**MINUTES**

**BOARD OF DIRECTORS MEETING**

**ISTANBUL, TURKEY**
**October 13-14, 2022**

**Approved by the Board of Directors on February 5, 2023.**

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**PRINCIPAL APPROVED MOTIONS**

Board of Directors Meeting

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| No. - Pg. | Motion |
|---|---|
| 1 – 3 | The minutes from the August 15, 2022 BOD meeting be approved. |
| 5 – 8 | ExCom recommends that the BOD approve the MOU with the UAE Ministry of Energy (ATTACHMENT A). |
| 6 – 8 | ExCom recommends that the BOD approve the new Toronto Chapter scholarship (ATTACHMENT B). |
| 8 - 13 | The BOD reaffirm the goals stated in the 2020 Vision Statement and the 2007 BOD vote as well as the decarbonization position document to achieve net zero energy buildings by 2030. |
| 9 - 17 | The following motions be considered as a consent motion:<br>➢ Standards Committee recommends that BSR/ASHRAE Addendum *x (relocates exhaust requirements)* to ANSI/ASHRAE Standard 62.1-2022 *Ventilation and Acceptable Indoor Air Quality*, be approved for publication.<br>➢ Standards Committee recommends that BSR/ASHRAE Addendum *i (establishes minimum requirements for ozone emissions of air-cleaning systems)* to ANSI/ASHRAE Standard 62.2-2022, *Ventilation and Acceptable Indoor Air Quality in Residential Buildings*, be approved for publication.<br>➢ Standards Committee recommends that BSR/ASHRAE Addendum *J (prohibits the installation of unvented combustion space heaters within dwelling units)* to ANSI/ASHRAE Standard 62.2-2022, *Ventilation and Acceptable Indoor Air Quality in Residential Buildings*, be approved for publication.<br>➢ Standards Committee recommends that BSR/ASHRAE Addendum *m (minimum efficiency of certain filters)* to ANSI/ASHRAE Standard 62.2-2022, *Ventilation and Acceptable Indoor Air Quality in Residential Buildings*, be approved for publication.<br>➢ Standards Committee recommends that BSR/ANSI/ASHRAE Addendum *h (ELC revisions)* to ANSI/ASHRAE Standard 90.4-2019, *Energy Standard for Data Centers*, be approved for publication.<br>➢ Standards Committee recommends that BSR/ANSI/ASHRAE/ICC/USGBC/IES Addendum *k (Emergency Ventilation Rates)* to ANSI/ASHRAE/ICC/USGBC/IES Standard 189.1-2020, *Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings*, be approved for publication. |

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|---|---|
| | ➢ Standards Committee recommends that BSR/ANSI/ASHRAE/ICC/USGBC/IES Addendum *m (Emissions and SECFs Update)* to ANSI/ASHRAE/ICC/USGBC/IES Standard 189.1-2020, *Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings*, be approved for publication.<br><br>➢ Standards Committee recommends that BSR/ANSI/ASHRAE/ICC/USGBC/IES Addendum *y (Prohibition of Smoking and Vaping)* to ANSI/ASHRAE/ICC/USGBC/IES Standard 189.1-2020, *Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings*, be approved for publication. |
| 10 - 18 | Standards Committee recommends that BSR/ASHRAE Standard 230P, *Commissioning Process for Existing Buildings and Systems*, be approved for publication. |
| 11 - 18 | The following motions be considered as a consent motion:<br><br>➢ Technology Council recommends that proposed changes to the Procedures for ASHRAE Standards Actions (PASA) within Section 4. Approval Of Proposed Standards, Section 5. Relationships with other Standards-Developing Organizations, Section 7. Criteria for Approval, Withdrawal, and Discontinuance of ASHRAE Standards and Guidelines, Annex A1: Definitions, Annex B: Appeals of Board of Directors' Standards Actions or Inactions, and Annex C: Complaints of Actions or Inactions by the StdC, its Subcommittees or PCs, be approved as shown in ATTACHMENT D.<br><br>➢ Tech Council recommends that proposed changes to the Rules of the Board Section 2.425.001 *Scope and Purpose*, and Section 2.425.003 *Operation*, be approved as shown in ATTACHMENT E. |
| 12 - 19 | Technology Council recommends that the Board of Directors approve the revised *Infectious Aerosols* position document (PD) as shown in Attachment F**.** |

**ACTION ITEMS**

Board of Directors Meeting

October 13-14, 2022

| No. - Pg. | Responsibility | Summary of Action | Status | Goal Date |
|---|---|---|---|---|
| 1 – 9 | Macauley | Investigate the possibility of developing regions specific ALI courses. Region specific courses would be developed by members outside of North America and presented by members from the regions where they were developed. | | |
| 2 – 11 | Knight | Work with the Finance Committee to reevaluate the 65% of Full Member dues that is used to set the Developing Economy dues rate. | | |
| 3 – 13 | Littleton | Take the documentation from the Global HVAC Summit and forward it to the TFBD ExCom. The TFBD will address relevant items from the summit in a future report. | | |

# MINUTES
# BOARD OF DIRECTORS MEETING
October 13-14, 2022

**MEMBERS PRESENT:**
Farooq Mehboob, President
Ginger Scoggins, President-Elect
Dennis Knight, Treasurer
Billy Austin, Vice President
Dunstan Macauley, Vice President
Sarah Maston, Vice President
Ashish Rakheja, Vice President
Jeff Littleton, Secretary
Steven Sill, Region I DRC
Ronald Gagnon, Region II DRC
Mark Tome, Region III DRC
Bryan Holcomb, Region IV DRC
Jim Arnold, Region V DRC
Susanna Hanson, Region VI DRC
Chris Gray, Region VII DRC
Tyler Glesne, Region IX DRC
Devin Abellon, Region X DRC
Eileen Jensen, Region XI DRC*
John Constantinide, Region XII DRC*
Cheng Wee Leong, Region XIII DRC
Andres Sepulveda, Region XIV DRC
Richie Mittal, RAL DRC
Blake Ellis, DAL
Luke Leung, DAL
Wei Sun, DAL*
Dru Crawley, DAL
Ken Fulk, DAL
Art Giesler, DAL
Wade Conlan, DAL
Kishor Khankari, DAL
Adrienne Thomle, DAL*

**STAFF PRESENT:**
Candace DeVaughn, Manager - Board Services*
Chandrias Jolly, Assistant Manager - Board Services*
Joyce Abrams, Director - Member Services
Vanita Gupta, Director - Marketing
Kim Mitchell, Chief Development Officer
Mark Owen, Director - Publications & Education*
Stephanie Reiniche, Director - Technology
Alice Yates, Director - Government Affairs
Craig Wright, Director of Finance
Tanisha Meyers-Lisle, Procedures Administrator*
Ayah Said, Manager – Global Training Center, Dubai*
Joslyn Ratcliff, Sr. Manager – Marketing Communications*

*Virtual Attendee

**GUESTS PRESENT:**

A.K.M. Foysal Ahmed*
Abbas Sajid
Abdul Rehman*
Abdullah Yousef*
Ade Anujoola
Ade Oyenekan
Ahmed Alaa Eldin
Ahmet Goksin
Akash Saxena
Al-Emran Hossain*
Alexandre Kontoyanis*
Ammar Bahman*
Amol S. Joglekar
Amr Adel Galal
Ananta Ahmed
Anoop Peediayakkan*
Ardiyansyah Yatim*
Ashley Keller*
Ashok Virmani
Ather Naseem Siddiqui
Atilla Biyikoghu
Babatunde Badru*
Bassel Anbari
Bharat Jare*
Bill Bahnfleth*
Bill Damon*
Bill Walter*
Bratislav Blagojevic*
Buzz Wright*
Carl Huber*
Carlos Gabriel Farto*
Cesar Luis Lim*
Ching Loon Ong*
Chirdpun Vitooraporn*
Costas Balaras*
Courtney Araiza*
Danny Castellan*
David Lau*
David Roberts*
David Underood*
David Underwood
Dayani Gunawardhana
Deddy el Rashid*
Dimpy Daroch*
Dinesh Madhuranga*
Don Denton*
Doug Cochrane*
Eduardo Maldonado*
Emeka Achebe
Enea Dimtris Tseno*
Erol Arcakioglu
Faisal Abdallat
Francis Mills*
Gabriel Okwuofu*
Gary O'Sullivan*
Gemunu Senadheera*
Gerardo Alfonso*
Ghassan Al Ali
Guillermo Soriano*
Gurpreet Maini*
Hani Timsah*
Harrison Kesling*
Harshal Surange
Hasmukh Patel
Ibad Hasau
Ibrahim Shabaka*
Irene Reichert*
Isagani Brugada*
Jalal Ifsaisi*
Jaspal Singh*
Jeffrey Eng Ee Seong*
Jennifer Isenbeck*
Jintana Sirisantana*
Jonathan Smith*
Joshua Vasudevan*
Julia Timberman*
Junjing Yang*
Kafi Uddin*
Kanauaraj Ganesan
Kavita Dhanawade*
Kay Thrasher*
KC Ng*
Kent Peterson*
Krishna Kumar Mitra
Krishna Kumarmitra
Krishnan Viswanath
Lukasz Semla*
Maggie Moninski*
Mahesh Prabhu
Mahmood Ahmooq
Mahroo Eftekhari*
Maitham Abdulla
Mallikarjun Andanappa*
Marko Ignjatovic*
MD Hasmotuzzaman
MD. Ershed Jaman Khan
MD. Mahafizur Rahman
Megan McNulty*
Menuwan Jayasuriya*
Mick Schwedler
Mohamed Abdelrahim*
Mohamed Abdelwarith Said*
Mohammad Monzur Alam*
Mohammad Tassi
Mohammed Asif Basha
Mohammed Murtaza
Mohammed Shamroukh
Moiz Ashraf*
Muhammad Farooq Saeed*
Muhammad Harold
Muhammad Mohsin
Muhammed Omer Khan
Nilan Ranasundara*
Nilesh Patel
Niss Feiner*
Nitin Naik
Nivedita Jadhav
Nivedita Jadhav*
Ola Kamiyo*
Olubukunmi Olatunbosun*
Om Taneja*
Osama Khayata
Pankaj Saweew
Pankajbhai Amin*
Peter Lavery*
Poorna Gamage*
Pranar Godbole
Praveen Kumar Jha*
Priyank Garg
R. Salman
Rahi Al Asad
Rajkumar Balasubramaniyan*
Rashid Alshatti *
Ravindu Viduranga*
Richard Rooley
Roy Crawford*
Rupesh Umtol
Ruwan Kurera*
Salah Ebrhim Hassan
Salah Salem*
Sam Hui*
Sana Alazzeh*
Sandesh P. Bhure
Sayani Havi Babu
Scott Peach*
Serafin Grana*
Shamila Karunanayake*
Shuja Khalid
Suei Keong Chea*
Syed Mubarak Abdul Razaak*
Tarik Bilto
Thomas Phoenix*
Tim Wentz
Tulia Rios*
Tyler Owens*
Udaa Perera*
Umut Yilmas*
Van Baxter*
Vijaya Baskarans
Vineet Nair*
Vinod Venugopal
Vishal Kapur
Vivedita Jadhan
Vorasen Leewattanakit*
Wael Eid*
William Fisher*
Wimala Goonaratne
Yashkumar Shukla
Yeshwant Karkhanis
Yongkie Tileno*
Yuichi Takemasa*
Zack Rose*
Zaki Zaatari

*Virtual Attendee

**CALL TO ORDER**

Mr. Mehboob called the meeting to order on October 13, 2022 at 3:09 pm.

**CODE OF ETHICS**

Mr. Mehboob read the code of ethics commitment and advised that the full code of ethics and core values are available online.

**ROLL CALL/INTRODUCTIONS**

Roll call was conducted; members, guests, and staff in attendance as noted above.

**REVIEW OF MEETING AGENDA**

Mr. Mehboob reviewed the meeting agenda. There were no changes or additions.

**APPROVAL OF MINUTES**

**AUGUST 15, 2022**

Mr. Gagnon moved and Ms. Scoggins seconded that

**1.** The minutes from the August 15, 2022 BOD meeting be approved.

**MOTION 1 PASSED** (Unanimous Voice Vote, CNV).

**REVIEW OF ACTION ITEMS**

**JUNE 29, 2022**

Both action items were reported as complete.

**AUGUST 15, 2022**

The action item was reported as complete.

**POSTPONED MOTIONS**

Ms. Scoggins stated that due to the interest in these votes and in order to dissuade any concerns about peer pressure, it has been decided that both postponed motions will be voted on via letter ballot.

Mr. Mehboob added that letter ballots will avoid public pressure and allow Directors to vote with their consciences. BOD members participating in the meeting virtually will share their vote privately in the chat with staff.

Hearing no opposition, Mr. Mehboob stated that the BOD will move forward with using letter ballots.

**WEDNESDAY, JUNE 29, 2022**

**2.** Motion 14 from the June 29, 2022 BOD meeting be considered

***The Society implement the recommended revisions to the ASHRAE Board of Directors and councils' structure as listed in APPENDIX I of the Board Composition and Leadership Structure Subcommittee Final report dated June 26, 2022 (ATTACHMENT F).***

Mr. Mehboob opened the floor for discussion. A summary of the discussion is below:

*Gagnon – Spoke strongly against the motion. Choosing between two options is biased.*

*Gray – Spoke in favor of the motion. Society must be willing to embrace change to ensure we thrive and not just survive.*

*Jensen – Spoke against the motion. Have yet to be given an explanation as to how reducing the number of BOD members will make the BOD more strategic and nimbler. Can only conclude that the goal is to reduce the number of voices on the BOD.*

*Reducing the number of BOD members would be a loss to the rich diversity of opinions and limit the inclusion of those who would otherwise not be represented. Fewer representatives on the BOD does not provide enhanced globalization; creates the appearance of placing power in the hands of a few and makes Society look elitist and opaque.*

*Suggest waiting to see if the recently approved changes provide any of the desired changes. If too many things are changed at once, there is no way of knowing what worked.*

*Constantinide – Cautiously in favor of the motion. Agree with numerous points that Ms. Jensen made. What is encountered at the BOD level is more than a composition issue, it is an operational issue. If the goal is to empower the councils more, that should be done and then streamlining reassessed.*

*Would like to hear more discussion and then suggest that the motion be tabled or postponed.*

*Rakheja – Undecided on the motion. Received feedback from the CRCs that there is a sense of insecurity and concern over the additional layer that districts would create.*

*How will the silos of the councils be addressed? It was not properly communicated and did not appear in the presentation that work is already being done to break down silos and empower the councils.*

*Khankari – Spoke against the motion because the grassroots members are not in favor. Primary objection is that the BOD is currently strategic; the number of members on the BOD and whether the BOD is strategic do not go together. Currently having 30 members on the BOD is an asset, members should be assigned strategic items and held accountable.*

*Several hundred hours of volunteer time have gone into the current structure, please think before a new one is selected.*

*Ellis – In favor of the motion. How do you have a discussion with 30 of your closest friends? The answer is you don't. This motion will solve all inefficiencies and will help us get better. It also*

*simplifies and improves BOD communication. Currently, there isn't time to have discussions. How do we address the issues of the day without the ability to have discussions.*

*Don't see the motion having an impact on chapter operations. Would strengthen the nomination process. This vote isn't to implement the change but to ask our members if the change should be implemented.*

*Abellon – In favor of the motion. I came through the grassroots and feel that the proposed structure will not only result in a more agile and strategic BOD but will also better serve grassroots members on issues that most impact them.*

*A lot of vocal concerns and I understand. The motion does not combine or merge regions – Directors will serve multiple regions and DRCs will still be able to work closely with the regions. There is a sense that grassroots members have a voice because their DRC sits on the BOD. There were 20 motions presented today that will go to Members Council; the goal is to empower Members Council to make the decisions that matter most to the members.*

*Leong – Do not need to reduce BOD size to be more efficient; can be done in other ways. Not in favor of the reduction of the BOD.*

*Fulk – After a lot of careful thought, I have decided that I am against the motion. Express sincere thanks for those involved in developing this proposal. Agree with a lot of the comments already made.*

*Several concerns still remain. A smaller BOD does not guarantee anything. I know of large and effective BODs. Many factors determine how effective a BOD is. Currently pursuing streamlining at all levels of ASHRAE, suggest waiting to see the results of these efforts before deciding if the size of the BOD is a problem. Do we allow the BOD to be larger in the future? What impact does the proposed BOD size reduction have on grassroots efforts? No other professional organization has the DRC structure that Society has and that makes us special and more effective at feeding our grassroots.*

*A smaller BOD results in less BOD level exposure and will make it non-existent over time. Direct connection from the BOD to chapters is needed. Unintended consequences will be detrimental to Society and membership growth.*

*Suggest that structural and operational changes be considered to council leadership and ExCom makeup.*

*Mittal – Spoke against the motion. Agree with many of the points already made.*

*Austin – Spoke against the motion. Spoke against tabling the motion. The motion does add a layer of management. Haven't seen an effort by the BOD to be strategic in our meetings. Being strategic has been delegated to the Planning Committee.*

*Glesne – What was the opinion at Members Council?*

*Scoggins – Had a discussion today; some were for the recommendation but the majority were not in favor.*

*Holcomb – If it were as easy as changing agendas, would question why this hasn't been done in the past. The BOD must recognize the members while continuing to change and adapt to what is going on in Society. Feel this motion is a monumental step towards moving forward.*

*Sill – Region I is currently the largest region in Society. Conducted a town hall at the CRC and the membership was in favor of the motion two to one. Spoke in favor of the motion.*

*Macauley – Spoke in favor of the motion. This was not a streamlining exercise. The task of this subcommittee was to look at the current structure of the BOD and make recommendations on that alone.*

*Our structure was created in 1959 when ASHRAE was only a US based organization with less than 20,000 members. Society has grown considerably and our structure hasn't changed to adapt to the changing needs of our members and position us to grow as we face stiff competition.*

*Numbers and diversity don't go hand in hand, that is quotas. Suggest focusing on what is needed to move forward and to be more effective to meet the needs of our members.*

*Gray – If a Director is only here to represent her/his region, would suggest that is an ethical violation. At the BOD level, Directors take off their DRC hat and think about the Society as a whole.*

*Should take recommendations that our BOD is too large into consideration.*

*Constantinide – Realized that thinking too long about a proposal doesn't always come to the best proposal.*

Mr. Constantinide moved that

**3.** The motion on the floor be postponed until the February 2023 BOD meeting.

**MOTION 3 FAILED TO SECOND.**

Discussion of MOTION 2 resumed.

*Khankari – This is not streamlining; this is restructuring with the goal to streamline. The Society's current structure was formulated over 70 years ago, should we not be following the same straight line? This recommendation is going in the other direction.*

*Conlan – Future growth of our Society would allow for nine regions to be added without changing the structure of the BOD.*

*The current vetting process for evaluating future BOD members is not an equal process for all Directors. The model presented would make this an equal process.*

*The model presented would also increase the vision of what it means to be on a council.*

*The recommendation changes more than just the number of BOD members. Would be nice to hear comments on other aspects of the presentation.*

*Crawley – Serve on another large BOD and it is hard to get things done and have quorum. In favor of this motion.*

**MOTION 2 FAILED** (10:19:1, CV).

Mr. Mehboob thanked Mr. Macauley and his subcommittee for their work. He stated that he was sure that much of the group's work will carry into other streamlining activities moving forward.

Mr. Mehboob stated the BOD should have full and complete management and control of the Society. He read ASHRAE Bylaw 4.4:

*The Board of Directors shall have full and complete management and control of the activities and funds of the Society and may adopt such rules and regulations for the conduct of its meetings, the exercise of its powers, and the management of the affairs of the Society as it may deem proper, subject to the provisions of the laws of the State of New York, the Certificate of Consolidation and these Bylaws.*

**MONDAY, AUGUST 15, 2022**

**4.** That Motion 3 from the August 15, 2022 BOD meeting be considered

***The BOD DEI Advisory Subcommittee recommends to the ASHRAE Board of Directors consider issuing a response to the request from Society of Women Engineers of coordinating efforts between ASHRAE and AIA on a Building Industry Statement to address the recent ruling overturning Roe vs. Wade.***

Mr. Mehboob stated that at the August 15 BOD meeting, the question before the BOD was, 'Does our BOD want to get involved in social issues particularly pertaining to one part of the world, as we have social issues in the 130 countries we operate in.'

