 / Brendon
 - The objective of these additional tests would be the following:
 - How does varying the velocity of the air in the wheels affect the contaminants transfer and at the same time how does it affect the energy recovery efficiency.
 - Does a sensible only wheel could also transfer contaminants when there is condensation (water) on the wheel during heat recovery at low exterior temperature.
 - Does the concentration of contaminants at the entry influences the transfer. Does the transfer is the same at low contaminants concentration.
 - Is it possible to test more than one chemical at the same time instead of only one. This would reduce the testing costs.
 - Does human bio-effluent are also transferred by the adsorption/desorption process, and how this would affect the required amount of outside air needed ?
 - How could we test some gas contaminants that are captured in the wheel and not released till the wheel is saturated ?

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Potential RTAR

- XXXX RTAR: OR Thermal Comfort
 - TC2.1 Lead – Guangyu Cao
 - Draft RTAR underway
 - Follow-up requested
 - Update –

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Potential RTAR - Priority

- XXXX RTAR: Understanding the appropriate application of humidity and temperature control strategies across climate zones on infectious aerosol transmission
 - Standard 170 Work Group ongoing.
 - Research need will be defined by result, anticipated Summer 2024
 - Update - Jonathan

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Potential RTAR - Priority

- XXXX RTAR: Risks Associated with different medical practices (clinic, MOB, hospital)
 - Potential overlap with 1864, consider waiting for 1864 to mature more prior to finalizing focus
 - FGI meeting – Michael/Jeremy/Jonathan
 - AHA data/research center – J. Flannery in May
 - Risk differences (occupational unlikely; HAI more likely)
 - Service-type (i.e. outpatient vs inpatient procedure)
 - Sick vs well areas
 - Update – ?

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Potential RTAR

- XXXX RTAR: Infectious Aerosols PD Ventilation Interventions
 - Update – Walt

Strategy	Quality of Evidence	Indirect Evidence	Magnitude of Benefit	Life Cycle Cost	Energy and Carbon	Strength of Recommendation
Natural Ventilation	Low	High	Moderate	Low	Low	Strong
Mechanical Ventilation	Low	High	High	High	High	Strong
Filtration	Moderate	High	Moderate	Moderate	High	Recommendation
UVGI	Moderate	High	Moderate	High	Moderate	Conditional
Air Cleaning	None	Low	Low	High	Moderate	Weak
Airflow Patterns	Moderate	High	High	Moderate	Low	Recommendation
Humidity Control	None	Low	Low	High	High	Weak

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Other

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Open Discussion

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Other Research Efforts

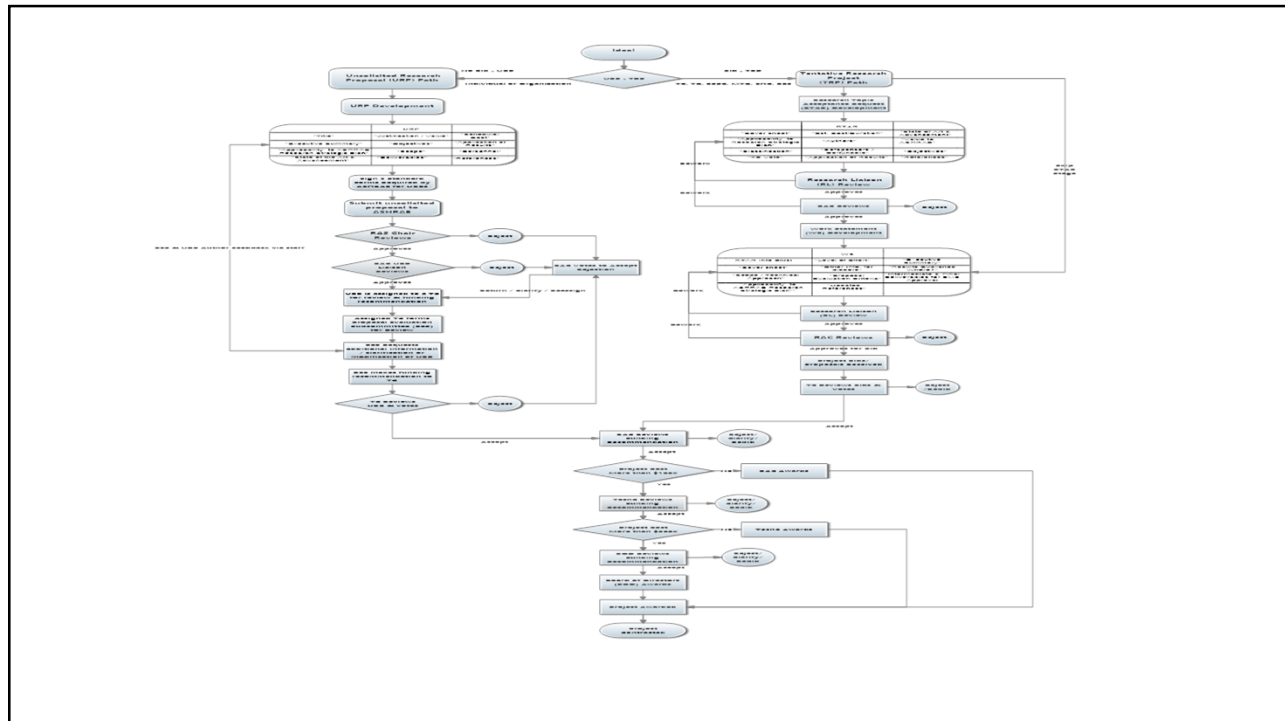
- Big Data Operating Room Air Change Analysis
 - Team - Ehsan, Fred
 - Recommendation from CO-RP3
 - Utilizing public SSI data and air balance reports
 - Pilot complete; funding for additional hospitals acquired
 - Investigating funding, other sources (ASHRAE not prime)