He stated that staff reminded the BOD that the Society's 501(c)3 status prohibits Society from being involved in political discussions.

Mr. Mehboob opened the floor to discussion. A summary of the discussion is below:

*Thomle – Want to remind the BOD that this request came from the Region VI GAC RVC. Do not have a draft statement for the BOD to review at this time.*

*Mehboob – At this time, a draft response is not so important. Remind the BOD that silence is also a response.*

*Hanson – Want to clarify that this request did not come from SWE and the statement that organization issued was only used as an example. This request came from Beth Thomlinson.*

*Constantinide – Is the BOD responsible for making the response?*

*Mehboob – The BOD would first need to decide if we are going to go down this road.*

*Scoggins – Have strong personal opinions but don't feel it is Society's job to get involved. Therefore, speak against the motion.*

*Arnold – Spoke against the motion. The motion opens up the gates. Could address other injustices in the world as well.*

*Glesne – This is not just a social justice issue, it is a human rights issue. Can't find in our mission where we should speak to this issue. Spoke against the motion.*

*Sun – Discussed this at the last BOD meeting. Speak against the motion. There are many other social issues.*

**MOTION 4 FAILED** (2:27:1, CV).

**EXCOM REPORT TO THE BOD**

**AUGUST 31, 2022**

Mr. Knight reported.

Mr. Knight moved that

**5.** ExCom recommends that the BOD approve the MOU with the UAE Ministry of Energy (ATTACHMENT A).

Mr. Knight reported that this MOU is the equivalent of an MOU with the Department of Energy in the US. The MOU doesn't fully commit Society to anything but is an important and strategic partnership for Society.

**MOTION 5 PASSED** (Unanimous Voice Vote, CNV).

Mr. Knight moved that

**6.** ExCom recommends that the BOD approve the new Toronto Chapter scholarship (ATTACHMENT B).

Mr. Knight reported that criteria for the proposed scholarship is noted in the "Purpose" section of the attached agreement between the ASHRAE Foundation and the ASHRAE Toronto Chapter dated and signed July 6, 2022.

Current list of schools in Toronto with an ASHRAE student branch:

- Ryerson University – ACTIVE
- Seneca College – ACTIVE
- Sheridan Institute of Technology – ACTIVE
- University of Toronto – ACTIVE
- Humber College – ACTIVE
- Centennial College – ACTIVE
- George Brown College – ACTIVE
- Lakehead University – ACTIVE

Current list of schools in Toronto with programs accredited by Engineers Canada (a signatory of the Washington Accord):

- Ryerson University

- University of Toronto
- York University

Mr. Conlan noted an editorial change that the wrong country for Society is listed incorrectly in the document.

**MOTION 6 PASSED** (Unanimous Voice Vote, CNV).

Mr. Knight reviewed information items.

Mr. Khankari suggested that ALI courses are mostly developed from North American instructors and a North American point of view. He suggested that it would be better that courses with similar topics be developed by regions outside of North America. He stated that these proposed courses would be relevant to those regions and the presenters would come from those regions, helping to reduce travel.

Mr. Macauley will investigate the possibility of developing region specific ALI courses. Region specific courses would be developed by members outside of North America and presented by members from the regions where they were developed. **AI - 1**

**TREASURER'S REPORT**

**FINANCIAL UPDATE FY21-22 RESULTS**

Mr. Knight reported. He reviewed the presentation attached to the agenda.

**FY22-23 YTD THROUGH AUGUST – DASHBOARDS AND FINANCIAL STATEMENTS**

Mr. Knight reported that for the last two years, the Subcommittee on Financial Focus has been working toward getting a set of key performance indicators and provide the BOD with up-to-date information prior to meetings.

Mr. Knight reviewed the report attached to the agenda.

Mr. Knight reported that beginning in December, the BOD will begin receiving a financial dashboard.

It was stated that the BOD receives a lot of dashboards. It was suggested that all dashboards are sent to the BOD at once and condensed to one to two pages.

Mr. Littleton will work to combine all monthly dashboards sent to the BOD into one 'snapshot' document.

**FINANCE COMMITTEE REPORT TO THE BOD**

Mr. Knight moved that

**7.** Finance Committee recommends to the Board of Directors (BOD) a proposed dues increase in ASHRAE Society Year 2023-2024 using indices that more closely reflect annual operational cost increases. This adjustment is in accordance with the Finance Committee Reference Manual, Section 8 – Dues Increase Guideline.

Mr. Knight reported that attachment A of the Finance Committee report outlines the recommended Fiscal Year 2023-2024 dues.

Until a few years ago, the dues calculation was calculated using the Consumer Price Index (CPI) as the only basis for adjustments. It is currently used as a comparison to the revised dues formula for discussion and as a point of reference.

The revised dues formula includes the use of a combination of indices including the Producer Price Index, Employment Cost Index and actual staffing cost increases and rounds the calculated figures to the closest 5 or 0.

The BOD still has the prerogative to make individual adjustments in dues for any membership grade at any time as they may desire based on conditions that exist at the time of consideration.

There was extensive discussion of the motion. A summary of that discussion is below:

*Gray – Cost per member is around $85 or $86 per member. How do those two correlate? How do we justify a dues increase if we are within cost to provide member services.*

*Knight – Feel there is an error on the dashboard. Finance will dig into how the cost per member is being calculated in the dashboard because that is not correct.*

*Mehboob – Would you like to defer this motion until you can bring forward the justification for consideration by the BOD?*

*Knight – Do not have a problem deferring the motion.*

*Mehboob – Would the BOD like more information on the justification?*

*Glesne – Recommended that an action item be assigned to Finance to see if something a little more equitable can be done for the membership.*

*Rakheja – These indexes are related to the US. There has been unprecedented currency reduction around the world. Some members would have to pay more than double the current dues rate. Suggested that a better mechanism be developed for future use.*

*Gray – Actual cost per member is an important topic and I am trying to understand. Have to be very careful to ensure we are setting dues appropriately across the board to ensure we are covering costs. This is an information item I would like to understand more.*

*Ellis – The Finance Committee Reference Manual provides guidelines for calculating rates to raise member dues. The committee considers the consumer price index as well as relative salary increases in the US (addressing staff costs). After considering these financial indicators, the Finance Committee makes a recommendation.*

*The current process does a pretty decent job of tracking where Society's costs are. In the past, Society dues were lagging pretty dramatically.*

*Mehboob – Does the Finance Committee consider that 1/3 of members do not live in the US and the definition of the World Bank doesn't even cover certain countries?*

*Sepulveda – The growth of member revenues is about the same because of the increase in Society dues. Member growth considered for the next two years is almost zero.*

*Fulk – Mr. Ellis did a good job summarizing. When the current process was developed ten years ago, the cost of member services in developing economies was considered. May need to be looked at again.*

*Khankari – Agree with formulas and what is going on from a commonsense point of view. Looking at this as a member, if we have a surplus budget why are dues increasing? Are we just using the formula?*

*Gray – Mr. Khankari raises a very good point. Keep in mind that our surplus and deficit is a very slim margin. Society is projected to have a surplus budget, but that could very easily change.*

*Knight – All we have to do is look at expenses and see that we are almost $500 and some dollars per member, those are real costs, and that trend will accumulate.*

*Mehboob – There is a growing number of Life Members that do not pay dues. Would we consider asking them for a contribution rather than put the whole thing on our younger members?*

*Crawley – ASHRAE has the most inexpensive dues of any organization I have ever belonged to and I get five times the value out of my ASHRAE membership than I do from any of those other organizations.*

*Hanson – Renewals aren't considered when dues increase. When dues are increased, should it be communicated what Society has done to offset the costs? What is currently being done to manage the perception when dues are increased?*

*Knight – Society just went through the loss of an AHR Expo and we weathered it because we are managing our funds and managing our reserves. Society has to have a rainy day fund to remain a viable organization and that has to be taken into consideration.*

*Rakheja – At no point in time should the intent be to do away with the dues increase cycle. What we are discussing is trying to come out of the formula where we can address concerns arising from various parts of the world.*

Mr. Knight and the Finance Committee will reevaluate the 65% of Full Member dues that is used to set the Developing Economy dues rate. **AI - 2**

Mr. Littleton reported that Society currently has 3,545 members in the developing economies program. Out of that, 1,230 are Student Members, so there are currently 2,315 members in the developing economies program that would be impacted by the proposed motion.

**MOTION 7 WITHDRAWN** with no objection.

Mr. Knight reviewed the Finance Committee's information items.

Mr. Khankari suggested that the investment dashboard be included. Members need to see we are investing their money.

Mr. Wright reported that $2 million was transferred to the Society's investment advisor several months ago and an additional $600,000 will be invested in the market before the end of the calendar year. He reported that the financial advisors have purview to decide when to invest the additional funds.

Mr. Khankari reported that the Society's current investment strategy is to invest 70% in stocks and 30% in fixed income value like bonds. He reported that the Society's current investment strategy is a three on the risk scale of one to five.

Mr. Knight stated that everyone has their own risk tolerance but BOD members are a fiduciary for our members. He reported that the Society's investment guidelines and the BOD's risk tolerance is a fair amount more conservative than if it were our own money and Society's investment firm is behaving accordingly.

Mr. Leung stated that Ms. Scoggins' report on scope 3 emissions could be used to calculate what it would take to be the first organization in history to reach net zero.

Mr. Mehboob asked that Mr. Leung's suggestion be raised under 'New Business.'

**TASK GROUP REPORTS**

**TASK FORCE FOR BUILDING DECARBONIZATION EXCOM**

Mr. Peterson reported that the TFBD ExCom has been extremely busy and he commended the members for stepping up to meet the challenge set by the BOD.

He reviewed the presentation, included in ATTACHMENT C.

Mr. Peterson opened the floor to questions:

***Very North American centric organizations for collaboration. Are we working to get that collaboration internationally?***

*Peterson – The collaborative is currently a North American collaborative. The Global Advisory Panel met for the first time last week. The TFBD ExCom is looking into funding from DOE to help push this out to municipalities and DOE is focused on North America. Other agencies will be included in future reports.*

*The first guide will be available in December and will be free because of DOE's funding. For future guides, funding and method of delivery are not determined. TFBD ExCom is currently receiving feedback and input from others on how the guides can be made available for free in the future.*

***Can you comment on whether a chair has been identified? Were SPLS liaisons included? Want to ensure that we can continue the good work of the TFBD.***

*Peterson – STD 211 does not currently have a committed chair, but they have a leader. One individual has indicated that they would be willing to be a chair in the future, but that individual is fairly committed. If our current plan works, would not have to reconstitute that project committee until after the standard is reaffirmed.*

*A virtual meeting was held and SPLS members were not in the room; it was more of an open discussion. Would highly encourage the SPLS to get involved.*

***With respect to work plans, feel that we will want more accountability embedded into what we expect. Can you comment on that?***

*Peterson – Work plans are guiding documents but it is always good to have a plan and discussion. If the plan is approved, at least you know that the consensus body has the goal to move in that direction. The project committee is not raising red flags at this time. Believe it is always good for us to have work plans.*

*Encourage everyone to read through the 90.1 work plan when that gets published to know what the overriding goals of the organization are.*

***Is there a need for the BOD to reaffirm the goals and previous BOD vote?***

*Peterson – Do feel it would have an impact to reaffirm the commitment that the BOD made 15 years ago. If the BOD could send a message down or if the message came from Standards Committee, it would mean a lot to those outside Society as well.*

*We as an organization should not sit on the sidelines and allow others to write a code. Society could publish a zero energy code and indicate that 90.1 is moving in this direction. Work could also be done to move jurisdictions in this direction if they are looking to be leaders in this area.*

*If Society wants to be the leader in the next nine years, we need to do this. People are looking for Society to lead in these areas.*

***Hope our efforts from the summit will be carried over. At the HVAC Summit, there was discussion of the 'R' in ASHRAE as well has 90.1 seemingly not addressing refrigeration or other energy loads that will have to be addressed as we approach net zero.***

*Mehboob – Would like to allow Mr. Peterson to review the results of the Global HVAC Summit before responding.*

Mr. Littleton will take the documentation from the Global HVAC Summit and forward it to the TFBD ExCom. The TFBD will address relevant items from the summit in a future report. **AI - 3**

Ms. Scoggins moved and Mr. Ellis seconded that

**8.** The BOD reaffirm the goals stated in the 2020 Vision Statement and the 2007 BOD vote as well as the decarbonization position document to achieve net zero energy buildings by 2030.

The meeting recessed at 6:19 pm.

The meeting reconvened on Friday, October 14 at 9:24 am.

**CODE OF ETHICS**

Mr. Mehboob read the code of ethics commitment.

**ROLL CALL/INTRODUCTIONS**

Roll call was conducted; members, guests, and staff in attendance as noted above.

Mr. Mehboob opened the floor for discussion on the motion.

Mr. Leung stated that Architecture 2030 has a net zero code that was adopted by ICC. The point is, if we don't do it, other organizations will.

Mr. Fulk asked if Society had previously reaffirmed its commitment. What are we tracking as it relates to the goals set in 2007?

Mr. Mehboob stated that the commitment was previously reaffirmed and that the goals set in 2007 were achieved by Society.

Mr. Littleton reported that milestones are also available in Mr. Peterson's presentation, ATTACHMENT C.

**MOTION 8 PASSED.** (Unanimous Voice Vote, CNV).

Ms. Scoggins requested that this decision be communicated to Technology Council and Standards Committee as soon as possible.

Mr. Mehboob stated that he would certainly issue a letter. He agreed with Ms. Scoggins that we don't want Society left behind.

**BOD SUBCOMMITTEE REPORTS**

**BOD DEI ADVISORY SUBCOMMITTEE**

Ms. Thomle reported on behalf of the subcommittee. She stated that the subcommittee had no motions for the BOD's consideration.

She provided an update on the subcommittee's ten initiatives. The full subcommittee's report was attached to the agenda.

Mr. Leung stated that he recently learned that Society is working with CIBSE to develop a circular economy; specifically, there is a join effort to develop this next generation standard. He expressed appreciation for the opportunity to be in Istanbul, if he were not in attendance, he would not have been aware of this.

Mr. Mehboob expressed his thanks to the BOD for conducting this meeting at the RAL CRC, stating it was a visionary step.

Mr. Khankari thanked Mr. Knight and Ms. Hayter for their assistance with the book club. He requested that all BOD members attend, stating that even if members did not read the book they should still attend. He stated that unconscious bias is an important topic for Society as a volunteer organization.

He reported that there will be a cultural mixer at the Winter Conference. BOD members were asked to attend and share their cultural experiences. He stated that the event is meant to be fun and educational. He asked that everyone invite other members and colleagues to attend.

Mr. Mehboob thanked Ms. Thomle and the subcommittee for their work.

**FINANCIAL FOCUS SUBCOMMITTEE**

Mr. Knight reported on behalf of the subcommittee. He reviewed the subcommittee's three charges. He reported that the subcommittee is working in three two-person subgroups to address each of the three initiatives.

He reported that the subcommittee completed a first pass on the dashboards. He asked that the BOD review the dashboards and provide comments. The goal is to begin publishing the dashboards the first of December.

He reported that the subcommittee is working with the Finance Committee on limits of authority. There is a draft from the Finance Committee that the group is reviewing.

Mr. Knight reported that at every CRC and fall council meeting members of the subcommittee have been talking about financial focus and stressing the need for more detailed financial impacts when motions are brought to the BOD. He stated that refining that tool allows better access to that information so that accurate fiscal impacts can be provided with motions.

Mr. Mehboob stressed that the purpose behind creating BOD Subcommittees is to allow the BOD to be strategic. He thanked members of the BOD serving on the subcommittees, stating that they were doing great strategic work that will move the BOD forward.

**SOCIETY STREAMLINING SUBCOMMITTEE**

Ms. Maston reported. She stated that the group engaged Hugh Crowther and his lean process experts. The goal was to provide structure to the subcommittee's efforts. Team members have started to engage members of councils to hear what their challenges are and are gathering data.

She reported that a timeline and deliverables were not included in the update. Once the first round of information comes back the subcommittee will evaluate the information, prioritize, and put together what the deliverables will be.

Mr. Mehboob reviewed the subcommittee's charge. He stated that in light of the streamlining motion being defeated, the subcommittee's work will be focused on answering specific questions as listed in the scope.

He stated that the subcommittee's focus should be on the six subjects listed in the charge and that the group is expected to provide concrete recommendations at the spring meeting. He requested that the subcommittee focus on the scope and deliverables. He stressed that time is of the essence.

Ms. Maston stated that with all due respect, the top-down model that the BOD has tried to implement over the years has not moved the needle at all. She stated that the subcommittee is going directly to the councils and committees that report to the BOD as part of a bottom-up process. She expressed that there will be more buy in if conversations start at the council level and that driving things from the process level might be the best path to success.

Mr. Mehboob stated that it was the subcommittee's call as to how they handle the business. He stressed that answers on each of the charges was needed.

He thanked Ms. Maston and the subcommittee for their great work and expressed his thanks.

Mr. Glesne stated that Tech Council does have a desire to be autonomous, to pick their own members and not have to make large reports to the BOD. He stated that Tech Council was in agreement.

Ms. Scoggins stated that Members Council was excited at the opportunity to take on more ownership.

**STRATEGIC BUSINESS DEVELOPMENT SUBCOMMITTE**

Mr. Macauley reported that the subcommittee did not have a formal report.

He stated that, per the charge, the subcommittee was tasked with developing a strategic business plan to roll out new products. He reported that the group is currently finalizing the task list, making assignments, and assigning timelines. He stated that implementation timelines would extend past the current Society year and that the group would coordinate with Pub and Ed Council to ensure that the work continues. More details will be available at the next report.

Mr. Mehboob asked how many times the subcommittee me.

Mr. Macauley responded that the group had one meeting and exchanged emails. He stated that the group would likely not have a final report by March as the planned market research would likely continue into the latter part of the Society year. He stated that the group wants to have continuous tracking of programs and products.

Mr. Mehboob stated that the BOD has discussed threats and challenges on the horizon many times. He stated that additional members can be added or the charge can be divided up among multiple groups. He stated that a strategic business plan is needed on the set deadline and stressed that it was critical to the Society.

Mr. Khankari stated that most of the Society's publications are volunteer written. Would it be strategic from a business development point of view to change our approach to a contractor approach? He suggested that an RFP be issued for strategic publications, the best proposals be selected, and Society then charge a premium price for those publications. He stated that doing so would increase revenue.

Mr. Macauley stated that some projects are already done using RFPs. He reported that Society currently utilizes both formats to get products to market. He thanked Mr. Khankari for his suggestion and stated that the subcommittee would take it under consideration.

**COUNCIL REPORTS**

**MEMBERS COUNCIL**

Ms. Scoggins reported. There were no recommendations for the BOD's consideration. She reviewed information items. The full report was attached to the agenda.

**PUBLISHING AND EDUCATION COUNCIL**

Mr. Macauley reported that the council did not have an updated report since the Toronto meeting.

**TECHNOLOGY COUNCIL**

Ms. Maston reported. She reminded BOD members that members are to review the following motions for adherence to ASHRAE's Procedures for Standards Actions (PASA) and ANSI Essential Requirements and not technical content. If the BOD disapproves a Standards Committee Document for publication, please detail reasons for the record.

Ms. Maston moved that

**9.** The following motions be considered as a consent motion:

- Standards Committee recommends that BSR/ASHRAE Addendum *x (relocates exhaust requirements)* to ANSI/ASHRAE Standard 62.1-2022 *Ventilation and Acceptable Indoor Air Quality*, be approved for publication.

- Standards Committee recommends that BSR/ASHRAE Addendum *i (establishes minimum requirements for ozone emissions of air-cleaning systems)* to ANSI/ASHRAE Standard 62.2-2022, *Ventilation and Acceptable Indoor Air Quality in Residential Buildings*, be approved for publication.

- Standards Committee recommends that BSR/ASHRAE Addendum *J (prohibits the installation of unvented combustion space heaters within dwelling units)* to ANSI/ASHRAE Standard 62.2-2022, *Ventilation and Acceptable Indoor Air Quality in Residential Buildings*, be approved for publication.

- Standards Committee recommends that BSR/ASHRAE Addendum *m (minimum efficiency of certain filters)* to ANSI/ASHRAE Standard 62.2-2022, *Ventilation and Acceptable Indoor Air Quality in Residential Buildings*, be approved for publication.

- Standards Committee recommends that BSR/ANSI/ASHRAE Addendum *h (ELC revisions)* to ANSI/ASHRAE Standard 90.4-2019, *Energy Standard for Data Centers*, be approved for publication.

- Standards Committee recommends that BSR/ANSI/ASHRAE/ICC/USGBC/IES Addendum *k (Emergency Ventilation Rates)* to ANSI/ASHRAE/ICC/USGBC/IES Standard 189.1-2020, *Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings*, be approved for publication.

- Standards Committee recommends that BSR/ANSI/ASHRAE/ICC/USGBC/IES Addendum *m (Emissions and SECFs Update)* to ANSI/ASHRAE/ICC/USGBC/IES Standard 189.1-2020, *Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings*, be approved for publication.

- Standards Committee recommends that BSR/ANSI/ASHRAE/ICC/USGBC/IES Addendum *y (Prohibition of Smoking and Vaping)* to ANSI/ASHRAE/ICC/USGBC/IES Standard 189.1-2020, *Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings*, be approved for publication.

There was no discussion.

**MOTION 9 PASSED** (28:0:1, CNV).

Ms. Maston moved that

**10.** Standards Committee recommends that BSR/ASHRAE Standard 230P, *Commissioning Process for Existing Buildings and Systems*, be approved for publication.

**MOTION 10 PASSED** (27:0:2, CNV). Mr. Conlan and Ms. Maston abstained.

Ms. Maston moved that

**11.** The following motions be considered as a consent motion:

- Technology Council recommends that proposed changes to the Procedures for ASHRAE Standards Actions (PASA) within Section 4. Approval Of Proposed Standards, Section 5. Relationships with other Standards-Developing Organizations, Section 7. Criteria for Approval, Withdrawal, and Discontinuance of ASHRAE Standards and Guidelines, Annex A1: Definitions, Annex B: Appeals of Board of Directors' Standards Actions or Inactions, and Annex C: Complaints of Actions or Inactions by the StdC, its Subcommittees or PCs, be approved as shown in ATTACHMENT D.

- Tech Council recommends that proposed changes to the Rules of the Board Section 2.425.001 *Scope and Purpose*, and Section 2.425.003 *Operation*, be approved as shown in ATTACHMENT E.

Ms. Maston reported that the redline changes to the ROB are proposed in an effort to streamline processes. At the Toronto meeting the motion was tabled to allow members time to review changes. She reported that the proposed change was also shared as an information item with Tech Council and the BOD.

No additional changes have been made to the proposed edits since June.

She reported that, if approved, the proposed changes to PASA would move forward for public review with ANSI. That process could take six months to a year, depending on the comments received.

Ms. Thomle commended and thanked Ms. Hanson and the Standards Committee for their work on this. She stated that the edits were a lot of work and a streamlining effort.

**MOTION 11 PASSED** (27:0:0, CNV).

Ms. Hanson stated that staff did a lot of work on the proposed edits. She stated that she did not abstain from the vote because she had not voted on this item at any other level and therefore felt it was appropriate to vote.

Mr. Mehboob stated that tremendous work went into the proposed edits and that they speak to the Society's streamlining.

Mr. Littleton reported that in addition to removing the BOD from the Standards approval process for addenda, the change also eliminates the requirement for a super majority when voting for Standards addenda. He expressed that not requiring a super majority would allow Standards addenda approval to happen even faster.

Ms. Maston moved that

**12.** Technology Council recommends that the Board of Directors approve the revised *Infectious Aerosols* position document (PD) as shown in Attachment F**.**

Ms. Maston reported that this PD is a revision to the current ASHRAE position document on Infectious Aerosols published April 14, 2020. This version was sent to the BOD on September 9th. An earlier version (version 5) of this PD was sent to BOD members on May 21, 2022, with a request for review and comments. The May 21, 2022 version was also sent to the BOD on September 9th for comparison. Comments were collected, sent to the PD committee and considered and/or addressed by the PD committee in the latest draft. There is not a track changes version comparing V9 to V5 as the format was drastically changed to conform with the new PD format approved by the Document Review Subcommittee (DRSC) and Tech Council in Toronto. The DRSC vote was 6-0-1, CNV. The PD Committee unanimously approved the document. If approved by the BOD, ASHRAE editing staff will work with the PD Chair and make any editorial changes deemed necessary prior to publishing the website.

**MOTION 12 PASSED** (Unanimous Voice Vote, CNV).

It was asked if an MTG had been established for the Infectious Aerosols PD.

Mr. Conlan responded that Mr. Hermans started an MTG with the intent of taking research projects from the ETF. He stated that he believes this is the MTG being asked about but he can get confirmation.

Mr. Khankari stated that there was effort taken by the committee to weigh the importance of different measures and their effectiveness. He stated that the committee was small enough to reach some conclusions. He reported that the committee strongly recommends that this be taken as the MTG and come up with recommendations.

Ms. Maston reviewed the council's information items.

**COMMITTEE REPORTS**

**DEVELOPMENT COMMITTEE**

Mr. Austin reported that he would be presenting as ExO on behalf of the chair. There were no motions for the BOD's consideration. Mr. Austin reviewed the committee's information items.

Mr. Austin reported that when seeking support from private foundations it is critical to show that 100% of the BOD provides monetary support of ASHRAE's mission. In the coming weeks, members of the Development Committee will be reaching out to BOD members individually. Please, when you hear from the Committee, please help them do their job and assist the Society in securing funding.

**AUDIT COMMITTEE**

Ms. Jensen reported that the Audit Committee has not met yet because the fall meeting centers around the audit, which is not complete. The committee will have a report to the BOD at the Winter Meeting in Atlanta.

**ASHRAE BRAND RECOGNITION**

Mr. Mehboob reported that Mr. Kishor and his group have been working on brand recognition. He expressed appreciation to the Marketing department and stated that they are doing a great job; this group is not meant to overstep.

Mr. Khankari thanked Mr. Mehboob for recognizing the strategic importance of this topic. He thanked previous subcommittee members for their work. He reported that staff are now members of the subcommittee. He stated that the subcommittee's charge is steep and that they will get their work going soon. BOD members were invited to attend the group's meetings.

Ms. Scoggins expressed that there was a need for a public awareness campaign as people do not equate buildings and building emissions with climate change. She suggested that this could be a possible fundraising opportunity.

Mr. Mehboob expressed agreement with Ms. Scoggins and asked that the subcommittee make a public awareness campaign a part of their work. He thanked Ms. Scoggins for her suggestion.

**TASK GROUP REPORTS**

**ASHRAE AT INTERNATIONAL CONFERENCES TASK GROUP**

Mr. Sepulveda reported. The full report was attached to the agenda. He reported that 20% of Society's members are outside of North America. He stated that the global summit at the RAL CRC is an excellent reminder that things also happen outside of North America.

He stated that it is important to demonstrate that Society operates globally. He suggested that what is done each year should be considered, and those future events be coordinated with the CRCs.

The floor was opened for discussion. A summary of that discussion is below:

*Cheng - Reported that Region XIII holds a conference every two years. Therefore, the Society does have a conference outside of North America every two years.*

*Leung - That there are financial and growth benefits to international conferences. Should be done every year. If we want to truly serve the world, cannot stay home, have to go out.*

*Rakheja – RAL has already demonstrated a cost neutral model to Society. Should encourage similar meetings at least once a year.*

*RAL received a tremendous response from potential sponsors and companies. The room was full of attendees. Suggested that a good cost model can be worked out.*

*Mehboob – This event was not cost neutral. He reported that there is $50,000-60,000 for consideration.*

*Scoggins – Getting a lot of comments for next year. What is your recommendation?*

*Sepulveda – Our recommendation is that a conference be held every year, possibly with rolling themes. Every year there should be a big event outside of North America every year.*

*Leung – Developers have deep pockets; supplest we focus on health and decarbonization and invite developers to be sponsors.*

*Constantinide – Region XII will have CRCs in Barbados, Brazil, and Ecuador in the coming three years. From a cost standpoint, this is a cost to Society, but it should be looked at as more of an investment.*

*If we reach out to other countries this is where we can look at standards implementation in other countries. Having a presence, especially a conference, speaks volumes from a government outreach standpoint.*

Mr. Mehboob summarized that one questions is frequency. Are we in favor of doing something annually? Feel we have consensus that something should be done every year.

Second question, what type of event, financials, and who would organize?

Ms. Scoggins stated that her plan is to place President Mehboob in charge of defining this event for the next Society year.

Mr. Mehboob stated that he would be more than happy to do whatever is needed to make Ms. Scoggins a success.

Ms. Abrams requested that Tony Giometti be included when these discussions are happening.

Mr. Knight reported that, to Ms. Abrams' point, Mr. Giometti has already been engaged along with CIBSE to start thinking about some type of building performance analysis conference. He suggested that this specialty conference could be done with other events around it. He reported that there are no details yet and discussions are in the very early stages.

Mr. Mehboob thanked Mr. Sepulveda and his team for all the work done. He expressed that Mr. Sepulveda won his point and congratulated him and the team.

**CHAMPIONS CLUB**

Mr. Wentz reported. He stated that this group is one of President Mehboob's vision. The full report was attached to the agenda.

He reported that there are six pillars of President Mehboob's vision. Presidential initiatives were color coded to reflect which of the six pillars they supported, along with a list identifying the champion of that item. Items highlighted in yellow are complete, blue items (with the exception of one) will be completed this Society year. This is the process that the group is using to identify and monitor the initiatives that support the Society theme. He then reviewed the initiatives and progress.

The group meets quarterly and has met once thus far.

Mr. Wentz reported that the HVAC summit was a new and strategic approach and was designed to be a strategic event. The summit was by invitation only and a great deal of time was spent identifying who was going to be invited. Thought diversity was important and invitees were selected by geographical location, what segment of the industry they were in, and their leadership.

He reported that the goal of the summit was to have a deliverable packet that will be delivered by the end of the year. This conference was a call to action and he expressed that the BOD will be impressed with the call to action deliverables.

The group will not be providing the BOD with recommendations. Instead, the group will report the voice of the customer.

Mr. Mehboob thanked Mr. Wentz and his team and stated that he was grateful for his service.

Mr. Wentz advised that members of the BOD would be receiving an evaluation of the summit. He strongly encouraged all BOD members to complete the evaluation.
He reported that the summit was not perfect in facilitating strategic conversations and weaknesses in the approach have been identified. A committee to improve the summit is prepared to make necessary changes if the BOD decides to host another summit.

**NEW BUSINESS**

**SOCIETY AND NET ZERO OPERATIONAL CARBON**

Mr. Leung proposed that Society investigate what it would cost, using Ms. Scoggins' leadership report on scope one, two, and three emissions, for Society to get to net zero operational carbon for the first time in history.

Ms. Scoggins reported that Society has evaluated proposals and contracted with SCS Global. The organization will provide guidance and suggestions on scope one, two, and three emissions and provide information on how to reduce those emissions.

She stated that Society would be the first organization that we are aware of, working toward zero emissions as an organization.

Ms. Scoggins and her group will have their first meeting with SCS Global in a few weeks. The goal is to have a report to the BOD in the next few months.

Mr. Khankari led the BOD in thanking Mr. Mehboob for his leadership in regard to this meeting. Thanks were bestowed on RAL for wonderful accommodations and organization of the event. The full BOD applauded as a show of their appreciation and thanks.

**EXECUTIVE SESSION**

Executive session was called at 12:16 pm.

Open session reconvened at 12:28 pm.

**INFORMATION ITEMS**

**PUBLICATION ANALYSIS SHEETS**

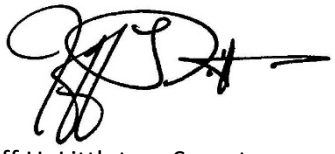
Mr. Littleton reported that the analysis sheets attached to the agenda are the BOD's opportunity to have an advance look at addenda that will come before the body. The analysis sheets attached to the agenda were reviewed by the BOD for approval at this meeting during the Technology Council report. There is no need for additional review or discussion at this time.

**UPCOMING MEETINGS**

Mr. Mehboob reviewed the time and date for the December BOD Election as well as the BOD meetings at the 2023 Winter Conference in Atlanta.

**ADJOURNMENT**

The meeting adjourned at 12:30 pm.



Jeff H. Littleton, Secretary

**ATTACHMENTS:**

A. UAE Ministry of Energy MOU
B. Toronto Scholarship Agreement
C. TFBD ExCom Report
D. PASA Section 4 Proposed Edits
E. ROB 2.425.003 Proposed Edits
F. Infectious Aerosols Position Document

UNITED ARAB EMIRATES
MINISTRY OF ENERGY & INFRASTRUCTURE

الإمارات العربية المتحدة
وزارة الطاقة والبنية التحتية

# MEMORANDUM OF UNDERSTANDING

مذكرة تفاهم

between

بين

Ministry of Energy and Infrastructure

وزارة الطاقة والبنية التحتية،

and

و

The American Society of Heating, Refrigerating and Air-Conditioning Engineers

الجمعية الأمريكية لمهندسي التدفئة والتبريد وتكييف الهواء

Dated\ بتاريخ: ----------

United Arab Emirate

الإمارات العربية المتحدة

# MEMORANDUM OF UNDERSTANDING

# مذكرة تفاهم

It is on this day……/…/…/2022, agreed by and between:

إنه في يوم ..... الموافق .... /...../2022، تم الاتفاق بين كل من:

(1) The Ministry of Energy and Infrastructure, represented herein by H.E……, in his capacity as……, having its address in the UAE, located in……Emirate, PO. Box….., Telephone……, Fax…….. (hereinafter referred to as First Party)

(1) وزارة الطاقة والبنية التحتية، يُمثلها في التوقيع على هذه المذكرة: سعادة : .....، بصفته.....، وعنوانها: بدولة الإمارات العربية المتحدة، ومقرها إمارة ....، ص. ب: هاتف (.....)، فاكس (.....)
(ويُشار إليها فيما بعد "**الطرف الاول**").

(2) The American Society of Heating, Refrigerating and Air-Conditioning Engineers, represented herein by H.E……, in his capacity as……, having its address in the UAE, located in……Emirate, PO. Box….., Telephone……, Fax…….. (hereinafter referred to as Second Party)

(2) الجمعية الأمريكية لمهندسي التدفئة والتبريد وتكييف الهواء ويُمثلها في التوقيع على هذه المذكرة: سعادة (.....) بصفته (.....)، وعنوانها: بدولة الإمارات العربية المتحدة، ومقرها إمارة ....، ص.ب: هاتف (.....)، فاكس (.....) (ويُشار إليها فيما بعد "**الطرف الثاني**").

(Each hereinafter referred to individually as a Party ('Party") and collectively as the Parties)

(ويُشار إلى كل منهم منفرداً بلفظ "الطرف" وإليها مجتمعين بلفظ "الطرفين / الطرفان")

## Preamble

## التمهيد

Proceeding from the Leadership vision and the strategic directions of the UAE, the keenness of the Parties to establish the joint strategic cooperation between them, benefiting from the services provided by them, in a way that ensures achievement of institutional integration between the parties.

انطلاقاً من رؤية القيادة والتوجهات الإستراتيجية للدولة وحرص الطرفين على إرساء أسس التعاون الإستراتيجي المشترك بينهما والاستفادة من الخدمات المقدمة من الطرفين بما يضمن تحقيق التكامل المؤسسي بين الطرفين.

Whereas, the importance of the present Memorandum lies in developing and strengthening cooperation relationships between the Parties, which contributes to organizing, coordinating, the procedures and legal systems in force between the Parties, in pursuance to an institutional framework that consistent with each party's obligations and competencies;

وحيث تكمن أهمية المذكرة الماثلة في تطوير وتعزيز علاقات التعاون بين الطرفين مما يسهم في التنظيم والتنسيق والإجراءات والأنظمة القانونية المعمول بها بين الطرفين وفق إطارٍ مؤسسي يتوافق مع التزامات واختصاصات كل طرف.

Whereas, the First Party (MOEI) is a federal entity incorporated by virtue of Decretal Federal Law No. (16) of 2020 Amending Certain Provisions of Federal Law No. (1) of 1972 On the Powers of the Ministries and Competencies of the Ministers, as amended, which could be referred to hereinafter as (First Party);

As the Second Party, The American Society of Heating, Refrigerating and Air-Conditioning Engineers, is the competent authority for standards, guidelines, and scientific research to arrive at knowledge society with global competitiveness that satisfies the future requirements of the labor market by ensuring the quality of outcomes and providing distinguished services to internal and external customers, hereinafter be referred to as the "Second Party".

In accordance with the strategic visions of both parties and the strengthening of collaboration and coordination between the Ministry of Energy and Infrastructure and The American Society of Heating, Refrigerating and Air-Conditioning Engineers, the two parties agreed to conclude this Memorandum and develop an official framework between them according to the following terms:

1. **Objective**

This Memorandum aims at strengthening cooperation between the two parties and achieving successful strategic partnership through developing the main common frameworks and coordination with the Stakeholders to find current and future ways of cooperation in various fields, to benefit from the accumulated mutual experiences of both parties and exchange studies and research aimed at improving the institutional work, in order to establish partnership between the Parties to attain common strategic objectives, developing

حيث ان الطرف الأول وزارة الطاقة والبنية التحتية اتحادية أنشأت بموجب المرسوم بالقانون الاتحادي رقم (16) لسنة 2020 بشأن تعديل بعض احكام القانون الاتحادي رقم (1) لسنة 1972 بشأن اختصاصات الوزارات وصلاحيات الوزراء وتعديلاته ويمكن أن يشار له فيما بعد ب " **الطرف الأول** "

ولكون الطرف الثاني الجمعية الأمريكية لمهندسي التدفئة والتبريد وتكييف الهواء هي الجهة المختصة بالمواصفات والأدلة الاسترشادية والبحث العلمي وصولاً لمجتمع معرفي ذي تنافسية عالمية ويلبي احتياجات سوق العمل المستقبلية وذلك من خلال ضمان جودة المخرجات وتقديم خدمات متميزة للمتعاملين الداخليين والخارجيين. ويمكن أن يشار له فيما بعد ب " الطرف الثاني "

ووفقاً للخطط الإستراتيجية لكلا الطرفين وتعزيز أواصر التعاون والتنسيق بين وزارة الطاقة والبنية التحتية الجمعية الأمريكية لمهندسي التدفئة والتبريد وتكييف الهواء فقد اتفق الطرفان على إبرام هذه المذكرة ووضع إطار عمل رسمية بينهما طبقاً للمواد التالية:

1. **الهدف:**

**تهدف هذه المذكرة إلى تعزيز أواصر التعاون بين الطرفين وتحقيق الشراكة الاستراتيجية المثمرة من خلال وضع أطر العمل الرئيسية المشتركة والتنسيق مع الجهات المختصة لإيجاد سبل التعاون الحالية والمستقبلية في مختلف المجالات، والاستفادة من الخبرات التراكمية المتبادلة لدى كل من الطرفين وتبادل الدراسات والبحوث الرامية إلى تجويد العمل المؤسسي لبناء علاقة شراكة بين الطرفين لتحقيق الأهداف الاستراتيجية المشتركة، وتطوير الخدمات الفنية للمشاريع، وتنسيق مجالات العمل المشترك، بغية تحسين أداء العمليات وتبسيط الإجراءات**

technical services for the projects, coordinating areas of joint work, in order to enhance the performance of operations, simplify the procedures, collaboration between the Parties within the framework of joint functional and practical cooperation to develop technical and administrative capacities of both Parties' Employees.

**2. Areas of Cooperation:**

First Party's Commitments:

1. To coordinate and collaborate to pave the way to benefiting from the Ministry's practical experience in planning, designing, executing, managing and maintenance of infrastructure projects within the UAE, which have been carried out by it. Regulating and developing the Energy, Water and Mining Sector, regulating and developing the Land, Maritime Transportation and Railway Sector in the UAE, through coordination with the Second Party in the fields related to educational awareness, Artificial Intelligence and regulatory policy making.
2. Provide the Second Party with any analytical studies in infrastructure projects, energy, water, mining, and transportation and making the same available within the legal framework of property rights and the exchange of information.
3. Collaborate and coordinate in order to provide the Second Party the opportunity to participate in technical competitions and awards offered by the Ministry.