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Appendix

- ASHRAE Research Home page –
 - <https://www.ashrae.org/technical-resources/research>
- Purchase Research Reports –
 - https://www.techstreet.com/ashrae/subgroups/34748?ashrae_auth_token=
- Research Flowchart (next slide) –

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SSPC 170 and TC9.6 – working slide

- The Impact of Recirculated Air on Total Air Change Requirements
 - Ken Mead, Jonathan Flannery, Robert Booth, Sarah Clock, Russ Olmstead to define IP
- Risks assessments associated with different healthcare settings – what is concern and what would answer do?
- Understanding appropriate application of humidity and temperature – (awaiting 170 workgroup efforts, will be led by Jonathan)
- Patient Bathroom Ventilation Design – Larry, Travis; Ken
- Anteroom Ventilation Design – responding to RAC comments
- ~~Outside Air Percentage Reduction – included as outcome of 1864~~
- ~~Recirculation efficiency in reducing energy consumption compared to infection transmission costs – submitted to RAC~~
- ~~HEPA Recirculation in lieu of total air change rate in patient room – ?~~
- ~~UV light in lieu of total air change rate in patient room – no~~

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SSPC 170 and TC9.6 – working slide

- Understanding appropriate application of humidity and temperature – Jonathan
 - JF to schedule meeting following 170 mtg
 - End in mind - Guidance to 170: more spaces, higher floor?
- ~~Recirculation efficiency in reducing energy consumption compared to infection transmission costs – feedback from RAC received~~
- Anteroom Ventilation Design – feedback from RAC received; underway
- Patient Bathroom Ventilation Design – need a partner with Ken?
- Risks associated with different levels of care (hospital, rehab hospital, outpatient, residential)
 - hospitals vs rehab (return rate, length of stay, financial) – JF to investigate AHA, FGI,
 - Outpatient urgent care waiting vs inpatient ed waiting
- Outside Air Delivery requirements – included as outcome of 1864
- ~~HEPA Recirculation in lieu of total air change rate in patient room~~
- ~~UV light in lieu of total air change rate in patient room~~
- Understanding total air changes (hold until 241 outcome – equivalent outdoor air)

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Potential RTAR - no

- XXXX RTAR: Source Capture - Ventilated headboard
 - NIOSH study relative to PACU
 - Efficacy of “headboard” (i.e. tent, kp, cdc, etc.)
 - Definition of headboard – appendix (Eric)
 - All room; “middle” room – air precautions room
 - HICPAC standards to CDC - <https://www.cdc.gov/hicpac/index.html>
 - Update – Roger, Ken, Dylan, Paul, Sonia,

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