**Second Party's Commitments:**

1. Collaborate with the First Party in exchange of experiences in the fields of

**والتنسيق بين الطرفين في إطار التعاون الوظيفي والعملي المشترك لتنمية القدرات الفنية والإدارية لموظفي الطرفين.**

**2- مجالات التعاون:**

أولاً: أوجه التعاون من قبل الطرف الأول

1. التنسيق والتعاون لإتاحة الاستفادة من خبرات الوزارة العملية في تخطيط وتصميم وتنفيذ وإدارة وصيانة مشاريع البنية التحتية بالدولة والمنفذة من قبلها، تنظيم وتنمية قطاع الطاقة والمياه والتعدين، تنظيم و تطوير قطاع شؤون النقل البري والبحري و السكك الحديدية في الدولة وذلك من خلال التنسيق مع الطرف الثاني في المجالات المتعلقة بالتوعية التعليمية والذكاء الاصطناعي وصنع السياسات التنظيمية.
2. التنسيق والتعاون لتزويد الطرف الثاني بأية دراسات تحليلية في مشاريع البنية التحتية، الطاقة، المياه، التعدين والنقل وجعلها متاحة ضمن الإطار القانوني لحقوق الملكية وتبادل المعلومات.
3. التنسيق والتعاون للإتاحة الطرف الثاني للمشاركة في المسابقات والجوائز الفنية التي تطرحها الوزارة .

**ثانيا: أوجه التعاون من قبل الطرف الثاني**

Infrastructure, Energy, Water, Mining and Transportation.

2. Joint collaboration and coordination in preparation of standard specifications and national codes and guidlines related to construction in infrastructure projects, Energy, Water, Mining and Transportation.
3. Developing of training programs, professional and scientific development, workshops and conferences related to the Ministry's fields of work.
4. Cooperation in conducting joint technical studies and research that serve the fields of infrastructure, energy, water, mining, and transportation.

1. التنسيق مع الطرف الأول في تبادل الخبرات في مجالات البنية التحتية، الطاقة، المياه،التعدين و النقل.

2. التنسيق والتعاون المشترك في اعداد المواصفات القياسية والأدلة الاسترشادية والكودات الوطنية الخاصة بالإنشاءات بمشاريع البنية التحتية، الطاقة، المياه، التعدين والنقل.
3. تنظيم برامج التدريب والتطوير المهني والعلمي وورش العمل والمؤتمرات المتعلقة بمجالات عمل الوزارة.
4. التعاون في إعداد دراسات و بحوث فنية مشتركة تخدم مجالات البنية التحتية، الطاقة، المياه ، التعدين والنقل

**3. Communication and Exchange of Information**

3.1The parties shall, regularly, agree on exchange of information and understanding in matters of common interest, which in their opinion are likely lead to their mutual collaboration.

**3- الاتصال وتبادل المعلومات:**

3.1 يتفق الأطراف وبشكل دوري على تبادل المعلومات والتفاهم في الامور ذات الاهتمام المشترك، والتي بنظرهم قد تؤدي للتعاون المشترك.

**4. Implementation Arrangements**

4.1 When the Parties are desirous to engage in more specific cooperation (such as projects and private events), under the framework of this Memorandum, they shall sign off another Memorandum of Cooperation or an addendum to this Memorandum that covers the Parties' responsibilities and areas of cooperation, where such a memorandum shall be separate for a specific project to be carried out and executed based on this Memorandum, which shall include a clause that refers to this Memorandum, where the programs and projects resulted hereof.

**4- الإجراءات التنفيذية**

4.1 عندما يود الأطراف الدخول في تعاون أكثر تحديداً (كالمشاريع والفعاليات الخاصة) تحت مظلة مذكرة التفاهم هذه، يوقع الأطراف مذكرة تعاون أخرى أو ملحق لهذه المذكرة، يغطي مسؤوليات الأطراف وأوجه التعاون. على كل مذكرة منفصلة لمشروع محدد أن يتم وينفذ بناء على مذكرة التفاهم هذه. وعليه أن يشمل بنداً يشير إلى مذكرة التفاهم هذه، والتي تنطبق عليها وعلى البرامج والمشاريع الناتجة عنها.

4.2 ,This MOU, per se, shall not impose any financial obligations on either party.

4.2 في حد ذاتها، لا تفرض مذكرة التفاهم هذه أية التزامات مالية لأي من الأطراف.

**5. Trademark and Communications**

**5- العلامة التجارية والاتصال**

5.1 Neither Party shall use the name, logo or trademarks of the other party or any abbreviation thereof, in connection with its business without obtaining prior written approval of the other Party in each case.

5.1 لا يجوز لأي طرف استخدام اسم أو شعار أو العلامات التجارية للطرف الآخر أو اختصاراتها في أعماله بدون موافقة خطية مسبقة من الطرف الآخر في كل مرة يتم فيها الاستخدام.

5.2 Each party acknowledge that it is familiar with principles and objectives of the other party and recognizes that its name and logo shall not be used in a manner inconsistent with the brand guidelines.

5.2 يقر كل طرف بأنه على دراية بالمثل والأهداف للطرف الآخر، وأنه لن يستخدم اسم وشعار الطرف الآخر بطريقة لا تتفق مع الدليل الخاص باستخدامه.

5.3 Parties agree to approve and endorse this partnership, as required. Each Party shall inform the other party and share with it all publications and promotional materials prior their use and display, to obtain a written approval from the other party before initiating printing, publication or general distribution.

5.3 تتفق الأطراف على الموافقة واعتماد هذه الشراكة، حسب الاقتضاء وعلى كل طرف إبلاغ الطرف الآخر ومشاركته بكل المنشورات والمواد الترويجية قبل استخدامها والعرض العام لها، والحصول على موافقة خطية من كل طرف قبل الشروع بالطباعة أو النشر أو التوزيع العام.

5.4 Any external communication with the media regarding the partnership from either party shall be agreed upon in writing.

5.4 يتم الاتفاق كتابياً على أي اتصال مع وسائل الإعلام حول الشراكة من قبل أي من الأطراف.

5.5 Neither party shall speak nor make public statements on behalf of the other party, nor claim to represent it, except in specific cases where express agreement is given in writing.

5.5 لا يجوز لأي طرف التحدث أو التصريح بالنيابة عن الطرف الآخر أو ادعاء تمثيله، إلا في حالات محدودة يتم الاتفاق عليها خطياً بشكل مسبق.

**6. Legal Compliance**

**6- الامتثال القانوني:**

Each party shall cooperate in the activities envisaged under this MOU in accordance with their own internal regulations, rules, and by-laws. Specific activities determined under this MOU that

سوف يتعاون كل طرف مع الأنشطة المفروضة بموجب مذكرة التفاهم هذه وفقا للّوائح والقواعد والتعليمات الداخلية الخاصة به. أي أنشطة محددة في هذه المذكرة والتي تتطلب التزامات أو

require financial commitments or liabilities of either party shall be subject to separate written agreements.

مسؤوليات مالية من أي من الأطراف ستخضع لاتفاقات مكتوبة منفصلة.

**7. Duration, Termination and Modification of this memorandum**

7.1 This MOU shall enter into force for two years, on the date of signing off by authorized signatories.

7.2 Either party may terminate this MOU by virtue of written notice to be addressed to the other party one month of its expiry. In the event of termination, the parties shall undertake all measures for quick and organized termination for its activities, as well as termination of such activities instigated within separated arrangements under the MOU, as mutually agreed. Where a party breached the conditions of the MOU, then it may be terminated without prior notice.

7.3This MOU may be amended by mutual consent, provided that one of the parties notifies the other in writing of the proposed amendment.

**7- مدة المذكرة وإلغاؤها وتعديلها**

7.1 يسري مفعول هذه المذكرة لمدة سنتين من تاريخ التوقيع عليها من قبل المفوضين.

7.2 يمكن لأي من الأطراف إنهاء مذكرة التفاهم الماثلة بموجب إشعار خطي يرسله إلى الطرف الآخر قبل شهر من تاريخ الانتهاء. في حال الإنهاء، فإن الأطراف تتخذ جميع الخطوات لتحقيق نهاية سريعة ومنظمة لأنشطتها، وكذلك إنهاء الأنشطة التي بدأت في إطار ترتيبات منفصلة مبرمة تحت مذكرة التفاهم كما هو متفق عليه بين الأطراف. في حال خرق أي من الأطراف شروط مذكرة التفاهم، يجوز إنهاؤها دون سابق إنذار.

7.3 يجوز تعديل هذه المذكرة بموافقة الأطراف، شريطة أن يقوم أحد الأطراف بإخطار الطرف الآخر خطياً عن التعديل المقترح.

**8. Privileges**

Nothing in or relating to this MOU shall be deemed a waiver, expressed, or implied of any of the privileges.

**8- إمتيازات**

لاشيء ضمن أو في ما يتعلق بمذكرة التفاهم الماثلة يعتبر تنازلاً، صريحاً او ضمنياً عن أي من الامتيازات للأطرا. ف

**9. ASSIGNMENT**

Neither Party may assign or otherwise transfer any of its rights or obligations under this MOU, in whole or in part, to a third party, unless agreed in advance by the other Party.

**9-التنازل**

لا يجوز لأي طرف التنازل عما جاء في هذه المذكرة أو تحويلها بشكل جزئي أو كلي إلى الغير دون موافقة خطية مسبقة من الطرف الآخر.

**10. APPLICABLE LAW AND DISPUTES SETTLEMENT**

**10.القانون واجب التطبيق وتسوية النزاعات**

The Parties agreed that in the event of any disagreement or dispute arising out of, or in connection with, the implementation of this MOU, the Arabic languages shall be used to construe its provisions. The Parties shall exert their efforts to arrive at amicable solution, settle the dispute in question, wherein this MOU shall not be considered as legal contract between the Parties.

اتفق الطرفان على أنه في حال وجود أي خلاف أو نزاع ينشأ عن تنفيذ مذكرة التفاهم الماثلة أو بخصوصها، تستخدم اللغة العربية لتفسير أحكامها، ويبذل الطرفان جهودهما للتوصل إلى حلٍ وديٍ وتسوية المسألة محل النزاع حيث لا تعد هذه المذكرة عقد قانوني بين الطرفين

## 11.CONFIDENTIALITY

## 11- السرية

The Parties shall maintain the confidentiality and existent of this MOU, objective, content and all confidential information. Neither Party shall utilize confidential information for their commercial purposes, disclose of any confidential information to third parties without procuring the other party's consent. For the purposes of Article (6), "Confidential Information" shall mean all information, regardless of its nature, wholly or partially related to any project or either party's affairs:

يلتزم الطرفان بالحفاظ على سرية وجودة هذه المذكرة وغرضها ومضمونها وجميع المعلومات السرية، وعليه ألا يستخدم أي معلومات سرية لأغراضه التجارية الخاصة أو الكشف عن أي معلومات سرية لأغراضه التجارية لأي طرف ثالث دون موافقة الطرف الآخر. ولأغراض هذه المادة 6، تعني "المعلومات السرية" جميع المعلومات، مهما كانت طبيعتها، المتعلقة كليًا أو جزئيًا بأي مشروع أو شؤون أي طرف:

- Provided by a party or on its behalf to the other party, whether orally, in writing or otherwise, and whether before or after the date of this MOU.
- Obtained by a party, in writing or orally, through or after discussions with the Management, Staff, Agents or Consultants of other Party.
- Acquired by observation or attendance by a Party at the offices or other premises of the other Party; or

- يتم تقديمها من قبل طرف أو نيابة عنه إلى الطرف الآخر سواء كان ذلك شفويًا أو خطيًا أو غير ذلك، وسواء كان ذلك قبل تاريخ هذه المذكرة أو بعده.
- يتم الحصول عليها من قبل أحد الطرفين خطيًا أو شفويًا، من خلال أو بعد مناقشات مع الإدارة أو الموظفين أو الوكلاء أو المستشارين التابعين للطرف الآخر؛
- يتم اكتسابها عن طريق ملاحظة أو حضور أحد الطرفين في المكاتب أو الأماكن الأخرى الخاصة بالطرف الآخر

Each Party shall take all appropriate procedures to ensure that the confidentiality of the Confidential Information is preserved.

يتعين على كل طرف أن يتخذ جميع الإجراءات المناسبة لضمان الحفاظ على سرية المعلومات السرية.

**Article 6 of this MOU shall not prohibit disclosure or use of any information if and to the extent:**

**لا تحظر المادة 6 من المذكرة الماثلة الكشف عن أو استخدام أي معلومات إذا كانت هذه المعلومات وفي حدود ما يلي:**

- The information is or becomes publicly available (other than by breach of this MOU).

- المعلومات أصبحت متاحة للجمهور (بأي طريقة أخرى لا تُشكل خرقًا لهذه المذكرة).

- The other Party has given prior written approval to the disclosure or use.
- The information is independently developed by a Party after the date of this MOU.
- The disclosure or use is required by applicable Law on which the shares of either party or any of its Subsidiaries is listed.
- The disclosure or use is required for the purpose of any judicial or arbitral proceedings arising out of this MOU or any documents to be entered pursuant to it.
- The disclosure of information to any competent tax authority to the extent such disclosure is reasonably required for the purposes of the tax affairs of the Party concerned or any of its Affiliates.
- The disclosure of information by a Party to its Affiliates, and its respective directors, officers, employees, agents and advisers on a need-to-know basis and on terms that such parties undertake to comply with the provisions of this Clause 6 as if they were a party to this MOU.

Except as required by applicable law, each Party agrees that it will not issue or release for external publication any article or advertising or publicity matter relating to this MOU or the Projects without the prior written consent of the other Party, which consent shall not be unreasonably withheld or delayed.

The Parties acknowledge and agree that damages would not be an adequate remedy for any breach of this Article No. 6 and the remedies of injunction, specific performance and other equitable relief are appropriate for any threatened or actual breach of any such provision and no proof of special damages shall be necessary for the enforcement of the rights under this Article 6.

- أعطى الطرف الآخر موافقة خطية مسبقة للكشف عنها أو استخدامها.
- تم تطوير المعلومات بشكل مستقل من قبل الطرف بعد تاريخ هذه المذكرة .
- إن كان الإفصاح أو الاستخدام مطلوبا بموجب القانون المعمول به الذي يتم سرد أسهم أي من الطرفين أو أي من الشركات التابعة لها بموجبه.
- إن كان الإفصاح أو الاستخدام مطلوبا لغرض أي إجراءات قضائية أو تحكيمية ناشئة عن هذه المذكرة أو أي وثائق يتم إدخالها بموجبها.
- إن كان الإفصاح عن المعلومات مطلوبا لأي سلطة ضريبية مختصة بالقدر الذي يكون فيه هذا الإفصاح مطلوبًا بشكل معقول لأغراض الشؤون الضريبية للطرف المعني أو أي من الشركات التابعة له.
- إن كان الإفصاح عن المعلومات من قبل أحد الطرفين إلى الشركات التابعة له ومديريه وموظفيه وعماله ووكلائه والمستشارين التابعين لها بشأن الحاجة إلى معرفة الأساس وبالشروط التي تتعهد بها تلك الأطراف بالامتثال لأحكام هذه المادة 6، كما لو كانت طرف في هذه المذكرة

باستثناء ما يقتضيه القانون النافذ، يوافق كل طرف على أنه لن يصدر أو يقدم للنشر الخارجي أي مقال أو إعلان أو مسألة إشهار متعلقة بهذه المذكرة أو المشروعات بدون موافقة خطية مسبقة من الطرف الآخر، والتي لا يجوز حجبها أو تأخيرها بشكل غير معقول.

يقر الطرفان ويوافقان على أن التعويضات لن تكون سبيل انتصاف مناسب لأي خرق لهذه المادة رقم 6، كما الأوامر التحذيرية، والأداء المحدد وغير ذلك من سبل الإنصاف العادل ملائمة لأي خرق مهدد أو فعلي لأي حكم من هذا القبيل، ولا يكون أي دليل على وجود أضرار خاصة ضروريًا لإنفاذ الحقوق بموجب هذه المادة 6.

**The Parties agree that they shall enter into an applicable Confidentiality MOU in respect of each Project at the appropriate time.**

**يو افق الطرفان على ضرورة الدخول في مذكرة سرية سارية فيما يعلق بكل مشروع في الوقت المناسب.**

## 13-General

## 13-أحكام عامة

1. Each Party shall bear its own costs and expenses (including due taxes) incurred in connection with the execution of this MOU unless otherwise agreed by the Parties. In case of any costs, expenses or fees resulting from execution of this MOU, they should be paid in accordance with the Action Plan and Schedule for execution of such works, which is mutually illustrated in the Addendum herewith.

1-يتحمل كل طرف التكاليف والنفقات الخاصة به (بما في ذلك الضرائب المستحقة) والناشئة عن تنفيذ هذه المذكرة ما لم يتفق الطرفان على غير ذلك وفى حال وجود أي تكاليف أو مصاريف أو رسوم تنتج عن تنفيذ هذه المذكرة فيتم سدادها وفقاً لخطة العمل والبرنامج الزمني لإنجاز تلك الأعمال والموضح اتفاقاً بمحلق هذه المذكرة.

2. References to Preamble and Articles are be references to Preamble, Articles or Sub-Articles of this MOU.

2-الإشارات إلى التمهيد والمواد هي إشارات إلى التمهيد أو المواد أو المواد الفرعية الواردة في هذه المذكرة

3. This MOU creates partnership, assignment or engagement; yet, it does not authorize any party to act as an agent, service provider or an employee of other party.

3-تُنشئ هذه المذكرة علاقة شراكة أو ارتباط أو تكليف ولا أن تُفوّض أي من الطرفين بالعمل كوكيل أو مقدم خدمات أو موظف للطرف الآخر.

4. No amendments, changes to this MOU shall be effective unless agreed by the Parties, made in writing and signed by the duly authorized representatives of the Parties.

4_ لن تكون أي تعديلات أو تغييرات على هذه المذكرة سارية المفعول ما لم يتفق الطرفان عليها وتتم كتابتها وتوقيعها من الممثلين المعتمدين للطرفين حسب الأصول.

5. The Parties shall commit and comply with intellectual property laws, in force in the UAE, which includes but not limited to intellectual property rights related to the Name, Trademark, Logos, Application software, Patents and any other intellectual property rights.

5-على الطرفان الالتزام والامتثال لقوانين حقوق الملكية الفكرية المعمول بها داخل دولة الإمارات وهذا يشمل المثال لا الحصر حقوق الملكية الفكرية المتعلقة بالاسم والعلامة التجارية والشعارات والبرامج التطبيقية وبراءات الاختراع وأي حقوق ملكية فكرية أخرى.

6. This MOU may be executed by one or more Parties to any counterparty, each of which shall be deemed an original and all of which

6- يجوز تحرير هذا المذكرة من طرف واحد أو أكثر بأي عدد من النسخ المطابقة، وتُعتبر كل نسخة أصلية وتشكل جميعها معًا المذكرة ذاتها.

together shall constitute one and the same MOU.

7. All notices and other communications required or authorized to be given under this MOU shall be sufficient and effective when the same is in writing and either personally served to an officer of the Party to whom it is given or mailed by registered or certified mail, return receipt requested, postage pre-paid, addressed as follows:

7- تكون جميع الإشعارات والمراسلات الأخرى المطلوبة أو المصرح بها بموجب هذه المذكرة كافية وسارية عندما تكون خطية وترسل إما شخصيًا لأحد مسؤولي الطرف الذي أُعطيت له أو تُرسل عن طريق البريد المسجل أو المعتمد، شريطة تلقي إيصال استلام، والبريد المدفوع مسبقًا، على أن يتم توجيهها إلى العناوين التالية:

---

إشهاداً على ما تقدم، وقع ممثلو وزارة الطاقة و البنية التحتية و الجمعية الأمريكية لمهندسي التدفئة والتبريد وتكييف الهواء

IN WITNESS WHEREOF the representatives of Ministry of Energy and Infrastructure and The American Society of Heating, Refrigerating and Air-Conditioning Engineers do affix their signatures:

| | |
|---|---|
| وكيل وزارة وزارة الطاقة والبنية التحتية<br>Undersecretary of the Ministry of Energy and Infrastructure. | رئيس الجمعية الأمريكية لمهندسي التدفئة والتبريد وتكييف الهواء<br>Chairman of The American Society of Heating, Refrigerating and Air-Conditioning Engineers |
| Name: الاسم | Name: الاسم |
| Signature: التوقيع | Signature: التوقيع |
| Date: التاريخ | Date: التاريخ |

# ENDOWED GIFT AGREEMENT BETWEEN TORONTO CHAPTER OF ASHRAE AND ASHRAE FOUNDATION, INC.

This Agreement is between the **Toronto Chapter of ASHRAE** (Donor) and **ASHRAE Foundation, Inc.** (The Foundation), located in Dekalb County Georgia, on behalf of and for the benefit of the American Society for Heating, Refrigerating & Air Conditioning Engineers (ASHRAE). In accordance with the Foundation's tax-exempt status, the gift will be placed in endowment and used for the stated purpose.

1. **Pledge**

The Donor, in consideration of an abiding interest in ASHRAE and for support of the Society, pledges to ASHRAE Foundation the amount of $60,000 US Dollars (Total Gift) subject to the provisions below to be paid via multi-year installments as follows: The Total Gift will be paid to the ASHRAE Foundation in a period of five years, with the first installment of $12,000 US Dollars to be paid on or by June 30, 2022. Future installments will be paid annually to fulfill this pledge until it is complete according to the following payment schedule:

$12,000 by June 30, 2023;

$12,000 by June 30, 2024;

$12,000 by June 30, 2025;

$12,000 by June 30, 2026;

Donor understands that the first scholarship under this agreement may not be awarded until at least one year following receipt of the Total Gift. In the event that the pledge for the Total Gift is not fulfilled according to the schedule set forth above, then this Agreement may be terminated and the fund balance and any unspent earnings may be transferred to an undesignated fund and used for a purpose as closely related to the original purpose as possible, keeping in mind the original intent of the Donor.

The Foundation will hold the Total Gift together with any other properties that may later be brought within the operation of this Agreement, for the purposes described in this Agreement.

The Foundation and Donor agree that the Donor and others have the right to make additional donations, either by gift or bequest, to be added to the Donor's Total Gift at the Foundation for the purposes outlined by this Agreement. Any such additional donations shall not in any way alter the purposes outlined in Section (2) below.

2. **Purpose**

The Toronto Chapter Scholarship Endowed Fund is to encourage local university and college students to pursue studies that will qualify them for employment in the heating, refrigeration and air conditioning industry.

Applications will only be accepted from students attending a college or university in the Greater Toronto Area which has an active ASHRAE Student Branch or the school is accredited by Engineers Canada, a signatory of the Washington Accord or the Canadian Council of Technicians and Technologists (CCTT), a signatory of the Sydney Accord.

Qualified applicants must be full-time undergraduate mechanical, architectural, sustainability, or building science engineering or engineering technology students enrolled in a program leading to a professional degree or advance diploma in a field of study that has traditionally been a preparatory curriculum for the HVAC&R profession. Applicants must have a class standing of no less than the top 30% and meet at least one of the following criteria.

Applications and all supporting documents must be in English.

If there are no qualified applicants available the scholarship would not be awarded for that year, and the funds will be available the following year to award two scholarships.

The Donor agrees to follow the ASHRAE "Scholarship Program Guidelines" in selection of the scholarship recipient, approved by the ASHRAE Board of Trustees as of June 29, 2011 and revisions to those guidelines as may be made in the future. The Donor should be advised of any proposed changes to these guidelines to allow the chapter to provide their input on proposed changes.

Pursuant to ASHRAE Foundation's spending policy for each fiscal year, as determined by the ASHRAE Foundation Trustees after considering the factors described in the Official Code of Georgia Section 44-15-4(a), 1-7, the applicable earnings portion of the Fund each year shall be used to support a deserving Engineering undergraduate student through the award of a scholarship. This amount is determined upon approval of the Foundation Trustees. As of the date of this agreement, the Foundation's spending policy is 5% of the Donor's Total Gift in American dollars.

3. **Administration**

The Foundation will manage the Fund in accordance with its financial management policies by the Board of the Foundation and use the Total Gift only to support the purpose outlined in Section (2). The ASHRAE Society Scholarship Trustees will select the scholarship recipient annually.

4. **Changed Circumstances**

It may be that at some future time it becomes impossible or impracticable, as decided by the Board of the Foundation, for all or part of the Toronto Chapter Scholarship to be used for the specific purpose set

forth above. The Board of the Foundation shall direct that its principal and income be devoted to purposes that it deems to be most consistent with the wishes and intentions of the Donor.

5. **Recognition**

Donor here agrees that the Total Gift may be noted in future ASHRAE Foundation and ASHRAE Society publications.

In witness whereof, the Donor and the Foundation have executed this Agreement on the dates indicated below.

| | |
|---|---|
| Mr. Abhishek Khurana<br>Toronto Chapter of ASHRAE<br>Chapter President | June 26, 2022<br>Date |
| Mr. Jeff Littleton, Secretary<br>ASHRAE Foundation, Inc. | 07/06/2022<br>Date |
| Mr. Tom Watson, Foundation Chair 2021-22 | 07/06/2022<br>Date |

**Appendix A**

**Certificate of Compliance**

On June 26, 2016 the ASHRAE Foundation and the Toronto Chapter of ASHRAE entered into an agreement governing a scholarship established by the Canadian Chapter. The Chapter transferred an initial gift to the Foundation. The Foundation agreed to invest the Chapter's scholarship funds in the Foundation's endowment for the benefit of the Chapter. The Chapter agreed to notify the Foundation each year of the name or names of the scholarship recipient.

The Chapter hereby certifies that it is in compliance with the ASHRAE Scholarship Program Guidelines in effect as of the date of this certificate. Among these requirements is Section 3.3 requiring a non-discriminatory selection process by the Toronto Chapter. Section 3.3 states, among other things, that the selection criteria are reasonably related to the scholarship purpose and that the scholarship may not be used to benefit an ASHRAE member, to recruit employees or to induce employees to continue their employment. A complete copy of the current Scholarship Program Guidelines are available on request from the Foundation.

Abhishek Khurana

Name
Toronto Chapter of ASHRAE President

June 26, 2022

Date

# Task Force for Building Decarbonization Update

10/7/22

# ASHRAE's position…

***Eliminating GHG emissions from the built environment is essential to address climate change***

# Our goals...

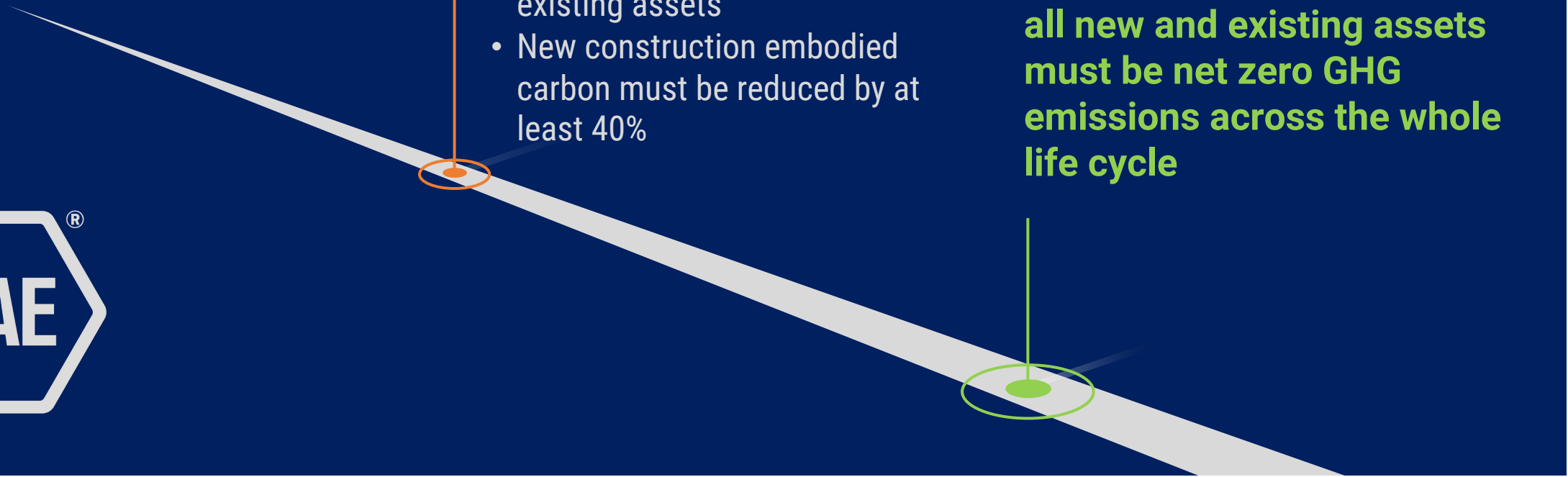
## 2030

**the global built environment must halve its 2015 GHG emissions**

- All new buildings must be NZE
- Widespread EE retrofits of existing assets
- New construction embodied carbon must be reduced by at least 40%

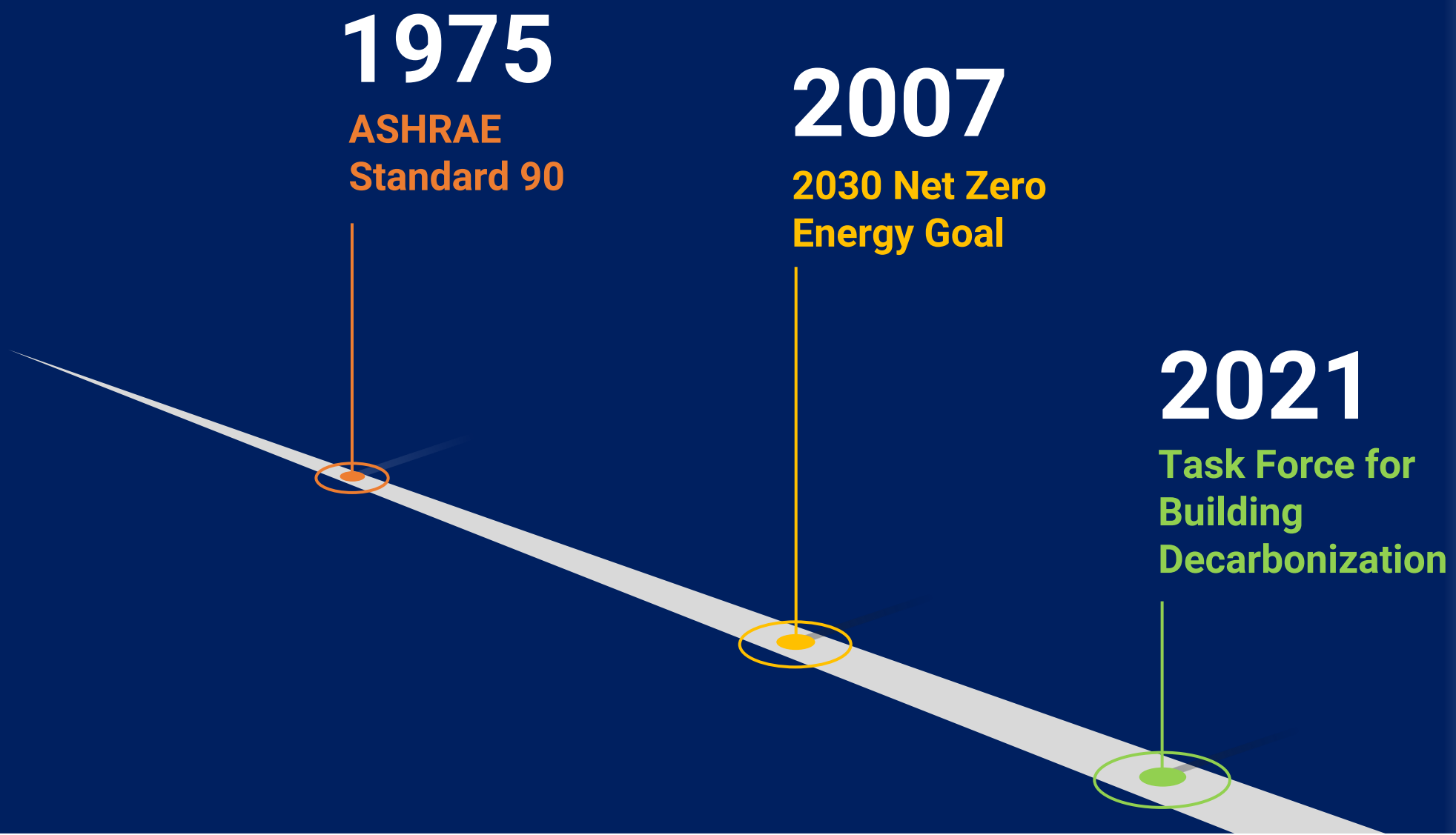
## 2050

**all new and existing assets must be net zero GHG emissions across the whole life cycle**



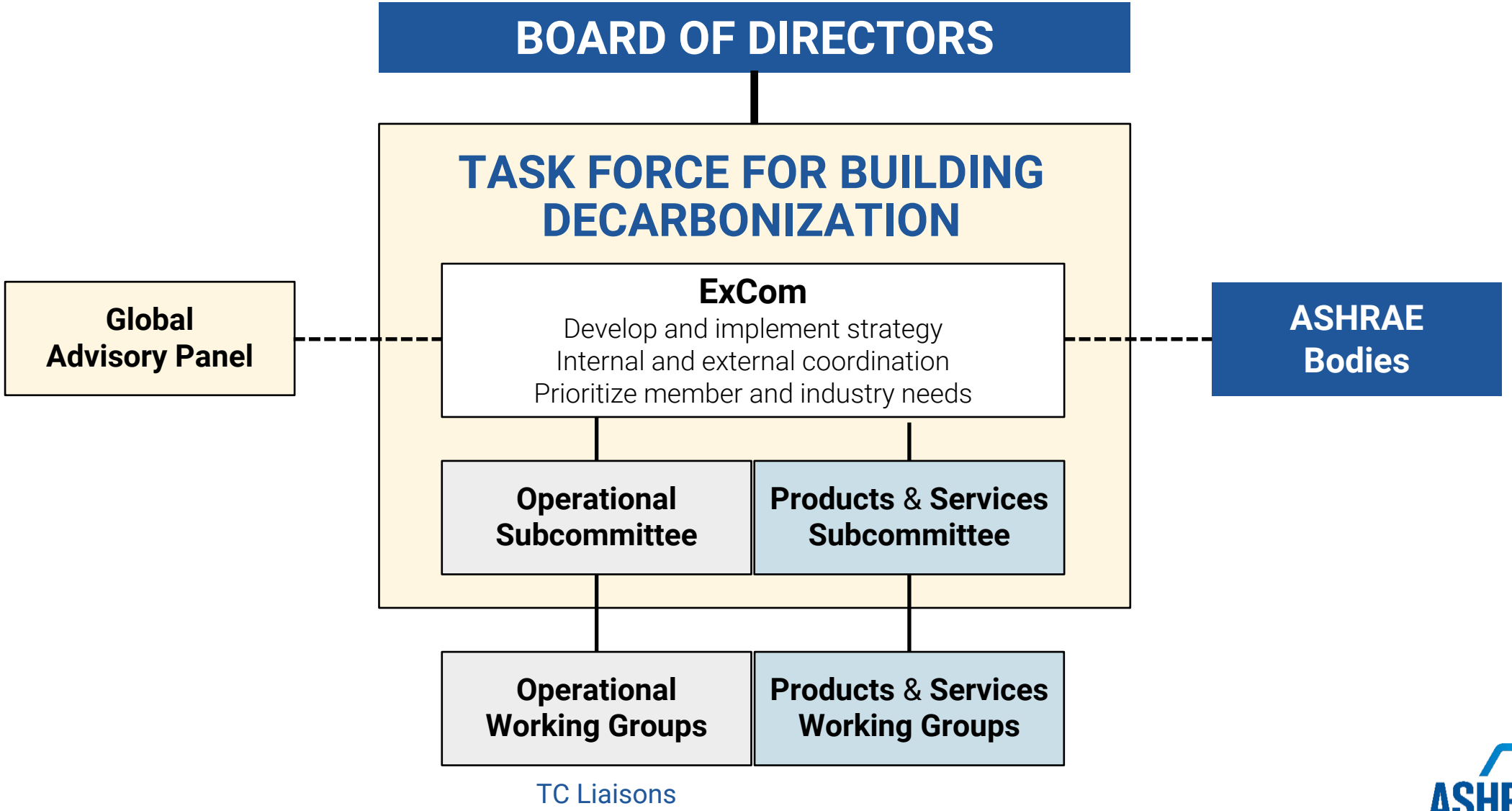
ASHRAE®

# Our energy efficiency history…



# ASHRAE key commitments…

- Develop technical guidance, standards, training, and other tools to support building decarbonization policy goals
- Educate and train the future workforce for building decarbonization
- Promote whole-building life-cycle assessment (WBLCA)
- Strengthen ASHRAE standards every 3-5 years, consistent with achieving a fully decarbonized built environment by 2050


BOARD OF DIRECTORS
TASK FORCE FOR BUILDING DECARBONIZATION
Global Advisory Panel
ExCom
Develop and implement strategy
Internal and external coordination
Prioritize member and industry needs
ASHRAE Bodies
Operational Subcommittee
Products & Services Subcommittee
Operational Working Groups
Products & Services Working Groups
TC Liaisons

# TFBD ExCom

## Operational Subcommittee

- Building Decarbonization Retrofit Guide WG
- Heat Pump Application & Operation Guide WG
- Healthcare Decarbonization Guide WG
- Building Performance Standard Technical Guide WG
- Grid-interactive Buildings for Decarbonization Guide WG
- Building Decarbonization Whole Life Design Guide WG

## Products & Services Subcommittee

- Web Site & Knowledge Hub WG
- Training & Education WG

# TASK FORCE FOR BUILDING DECARBONIZATION

2022-23

ASHRAE®

# TFBD Liaisons

| Number | Title | All WGs | TExCom | P&S SubC | Chair, VC | Retrofit | Heat Pump | Healthcare | BPS | GIB | Whole Life |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **ASHRAE Technical Committees** | | | | | | | | | | |
| 1.04 | Control Theory and Application | X | | | | X | X | | | | |
| 1.05 | Computer Applications | X | | | | | X | | | | |
| 1.06 | Terminology | X | | | | | | | | | X |
| 1.09 | Electric Systems | X | | | | | | | | X | |
| 1.10 | Combined Heat and Power Systems | X | X | | X | | | | | | |
| 2.05 | Global Climate Change | X | | | X | | | | X | X | X |
| 2.08 | Building Environmental Impacts and Sustainability | X | X | X | | X | | | | X | X |
| 2.10 | Resilience and Security | X | | X | X | X | | | | | X |
| 3.01 | Refrigerants and Secondary Coolants | | | | | | Requested | | | | Requested |
| 3.08 | Refrigerant Containment | X | | | | | | | | | X |
| 4.02 | Climatic Information | X | X | X | | | | | | | |
| 4.04 | Building Materials and Building Envelope Performance | X | | | | X | | | | | |
| 4.05 | Fenestration | | | | | Requested | | | | | |
| 4.07 | Energy Calculations | X | | X | X | X | | | | | |
| 6.02 | District Energy | X | X | X | X | | | | | | X |
| 6.07 | Solar and Other Renewable Energies | X | | X | | | | | | | |
| 6.08 | Geothermal Heat Pump and Energy Recovery Applications | X | | | | | X | | | X | |
| 6.09 | Thermal Storage | X | X | | X | | | | | | |
| 6.10 | Fuels and Combustion | X | | | | X | | | | | |
| 7.01 | Integrated Building Design | X | | X | | | | | | | |
| 7.03 | Operation, Maintenance and Cost Management | X | | | | X | | | | | |
| 7.04 | Exergy Analysis for Sustainable Buildings | X | | | | X | | | | | |
| 7.05 | Smart Building Systems (orig. TC 4.11 & TC 7.4) | X | | | | X | X | | | X | |
| 7.06 | Building Energy Performance | X | X | | | X | | | X | X | |
| 7.09 | Building Commissioning | X | | | X | X | | X | X | | |
| 8.11 | Unitary and Room Air Conditioners and Heat Pumps (orig. TC 7.6) | X | | | | | X | | | | |
| 9.06 | Healthcare Facilities | X | | | | | | X | X | | |
| 9.12 | Tall Buildings | X | X | | | | | | | | |
| 10.01 | Industrial Refrigeration and Piping Systems | | | | | | Requested | | | | |
| | **ASHRAE Multidiscplinary Task Groups** | | | | | | | | | | |
| | MTG.BIM Building Information Modeling | X | | X | | | | | | | |
| | MTG.LowGWP Lower Global Warming Potential Alternative Refrigerants | X | | | | | | | | | X |


# Four Key Focus Areas

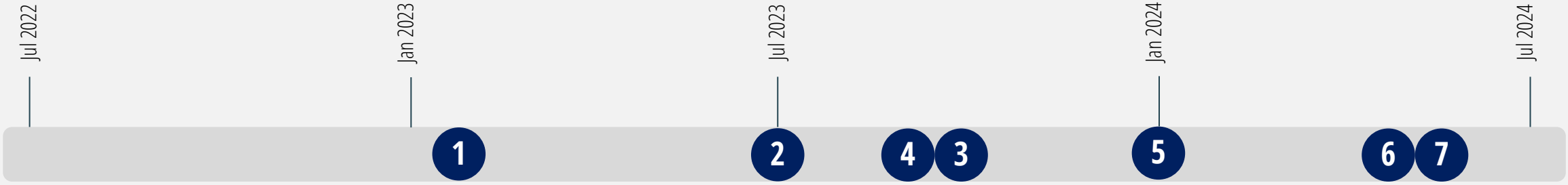

# Technical Resource Guides

- Building Decarbonization Retrofits
- Heat Pump Application and Operation
- Building Performance Standards
- Decarbonization Whole Life Design Guide for MEP Systems
- Hospital Decarbonization Design Guide
- Grid Interactive Buildings for Decarbonization: Design and Operation

# Technical Resource Guide Status

| | Working Group Developed Guides | Summary | Draft WS | Final WS | 60% Draft | 90% Draft | To Pubs | Complete | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | BPS Technical Resource | Complete | NA | NA | Complete | Oct-22 | Nov-22 | Feb-23 | |
| 2 | TM65 for North America | Complete | Oct-22 | Nov-22 | Feb-23 | Apr-23 | May-23 | Jul-23 | Target Jun-23 |
| 3 | Decarb Whole Life Design Guide for MEP Systems | Complete | Oct-22 | Nov-22 | Apr-23 | Jun-23 | Aug-23 | Oct-23 | |

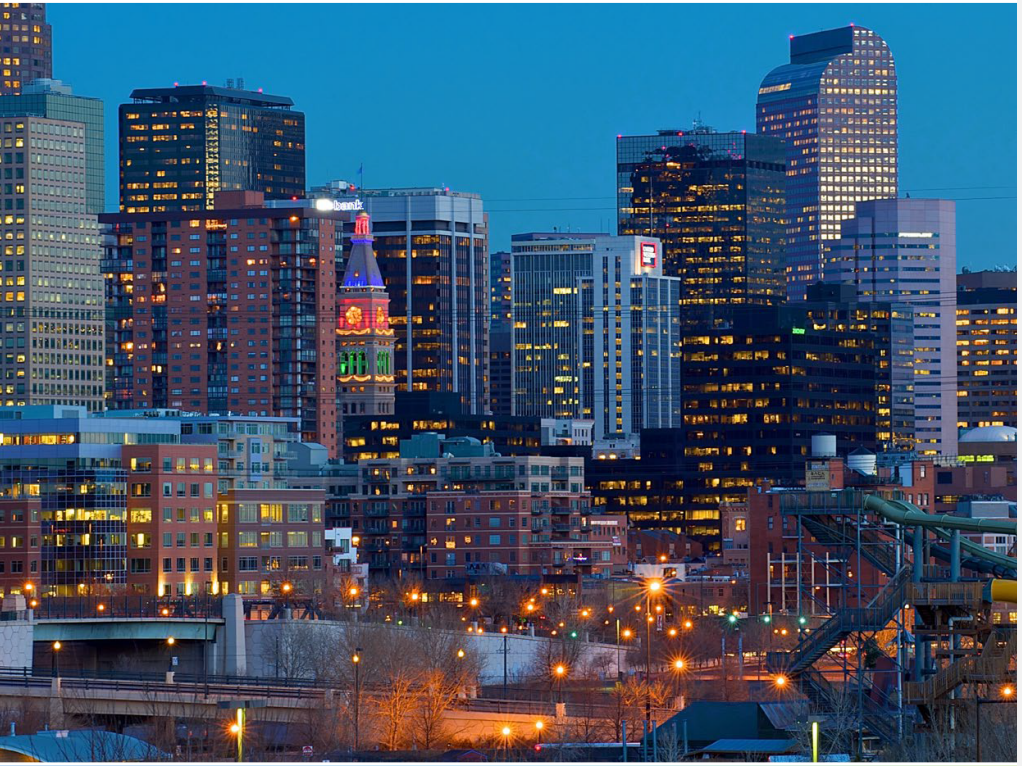
| | Contractor Developed Guides | Summary | Draft WS | Final WS | RFP | Bids Due | Selection | Award | 60% Draft | 90% Draft | To Pubs | Complete |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | Grid Interactive Buildings for Decarbonization | Complete | Complete | Complete | Complete | Complete | Complete | Oct-22 | Jan-23 | Apr-23 | May-23 | Aug-23 |
| 5 | Healthcare Decarbonization | Complete | Oct-22 | Nov-22 | Nov-22 | Dec-22 | Jan-23 | Feb-23 | Jun-23 | Aug-23 | Oct-23 | Jan-24 |
| 6 | Building Decarbonization Retrofit | Complete | Oct-22 | Nov-22 | Nov-22 | Dec-22 | Jan-23 | Feb-23 | Aug-23 | Nov-23 | Jan-24 | Apr-24 |
| 7 | Heat Pump Application & Operation | Complete | Oct-22 | Nov-22 | Nov-22 | Jan-23 | Feb-23 | Mar-23 | Sep-23 | Dec-23 | Feb-24 | May-24 |



BUILDING DECARBONIZATION GUIDES

# Building Decarbonization Retrofit

## Technical Resource Guide



ASHRAE

**Objective:** To provide design engineers with a framework for decarbonizing existing commercial and multi-family buildings, along with specific solutions, guidance, and case studies for these two building sectors.

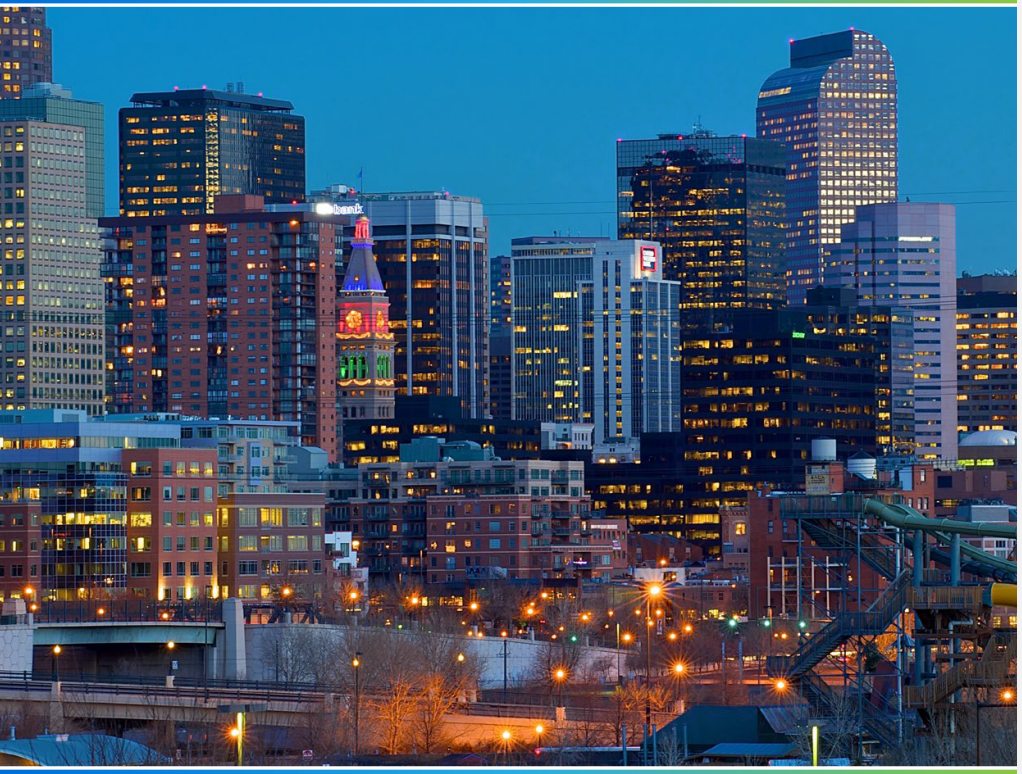
**Background:** Countries, states, cities and private industry are all setting decarbonization goals expressed in terms of a percent reduction in carbon emissions by a certain date. Even at the seemingly far off date of 2040, two-thirds of the global building stock at that time will be buildings that exist today . Decarbonization of the existing building stock is thus essential in the effort to meet any decarbonization goal. Much of the initial attention on decarbonizing buildings has been focused on new construction, where challenges and constraints are typically fewer, and codes are more easily applied. While many of the principles of decarbonization apply to both new construction and existing buildings, existing buildings present unique challenges and considerations that require a different solution framework.

**Target audience:** Design engineers

BUILDING DECARBONIZATION GUIDES

# Heat Pump Application & Operation

## Technical Resource Guide



ASHRAE

**Objective:** To develop a guide on the techniques and practices needed to incorporate various types of heat pump technologies in buildings in multiple climates for the purposes of decarbonization.

**Background:** Widespread deployment of heat pumps is expected to be a key strategy in on-going efforts to decarbonize building heating and hot water loads. Proper application, design, and operation of heat pump systems will be critical to the success of this effort.

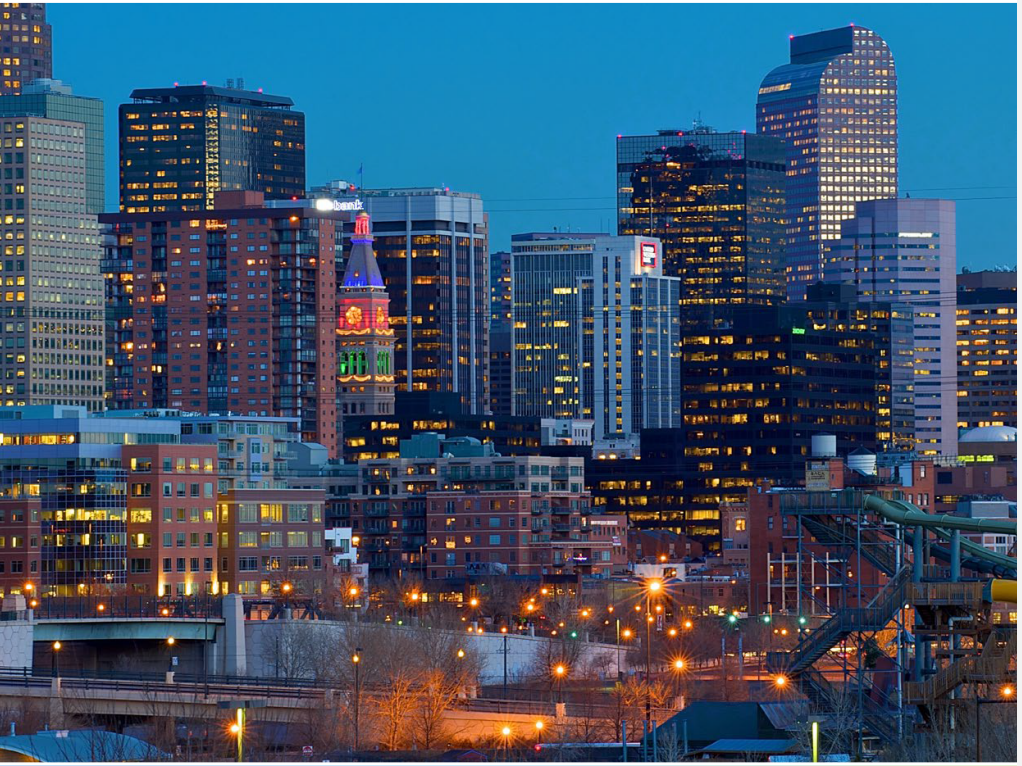
The Heat Pump Application and Operation Guide will focus on how heat pumps should be applied and how they should be operated in commercial and multi-family buildings to support decarbonization. The guide will provide guidance to design engineers on various heat pump-specific design elements including application and sizing in different climate zones, system configuration and refrigerants, electrical requirements, and control and operation strategies for space and hot water applications. The Heat Pump Application and Operation Guide will represent a critical resource to building designers and operators to support widespread adoption of this building decarbonization strategy.

**Target audience:** Design engineers, building operators

BUILDING DECARBONIZATION GUIDES

# Building Performance Standards

## Technical Resource Guide



ASHRAE
U.S. Department of Energy

**Objective:** Provide technical support for the Building Performance Standards development and implementation.

**Background:** This Guide is intended to provide technical basis and resources to policymakers, building owners, facility managers, design professionals and ASHRAE members when developing and implementing a Building Performance Standard. The Guide focuses on North America, where BPS are in place in several states and cities.

The Guide focuses on building types and scope of BPS as developed by leading U.S. cities and states. The guide covers BPS aimed toward reducing building operating energy use and resulting emissions and does not cover embodied energy or carbon. An ASHRAE Building Decarbonization Whole Life Design Guide is currently in preparation that will address embodied energy and carbon.

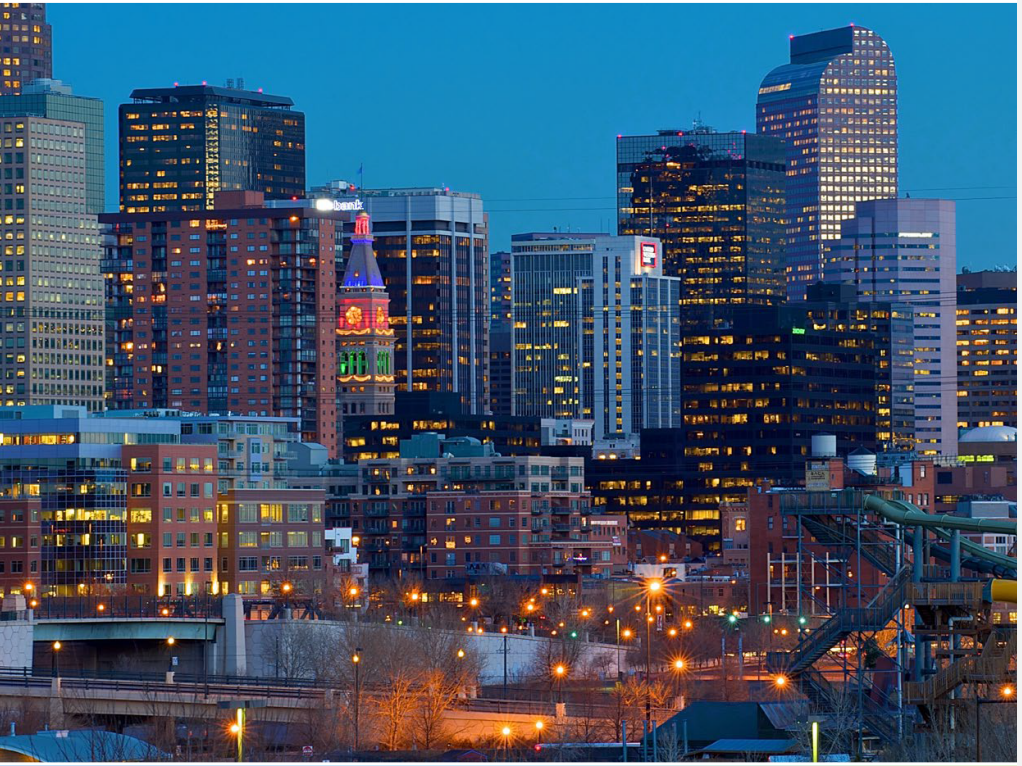
The Guide focuses on larger buildings, generally in the Scope of ASHRAE's Standards that cover buildings other than low-rise residential buildings (e.g., ANSI/ASHRAE/IES Standard 90.1: Energy Standard for Buildings Except Low-Rise Residential Buildings). It is possible that a future ASHRAE Guide may address BPS aimed at small residential buildings.

**Target audience:** Policymakers, building owners, ASHRAE members and design professionals

BUILDING DECARBONIZATION GUIDES

# Decarbonization Whole Life Design Guide for MEP Systems

## Technical Resource Guide



ASHRAE

**Objective:** Provide a design guide to minimize the whole life carbon emissions from MEP systems

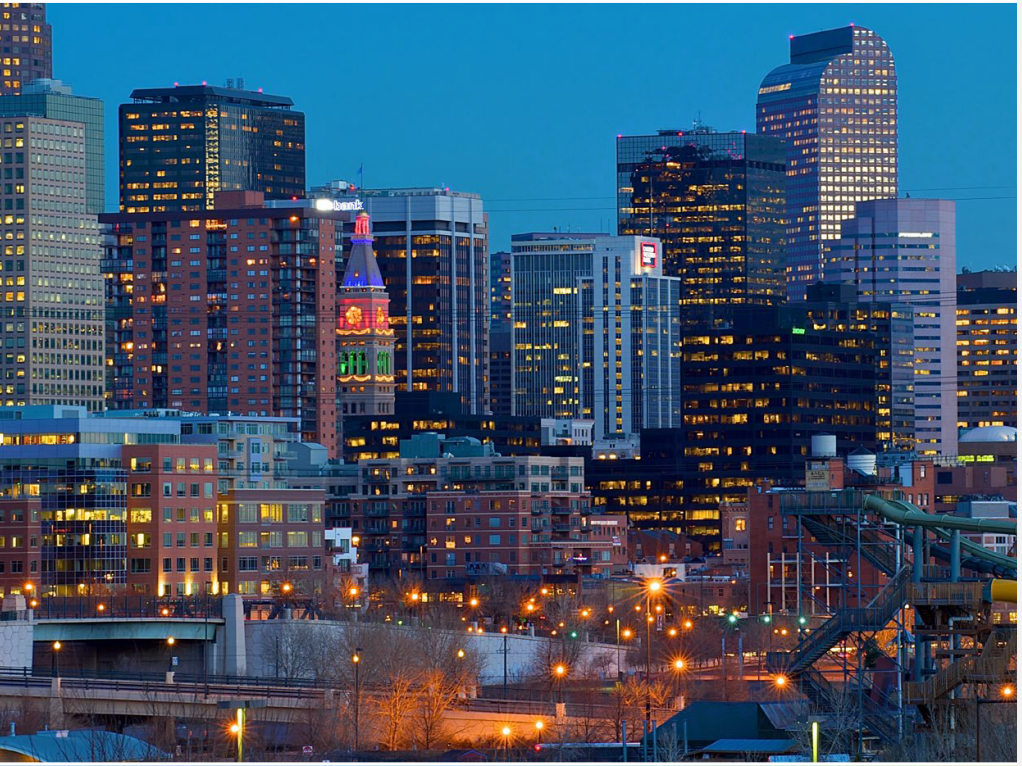
**Background:** Mechanical, electrical, and plumbing (MEP) systems are major contributors to the operational energy consumption and whole life carbon emissions of buildings. The industry has information and design methods to minimize the operational energy consumption and greenhouse gas emissions from heating, ventilation, and air conditioning (HVAC) and refrigeration systems; however, there are limited data and design guidance available to quantify and minimize the whole life emissions associated with the building MEP systems. Recent studies have shown that the embodied emissions from MEP systems can be between 15% and 49% of the total building embodied emissions and even higher if photovoltaic (PV) systems are included on the building. In order to minimize the whole life carbon emissions of MEP systems, tradeoffs between the embodied carbon and the operational carbon emissions, and among MEP, architectural and structural systems emissions should be considered. This guide will provide ASHRAE members and others with the definitions, concepts, and comprehensive guidance needed to calculate, interpret, and integrate life cycle data from multiple sources to design MEP systems for low whole life carbon emissions.

**Target audience:** Design engineers

BUILDING DECARBONIZATION GUIDES

# Hospital Decarbonization Design Guide

## Technical Resource Guide



ASHRAE
The American Society for Health Care Engineering

**Objective:** Provide a design guide to specifically show how to reduce GHG emissions in hospital buildings.

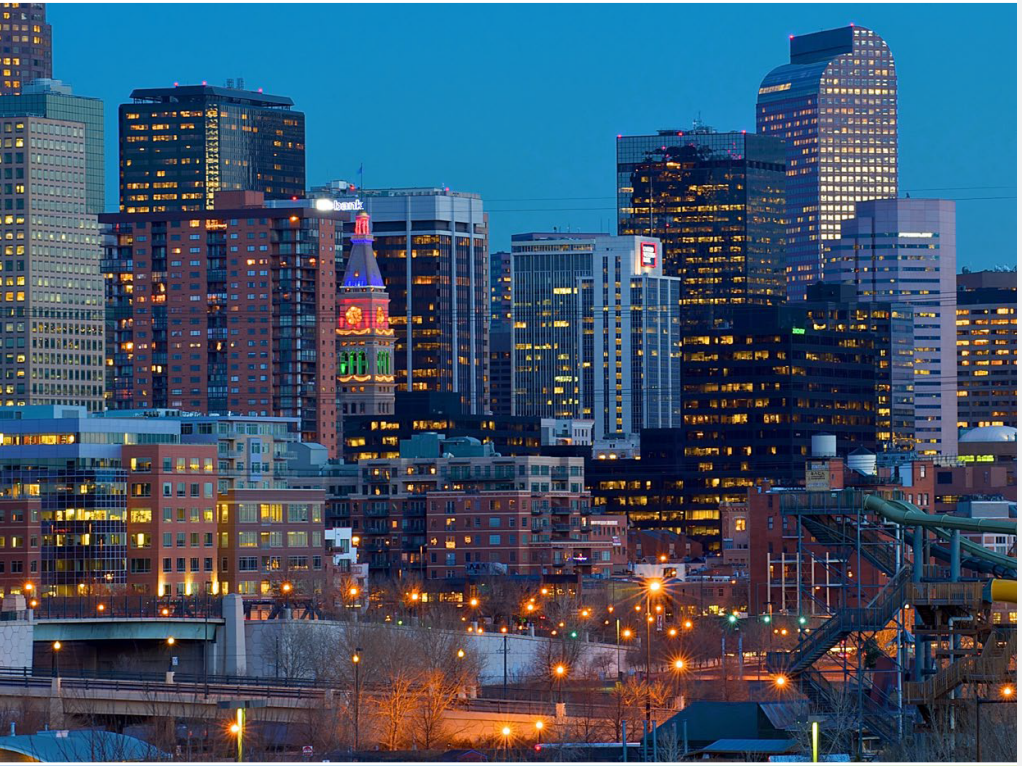
**Background:** North America hospital buildings have one of the largest carbon use intensities (CUI) of all building types. Owners of these buildings have a high interest in contributing to population (public) health by first, doing no harm. Some jurisdictions are now requiring all-electric new buildings. Yet the challenges for decarbonizing healthcare buildings are much more complex than those for other buildings because of their unique needs in terms of the number and complexity of systems, infection prevention needs, regulatory environment, abundance of technology to deliver healthcare services, and needs for resilience. Thus, special guidance for these buildings is critically needed. The Decarbonization Design guide for Hospitals will fill the need for hospitals but will also provide insight for other building types.

**Target audience:** Hospital facility managers, capital planners, hospital architectural and engineering teams, sustainability leaders, contractors and other building stakeholders.

BUILDING DECARBONIZATION GUIDES

# Grid Interactive Buildings for Decarbonization

## Design and Operation Resource Guide



ASHRAE

**Objective:** To develop a guide on the techniques and practices needed to enable buildings to maximize the benefits from the grid while minimizing carbon impact of the grid and building.

**Background:** This guide builds on the existing ASHRAE Smart Grid Application Guide by providing specific design and operational parameters for building projects (in the vein of an AEDG) that allow the audience to maximize carbon reduction in their interaction with the grid. Grid-interactivity is still a relatively new practice for most members of this audience.

This guide would have decarbonization as the primary goal. The guide will provide guidance on controls as they shift toward more real-time, automated interaction with the grid.

This guide could directly inform (and be referenced by) other global standards and initiatives, including general sustainability and climate standards (such as those administered by ASHRAE, ISO, Green Building Councils, and others) as well as those that are more focused on comprehensive grid interactivity.

**Target audience:** Building operators, designers, owners, consultants, and other building stakeholders


# Standards

- 240P new whole life carbon standard with ICC intended for code adoption
- 211 will be updated for building decarbonization audits
- 100 will become building performance standard for existing buildings
- 90.1 future direction is critical
- 90.2 being revised as energy and carbon reach code


# Education

- Decarbonization courses (3-hour)
  - ✓ Fundamentals
  - ✓ Systems and Equipment
  - ✓ Applications
- Heat Pump Application and Operations (full-day)
- Building Decarbonization Retrofits (full-day)
- Building Decarbonization Audit (full-day)
- Building Decarbonization 101 (45-minutes)

# Collaboration











# Building Industry Decarbonization Collaborative

- Proposed U.S. building industry collaborative initiated by ASHRAE
- National partnership of building industry organizations, coordinating and supporting the engagement of their chapter members in helping public and private building owners at a local level turn climate ambition into decarbonization action, at speed and scale
- Primary focus will be on educating the public and private sector on the technical "nuts and bolts" of building decarbonization, rather than policy design and implementation
- Potential announcement at 2023 ASHRAE Winter Conference

# **Future Activities** (Nov-Jan)

- Decarbonization web site and social media
- Provide a comprehensive plan for integrating building decarbonization activities into the ASHRAE structure
- Coordinate with and assist the Planning Committee to incorporate ASHRAE's building decarbonization goals into the Society strategic plan


*ASHRAE is committed to develop the technical guidance, standards, training, and other tools to support building decarbonization policy goals*

10. Technology Council recommends that proposed changes to the Procedures for ASHRAE Standards Actions (PASA) within Section 4. Approval Of Proposed Standards, Section 5. Relationships with other Standards-Developing Organizations, Section 7. Criteria for Approval, Withdrawal, and Discontinuance of ASHRAE Standards and Guidelines, Annex A1: Definitions, Annex B: Appeals of Board of Directors' Standards Actions or Inactions, and Annex C: Complaints of Actions or Inactions by the StdC, its Subcommittees or PCs, be approved as shown:

**4.1 RESPONSIBILITY**

The Standards Committee is responsible for the formation of project committees and the development, preparation, interpretation, revision, reaffirmation, and withdrawal ~~– and submittal to the Board of Directors or its designee for approval –~~ of ASHRAE ~~Standards Actions for~~ Standards, and ~~for~~ Guidelines~~except as noted~~. The Board of Directors or its designee will counsel and offer guidance to the Standards Committee on ~~policy level Standards~~ contentious issues during the development of the standards or guidelines.

### 4.3.1 Project Committees

Project committees are authorized by the Standards Committee as either Standard Project Committees (SPCs), which are ad hoc committees, or Standing Standard Project Committees (SSPCs), Guideline Project Committee (GPC), or Standing Guideline Project Committee (SGPC). Project committees are the consensus bodies of the Society. If a standard project committee is not balanced, efforts to recruit materially affected and interested parties from diverse interest categories to become members of a non-balanced SPC shall be on-going and documented.

A member of the SPLS is appointed as StdC Liaison to the new project committee. A call-for-members announcement is conducted. Drawing from the resulting applications and recruiting efforts, candidate committee members are recommended in consideration of their personal expertise and their effect on committee balance. Recommended members and ~~non-policy level~~ PC Chairs are approved by a majority vote of ~~a designated subcommittee of Standards Committee, normally~~ SPLS. ~~Standards Committee must concur by majority vote for all policy level PC Chairs.~~

### 4.3.3 PC Activity Initiation

At the first official meeting of a new PC, the PC shall vote on whether to concur with, or propose changes to, the original Title, Purpose and Scope (TPS). The PC may conduct business (for example, pass motions) only after the balanced membership roster with at least 5 voting members has been approved by SPLS or the StdC. However, the PC Chair may hold organizational meetings for individuals interested in becoming members of the PC, and the group may begin developing the Standard or Guideline.

### 4.3.4 Use of Subcommittees

The PC Chair may organize the committee structure using formal subcommittees. If subcommittees are used, the Chair's recommendation for subcommittee Chair must be approved by SPLS. Responsibilities of various PC subcommittees typically are to develop drafts of one or more assigned clauses of a standard, annexes, or addenda; prepare a system of units; prepare text in appropriate language; establish educational activities; develop draft responses to requests for interpretation; or develop proposed responses to comments resulting from public review. Subcommittees may also be formed to draft Standards Committee-approved standards or guidelines related to the subject matter of the parent project committee. Subcommittee actions shall be submitted as recommendations for action by the parent PC.

### 4.3.6 PC Members

A PC shall have individual members and designated PCs may have organizational members (see section 4.3.10). Individual members are appointed as "personal members," not as representatives of any organization, corporation, partnership, or employer. There shall not be more than one PCVM from any one company, association, or agency. ~~or entity.~~

### 4.3.8 Removal for Cause

The PC Chair may recommend removal of a PC member from the roster for due cause, by submitting a recommendation and justification outlining the reasons for said recommendation. ~~and~~ The PC Chair must submit a copy of communications between the PC Chair and PC member concerning this subject with the recommendation, in writing to the SPLS Liaison and Manager of Standards (MOS). The MOS will transmit the recommendations of the PC Chair and SPLS Liaison and related correspondence to SPLS for action in a meeting or by letter ballot. The SPLS Chair may call an executive session of the SPLS or the PC to discuss the matter. Failure of the PC member to properly disclose any conflict of interest shall be grounds for removal from the PC by SPLS.

**4.3.12 Project Committee Size**
The PC shall be balanced and consist of no less than 5 PCVMs with no upper limit, including the Chair. In addition to the PCVMs, the PC membership may also include PSVMs if the PC is organized into subcommittees or NVMs if not organized into subcommittees.

**5.2 Joint Sponsorship**
A request to jointly sponsor a standard shall be evaluated by the Standards Committee, considering overlap of expertise and responsibility. The evaluation must be reported to Technology Council. A recommendation for joint sponsorship including a recommendation for the lead organization shall be forwarded to the Technology Council for approval and reported as an information item to the Board of Directors.~~for approval~~. A recommendation against joint sponsorship shall be forwarded as an information item to Technology Council and the Board of Directors.

If joint sponsorship is approved by ~~the Board of Directors~~Technology Council, standards-writing and approval procedures must be negotiated with the other organization by the MOS on behalf of the Standards Committee. The standards-writing and approval procedures should be those of the lead organization. If ASHRAE procedures are not adopted, the adopted procedures must be compatible with ASHRAE procedures in regard to openness of proceedings, public review of drafts, and delegation of technical content to the project committee.

**7.2.1.1 Advisory Public Review (APR)**
A PC may vote by majority of the voting membership to recommend to the SPLS Liaison ~~and SPLS Chair~~ that a draft standard, guideline, or portion thereof, be subjected to an APR if the PC believes that the draft contains new, unusual or potentially controversial elements that the PC believes would benefit from increased public scrutiny prior to finalizing the draft for publication public review (no continuation letter ballot, no roll call vote record, no marked up roster, or submittal form is needed). Any comments received as a result of an APR are deemed to be "supportive" and do not need to be "resolved". Apart from acknowledging receipt of each comment, communication with commenters is optional but may be undertaken to clarify a comment's intent or to invite further participation in the standard development process. The underlying concept of the APR is to gain increased public participation early in the development process and thus to deal with, and potentially resolve, controversy before publication approval is sought. APRs are not submitted through the ANSI process.

**7.2.1.3 Fast Track Public Review (FTPR)**
A standards action approved by the PC for publication public review that meet all of the following criteria shall be processed as a fast track:

a) there are no negative votes with reason within the PC;
b) there is no credible threat of legal action (in writing) against ASHRAE has been made related to the proposed draft; and
c) the SPLS Liaison has not notified the MOS within ten calendar days, from the receipt of the package, with specific justification, that the PC has violated due process.

No additional approvals for issuing the standard, guideline or portion thereof, for public review are required.

**7.2.2 Publication Approval**
Approval of Standards Action by the ~~ASHRAE Board of Directors~~Standards Committee that have unresolved objectors ~~or a threat of legal action~~ shall be preceded by formally voted recommendations by the project committee ~~and Standards Committee~~. Standards Actions with unresolved objectors shall be reported to Technology Council and the ASHRAE Board of

Directors. The ASHRAE Board of Directors shall approve Standards Actions that have unresolved objectors with a credible threat of legal action.

Approval of Standards Actions that have no unresolved objectors and no threat of legal action shall be preceded by formally voted recommendations by the project committee and processed for publication by ASHRAE Staff. These Standards Actions shall be reported as an information item to the Standards Committee, Technology Council and the ASHRAE Board of Directors.

The standard, guideline or portion thereof, shall be deemed to have been approved by ~~the BOD~~Standards Committee upon approval of its designee.

**7.2.3 Quorum Requirements**

To conduct standards-related business at a meeting of a project committee, StdC or its subcommittees, ~~Technology Council or the Board of Directors,~~ a quorum must be present. A quorum exists if a majority of the voting membership is present.

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**7.2.4.2 Numerical Requirements for Standards Action Votes**

Standards actions votes must be approved by the project committee with ~~(1)~~ affirmative recorded votes by the majority of the total voting membership of the project committee, whether present or not, excluding abstensions.~~of the project committee, and (2) affirmative votes from at least two-thirds of those voting, excluding abstentions of the project committee~~.

**7.2.4.6 Approval of Standards Actions by Approval Bodies**

When recommendations for standards action votes are considered by SPLS or, Standards Committee ~~and the Board of Directors~~, the recommendation must be approved by a majority of those voting at a meeting, or by letter ballot.

**7.2.5 Voting Rules for Meetings**

Actions of PCs and PC subcommittees require approval by a majority of those voting at a meeting. Standards action votes must comply with 7.2.4. Issuance of an official interpretation requires affirmative votes of the majority of the voting membership. ~~and of at least two-thirds of those voting, excluding abstentions.~~

**7.2.6.1 Numerical requirements for letter ballots**

Actions of the PC and subcommittees ~~that are not standards action votes,~~ conducted by letter ballot, require approval by a majority of the voting membership of the committee. Standards action votes must comply with 7.2.4.2. The issuance or revision of an official interpretation require affirmative votes of the majority of the membership. ~~and of at least two-thirds of those voting, excluding abstentions.~~

**7.4.4.2 Complaints of Inactions by the Standards Committee, its Subcommittees or Project Committees**

In addition to formal appeal of ~~Board~~ Standards Committee standards actions or inactions, failure of the Standards Committee, its subcommittee(s), or a Project Committee to consider a written request may be addressed by writing (including electronic communication) to the Manager of Standards at any time. (See Annex C.)

**7.4.5 Public Review Period**

The public review comment period shall normally be the minimum allowed by ANSI unless more time is justified. Limited revisions, such as Independent Substantive Changes (ISCs) and addenda up to 5 pages may have a 30-day comment period.

**7.4.6.2 Comments Received Under Continuous Maintenance**
An SSPC or SGPC that is designated by the Standards Committee as operating under continuous maintenance procedures shall take documented, consensus action on each request for change to any part of its standard or guideline.

**7.4.7 Consideration of Standards Proposals**
Prompt consideration shall be given by the Standards Committee to proposals made for developing new standards or guidelines or revising, reaffirming, or withdrawing existing standards and guidelines.

**7.7.3 Other Bases for Withdrawal of Approval - updated**
The ~~ASHRAE Board of Directors~~Standards Committee or its designee also may withdraw approval of an ASHRAE Standard, Guideline or portion thereof, upon (a) advice of counsel, based on evidence of a legal nature, or (b) consideration of facts that have subsequently come to the attention of ~~the Board~~ the Standards Committee.

**7.8.1 Project Discontinuation Due to Lack of Membership**
Project discontinuation due to lack of membership shall be based on the following:

a) A new project shall be discontinued by the MOS if a PC Chair and balanced membership have not been approved by SPLS within twelve months after the project is approved by the ~~Board of Directors~~Standards Committee.

**7.11 Interpretation Requests of Standards**
Interpretation requests for a standard must be submitted to the MOS in writing. The Manager of Technical Services or the Chair of the current or past cognizant PC or the Chair's designee may respond in writing to written requests for unofficial personal interpretations. Cognizant SSPCs, if they exist, and SPCs that have not yet been disbanded will be asked to respond to requests for official interpretations in writing. If no PC exists, StdC will form an Interpretations Committee (IC) to respond. Procedures for interpretations of published Standards, Guidelines or portion thereof, are provided in StdC MOP Reference Manual Section 10. An issuance or revision of an official interpretation requires affirmative votes for the majority of the memberships. ~~of each approving and of at least two-thirds of those voting, excluding abstentions.~~

**7.12 Interpretation Requests of ASHRAE Standards Development Procedures**
Interpretations requests for ASHRAE's standards development procedures must be submitted to the MOS in writing. ASHRAE Staff may respond in writing to written requests for unofficial personal interpretations. Requests for official interpretations of procedures shall be submitted to PPIS. An issuance of an official interpretation requires affirmative votes for the majority of the memberships of PPIS. ~~and of at least two-thirds of those voting, excluding abstentions.~~

**A1 DEFINITIONS:**

**normal track:** an approval procedure applied to a Standard, Guideline or portion thereof, that meets one or more of these criteria:

a) receives one or more negative votes with reason upon approval for publication or
b) where ASHRAE receives a written legal threat

~~**policy level document:** a standard, guideline, designated as "policy level" by the Board of Directors or the Board's designee.~~

**subcommittee:** a group of individuals appointed by the project committee chair from among the project committee membership who vote on subcommittee activities and whose responsibility it is to develop drafts of one or more assigned sections of a standard, annexes, or addenda;

develop draft responses to requests for interpretation; or develop proposed responses to comments resulting from public review; all submitted as recommendations for action by the parent project committee. Subcommittees may also be formed to draft Standards Committee approved standards or guidelines related to the subject matter of the parent project committee.

**ANNEX B: APPEALS OF ~~BOARD OF DIRECTORS'~~STANDARDS COMMITTEE STANDARDS ACTIONS OR INACTIONS**

**B2 APPEALABLE MATTERS**

An action or inaction of the ~~Board of Directors (BOD)~~Standards Committee to adopt a new ASHRAE Standard, Guideline, an addendum to an existing Standard or Guideline, or to revise, reaffirm, or withdraw an existing ASHRAE Standard or Guideline is subject to appeal.

**B3 WHO MAY APPEAL**

Any person directly and materially interested who has been or will be adversely affected by the publication of a new, revision, reaffirmation, or withdrawal of an ASHRAE Standard, Guideline or portion thereof, or lack of such action, may appeal the ~~BOD~~ Standards Committee action or inaction. The appellant must be an unresolved public review commenter, associated with a new, revision, reaffirmation or withdrawal of the ASHRAE Standard or Guideline being appealed, or a PC member who cast a negative vote with reason(s) in relation to his/her vote on the consensus body associated with the creation, revision, reaffirmation or withdrawal of the ASHRAE Standard or Guideline being appealed.

**B4 SCOPE OF APPEAL AND BURDEN OF PROOF**

An appeal of a ~~BOD~~ Standards Committee standards action or inaction shall be solely based upon procedural grounds. When appeals are filed, the appellant shall demonstrate that ASHRAE Standards development procedures were not followed. Appeals arguments that are based on actions that took place in previous revision cycles will not be considered.

**B6 NOTIFICATION PROCEDURES**

Within 15 working days following ~~BOD~~ Standards Committee action on a standard, that results in approval of a new, revision, reaffirmation or withdrawal of a standard or addenda to a standard, the Manager of Standards (MOS) shall notify in writing (including electronic communication) all unresolved public review commenters and/or a PC member who cast negative votes with reason(s) in relation to his/her vote on the consensus body of the ~~BOD~~ Standards Committee action and inform them of their right to appeal that action.

**B6.1** An appeal, must be received by the Manager of Standards (MOS) of ASHRAE within 15 working days of the date on the notification letter regarding the Standards Committee~~BOD~~ action. The Chair of the Appeals Board may grant an extension, if requested prior to the close of the initial 15 working day period and if sufficient justification is provided.

**B6.2** Normally, any standards action by the ~~BOD~~ Standards Committee will be suspended during pendency of appeal(s), appropriately filed. The President of the Society may, however, maintain the ~~BOD~~ Standards Committee action until and if the Appeals Panel decides to dismiss the appeal, without a hearing, up to a maximum of 90 days. If the Panel decides to dismiss the appeal without a hearing, the President may maintain the action until the next meeting of the ~~Board of Directors~~Standards Committee. The appealed ~~BOD~~ Standards Committee action shall be immediately suspended if the Appeals Panel does not dismiss the appeal.

**B8.2 Ineligible Panel Members**

Any Member of the Appeals Board that served as a PCVM or PSVM on the project committee that is the subject of the appeal during the three years prior to the standards action under appeal shall be ineligible to serve on the Panel. Any Member of the Appeals Board that voted on

the draft that is the subject of the appeal as a member of the Standards Committee ~~or Board of Directors~~ shall be ineligible to serve on the Panel.

**B8.4** Non**-Dismissal of Appeal**
If the appeal is not dismissed, the ~~BOD~~ StdC action which has been appealed shall be immediately suspended, if not already suspended according to the first sentence of B6.2, and each claim in the appeal shall be considered separately and basic grounds given for each decision.

**B9.3 Guests**
~~A Standards Committee Liaison and the BOD Ex-Officio member of the Standards Committee shall be invited by MOS to attend the hearing.~~ The hearing shall be open to observation by representatives of directly and materially interested persons, although the number of observers may be limited at the discretion of the Appeals Panel Chair. Anyone planning to attend the hearing shall notify the MOS no less than 15 days prior to the hearing date. Guests that are not designated to speak on behalf of the Appellant or Respondent are not allowed to speak during the hearing or during the question period.

**B10 APPEALS PANEL DECISION**
The Appeals Panel shall decide within 15 business days of the hearing or after the receipt of the rebuttal, by majority vote, that the appeal, or any parts of the appeal, be upheld or denied. The Appeals Panel Chair shall, within 14 days following the Appeals Panel's decision, notify the Appellant(s), Chief Staff Officer, Director of Technology, Manager of Standards, President, Chair of Technology Council, Chair of the Standards Committee, and Chair of the PC of the decision. The decision of the Appeals Panel to uphold, deny, or dismiss an appeal shall be final. If the appeal is dismissed or denied by the Appeals Panel, the action of the ~~BOD~~Standards Committee, which was appealed shall become effective immediately.

**ANNEX C: Complaints of Actions or Inactions by the StdC, its Subcommittees or PCs**
In addition to formal appeal of ~~BOD~~ Standards Committee Standards actions or inactions (PASA Annex B), failure of the StdC, its subcommittee(s), or a PC to consider a written complaint may be addressed by writing to the MOS at any time. The complaint must identify the section of procedures that was violated and provide sufficient detail to support the complaint. Any committee tasked with reviewing a complaint may dismiss the claim if insufficient detail is provided.

**BACKGROUND:** At the Toronto meeting, the Technology Council Operations subcommittee tabled this motion to allow members time to review the proposed. These proposed changes were then also shared as an information item to both Tech Council and the Board of Directors during the Toronto Annual Meeting in June. These changes are part of the Standards Committee effort to streamline the standards development procedures. These changes move the standards actions approvals to the lowest approval body and include a simpler voting calculation to promote efficiency in the standards development process. These changes will have to go out for public review and approval through ANSI. This public review process and approval is between six months and a year depending on the comments received.

**Tech C Vote: 11-0-0, CNV**

11. Tech Council recommends that proposed changes to the Rules of the Board Section 2.425.001 *Scope and Purpose*, and Section 2.425.003 *Operation*, be approved as shown below:

**2.425.001 SCOPE AND PURPOSE**

The Standards Committee shall be responsible for the selection, development, and preparation, ~~and submittal to the BOD~~ of all code language documents, standards and guidelines in the

fields of heating, refrigerating, air conditioning, and ventilating engineering, including all revisions, re-affirmations or withdrawals thereof, to be considered for approval. It shall cooperate with and supervise the Society's participation in other organizations in the development, preparation, and adoption of codes, standards and guidelines. (SBL 7.9)

**2.425.003 OPERATION**

2.425.003.1 General Requirements (11-06-29-13)

A. This committee shall plan and implement activities in support of ASHRAE Policy on Use of ASHRAE Standards in Building Codes. (ROB 1.201.003) (98-01-16-41)

B. This committee shall, as the standards coordinating committee of an ANSI-accredited organization, submit its Procedures for ASHRAE Standards Actions (PASA), and all changes, to ANSI for approval. (95-02-02-54)

C. ASHRAE Standards Committee documents shall be developed in accordance with the Procedures for ASHRAE Standards Actions (PASA) except that balance on guideline project committees is not required but desired.

D. Adoption, revision, reaffirmation or withdrawal of a standard or guideline shall require approval of the ~~Board of Directors~~Standards Committee, and the ~~Board of Directors~~Standards Committee will determine that ASHRAE's procedures have been followed. In the event of credible threat of legal action related to adoption, reaffirmation, or revision of a standard or guideline approval by the Board of Directors shall be required. The effective date of a new, revised or reaffirmed standard, guideline or addendum shall be in accordance with the following unless otherwise approved by the ~~Board of Directors~~Standards Committee.

1. For a new standard the date of ~~Board~~Standards Committee approval of the standard.

2. For a revised standard, which is intended to replace an ANSI-approved American National Standard, the date of ANSI approval of the revised standard. If such standard fails to achieve ANSI approval, the effective date will be determined by ~~the Board~~Standards Committee, subsequent to the failure to achieve ANSI approval.

3. For a revised standard which will replace an ASHRAE standard which is not an approved American National Standard, the date of ~~Board~~Standards Committee approval of the revised standard.

4. For an addendum to an ANSI-approved American National Standard that is not code intended, the date of ANSI approval of the addendum. For an addendum to an ANSI-approved American National Standard that is code intended, the date of publication announced on the ASHRAE website. If such addendum fails to achieve ANSI approval, the effective date will be determined by ~~the Board~~Standards Committee, subsequent to the failure to achieve ANSI approval. (10-10-23-02)

5. For an addendum to an ASHRAE standard, which is not an ANSI-approved American National Standard the date of ~~Board~~ Standards Committee approval.

6. For a new, revised or reaffirmed guideline or addendum to a guideline the date of ~~Board~~ Standards Committee approval of the document.

**2.425.003.3** (98-01-18-02/05-06-30-27/11-06-29-13)

A. All ASHRAE standards shall be submitted for ANSI approval as American National Standards.

B. ASHRAE may obtain ANSI approval either by utilizing its ANSI Audited Designator status or by submitting to the ANSI Board of Standards Review for approval. Unless otherwise specified by the Board of Directors, the Audited Designator path will be used. (04-07-01-45)

C. Following approval by ~~the Board of Directors~~Standards Committee, an announcement of approval and availability of each standard, guideline, revision or reaffirmation thereof, or withdrawal of a standard or guideline shall be made. (67-06-25-08/86-001-23-56/88-05-21-49/00-06-25-7B)

**2.425.003.5** (84-12-19-LB/86-01-23-56/86-06-26-35/88-05-21-49/98-06-25-26/05-06-30-28/06-03-20-09/06-06-29-23/08-01-23-09/10-06-30-21)

A. The Standards Committee evaluates the need for joint sponsorship of standards or guidelines, considering overlap of expertise and ASHRAE responsibility. A request for joint sponsorship, including a recommendation for the lead organization, is submitted to Technology Council for approval and reported to the Board of Directors. If approved, standards writing and approval procedures are negotiated with the other organizations by the Manager of Standards on behalf of the Standards Committee.

B. The standards-writing and approval procedures should be those of the lead organization. If ASHRAE procedures are not adopted, the adopted procedures should be compatible with ASHRAE procedures; e.g., openness of proceedings, public review of drafts, and delegation of technical content to the project committee. The chair and members of the project committee shall be selected and approved in accordance with the negotiated joint sponsorship agreement.

C. The Standards Committee, ~~operating at the direction of the Board of Directors,~~ is responsible for recommending the approval of a standard, guideline, or revision, reaffirmation or withdrawal thereof or an addendum. ~~thereto, to the Board of Directors upon recommendation of the Project Committee after reviewing all negative votes cast by the Project Committee, and all unresolved comments. Technology Council is responsible for approving Standards Committee recommendations for publication of users' manuals for selected standards.~~

[5] David Yashar abstained because he had comments that weren't submitted during the review period and decided that it would be improper to submit them for consideration at this time.

## ASHRAE Position Document on

# Infectious Aerosols

Approved by the ASHRAE Board of Directors [DATE] Expires [DATE]

ASHRAE is a global professional society of over 55,000 members, committed to serve humanity by advancing the arts and sciences of heating, ventilation, air conditioning, refrigeration and their allied fields (HVAC&R). ASHRAE position documents are approved by the Board of Directors and express the views of the Society on specific issues. These documents provide objective, authoritative background information to persons interested in issues within ASHRAE's expertise, particularly in areas where such information will be helpful in drafting sound public policy. The documents also clarify ASHRAE's position for its members and building professionals.

## Infectious Aerosols is a Public Interest Issue

The magnitude of risk from aerosolized pathogens has become increasingly obvious, especially during the Covid crisis. These risks are particularly elevated in enclosed buildings.

Public health officials, policy makers, building owners, designers, and members of the public all need accurate, reliable guidance for appropriate ways to mitigate the risk from these pathogens. Available risk mitigation strategies include pharmaceutical interventions, non-engineering controls, and engineering controls. Given the concurrent climate crisis, the optimal mitigation bundle of interventions must achieve the highest possible risk reduction with the lowest possible resultant emissions.

## Why ASHRAE Takes Positions on Infectious Aerosols

ASHRAE consensus standards and design guides provide the technical foundation for international building practices and energy codes that balance the need for energy efficiency with the need to keep the indoor environment healthy and comfortable for occupants. The design, installation and operation of buildings' mechanical systems can improve—or can impede—the buildings' ability to mitigate risk from infectious aerosols.

Consequently, ASHRAE's positions, standards and design guidance can help avoid health risks associated with Infectious Aerosols.

## ASHRAE Takes The Positions That:

1. Exposure to infectious aerosols is an important factor in the transmission of infections in indoor environments between a source and a susceptible individual.
2. Engineering controls demonstrated to reduce the risk of exposure to infectious aerosols include dilution with outdoor air provided by mechanical or natural ventilation, filtration of indoor air, indoor airflow patterns, and disinfection by germicidal ultraviolet light and other technologies proven to be effective and safe.
3. Strategies using engineering controls for managing the risk from infectious aerosols should focus on reducing exposure to infectious aerosols in the breathing zone.
4. Effective design, installation, maintenance, and operation of ventilation controls are critical to achieve needed risk mitigation.
5. Existing evidence for the effects of temperature and humidity on infection risk does not justify changes to ventilation and IAQ standards, regulations, and guidelines at this time.
6. The effectiveness of any one risk mitigation strategy depends on many factors. The use of multiple risk mitigation strategies will usually be more effective than reliance on any single strategy.
7. Risk mitigation measures should be adaptable to levels of risk in a particular space.
8. Combinations of engineering controls and non-engineering controls can be optimized for effectiveness, cost, and energy use.

## ASHRAE Recommends that:

A multidisciplinary Research & Development (R&D) working group be established, aiming to improve coordination between engineers, scientists and health professionals, prioritize and accelerate the research agenda, development process and dissemination. As a minimum, this research should include the following topics.

- Controlled intervention studies to quantify impact on infection transmission resulting from various engineering controls considered singly and in combination with other non-engineering controls with respect to infectious aerosols of varying characteristics.
- Real time detection methodologies for the purpose of improved variable control of HVAC controls responsive to different levels of risk.
- Methods to reduce the life-cycle cost and carbon emissions of engineering controls in all conditions.
- Studies to characterize the size-resolved emission rate of infectious aerosols for different pathogens and different respiratory activities and metabolic intensities, determine the relationship between size and risk of transmission, and predict the fate and transport of these aerosol particles in indoor environments.
- Quantitative infection risk evaluation tools for infectious aerosols (quantitative microbial risk assessment is widely used for water and food, but much less for aerosols).
- Impact of indoor airflow patterns on the transmission of infectious aerosols and resulting risk of infection.

**ASHRAE commits to:**

1. Support model codes and standards that address exposure to infectious aerosols, balancing quality of evidence, risk mitigation, cost of installation and operation, and energy use and carbon emissions.
2. Support model codes and standards using variable amounts of outdoor/clean air delivery in response to measurement of air quality to optimize indoor air quality in an efficient way.
3. Promote research to enhance HVAC technologies and knowledge to mitigate the risk of infection due to airborne transmission.
4. Develop protocols for better testing and certification of control technologies.
5. Encourage publication of test data indicating removal efficiency by particle size for each filter as part of the certification process. This data should include information on performance effects associated with filter loading and electrostatic charge (if applicable).

## Appendix A: Background Information

This document is not a design guide. The purpose is to advise policymakers to identify appropriate engineering control strategies for various settings, various normal/epidemic disease states, and in combination with non-engineering strategies, based on the best available science, the amount of benefits and costs resulting from various strategies including their carbon implications, using principles of Evidence-Based Medicine.

A. Infectious Aerosols Risk

Respiratory diseases are among the most common causes of severe illness and death worldwide (Forum of International Respiratory Societies, 2017). Acute respiratory infections (ARIs) are the leading cause of morbidity and mortality from infectious disease in the world. Almost four million people die from ARIs each year, with 98% of these deaths due to lower respiratory tract infections (World Health Organization, 2014) The current Covid-19 pandemic, caused by the SARS-CoV-2 virus, and the increasing rate of emergent respiratory viral infections in recent years are of great concern, as some of the epidemic-prone ARIs may create global public-health emergencies.

Pathogens are classified in different risk groups describing the relative hazard posed by infectious agents or toxins. Considerations used in a biological risk assessment include the (a) pathogenicity of the agent and infectious dose, the (b) potential outcome of exposure, (c) natural route of infection, (d) other routes of infection resulting from manipulations, the (e) stability of the agent in the environment, (f) information available from animal studies and (g) the availability of effective prophylaxis or therapeutic interventions (World Health Organization Staff & World Health Organization, 2004).

While multiple factors must be considered for risk assessment, design of engineering and environmental mitigation measures should be guided by the specific route of transmission or contaminant dissemination. Transmission of infection is a complex process; the risk of disease is determined by numerous factors that have considerable and uncertain variability including: the characteristics of the pathogen concerned, the infectiousness of the host, the media through which the infectious agent passes from source to new host, and the immune response of the new host (Noakes & Sleigh, 2009). Transmission or dissemination through the air complicates this further by adding other influencing factors (Sze To & Chao, 2010).

B. Mechanisms of Transmission of Infectious Aerosols

An infectious aerosol is a collection of pathogen-laden particles in air. Typically, infectious aerosols are released by an infected person as part of respiratory activities such as breathing, talking, singing, coughing and sneezing. All people, whether infected or not, release droplets of respiratory fluid (mucus, sputum or saliva) spanning a wide range of sizes during such respiratory activities. Some droplets are so large that they cannot remain suspended for more than a few seconds in the expired jet. Some droplets are small enough to be considered aerosol particles (aerosols) that can remain suspended in air for an extended period. Under all but the most humid conditions, the smallest droplets rapidly evaporate, leaving behind solid or semi-solid residue consisting of non-volatile components of the respiratory fluid. If a person is infected, their respiratory droplets and aerosols may carry pathogens and may be infectious.

Traditional definitions of “airborne” and “droplet” transmission have been shown to be misleading, and revised definitions of transmission routes are more closely aligned with the actual mechanisms by which pathogens are transferred from one person to another (Marr & Tang, 2021). These revised routes are (1) inhalation of aerosols, (2) spray of large droplets, and (3) touching a contaminated surface. The first supplants the traditional airborne route, which was assumed to apply only at long distance, while the second and third correspond to the traditional droplet and fomite (or contact) routes. To facilitate readability and understanding, this committee agreed to leverage recently proposed terminology.

Inhalation of infectious aerosols can cause infection, though the risk of infection of any individual is a function of the infectivity of the particular organism, its ability to remain infectious in air, the susceptibility to infection of the person exposed, the number of particles inhaled, the amount of infectious virus in the inhaled particles, where the particles are deposited along the respiratory tract, and other factors.

In the past, transmission of most respiratory pathogens was thought to be associated primarily with larger droplets, of concern only to people at close range to an infected person. It is now clear that transmission of COVID-19 and other respiratory infections is likely dominated by inhalation of infectious aerosols both at close range and long range (Wang et al., 2021)

Pathogen-carrying droplets and aerosolized particles that fall to a surface can be a source of infection through touch and subsequent touching of the eyes or nose, or through re-aerosolization (or resuspension) followed by inhalation.

C. Factors affecting respiratory infection risk

Both proximity and duration of exposure to the source - a person who exhales infectious aerosols- are risk factors. Proximity to others influences the risk because airborne pathogens are most concentrated in the expiratory jets close to the point of release (Cortellessa et al., 2021). The concentration of aerosols decreases with distance. As infectious aerosols move through a space, they may lose infectivity over time. The risk of transmission also increases with duration of exposure (Buonanno et al., 2020).

From the perspective of potential risk mitigation interventions, there are three primary factors that influence the chain of infection for aerosolized pathogens: source, route, and susceptibility.

The source encompasses the emitters of the pathogen, the quantity of pathogen produced by each infected host, and the infectiousness of the pathogen.

In the case of aerosolized pathogens, the source will normally be an infected person. In some cases, the source may consist of a surface on which particles have fallen, and which may be re-suspended due to disturbance. In some cases, fecal material and waterborne pathogens may aerosolize to create yet a third kind of source. Many factors influence the risk from a particular source, but the most important is the infectiousness (e.g., transmissibility) of the particular pathogen.

Exhalations release droplets spanning a wide range of sizes, including those small enough to be considered aerosols. The number, size and velocity of these droplets and aerosols vary widely by individual, type of respiratory activity and/or metabolic intensity, volume of vocalization and stage of disease if the person is infected. Speaking loudly, singing, deeper breathing associated with physical activity and the like, increase the number and speed of droplets and aerosols discharged into the air (Coleman et al., 2021; Pöhlker et al., 2021; Tomisa et al., 2021; Wang et al., 2021).

The pathway refers to the physical movement of the pathogen between the source and the new host, the duration of time the source and new host are proximate, the medium of transfer from the source to the new host and the characteristics of the medium (in the case of air, humidity, temperature, indoor airflow patterns, etc.).

Exposure depends on the inhalation rate (volume per unit time), which varies with physical activity (Wang et al., 2021).

Vulnerability refers to the defenses the new susceptible host has to the particular pathogen being transmitted. This refers to both their immune response and behavior. Vulnerability at a population level is affected by the number of potential new hosts in proximity to a source. Therefore, risk is higher in "hubs for community transmission." Vulnerability at a population level is similarly high in locations with large numbers of persons who are more than normally susceptible to infection and with higher risk of severe disease when infected (Bueno de Mesquita et al., 2022).

D. Managing Risk

Risk from pathogen spread can be reduced by non-engineering interventions (pharmaceutical interventions, administrative controls, etc.), and engineering controls. The risk of exposure to and infection from various aerosolized pathogens is unlikely to be reduced to zero. The goal, therefore, must be to select a bundle of strategies, both engineering and non-engineering, that most practically minimizes risk and minimizes waste.

Given the variability of factors affecting the risk of infection in any given circumstance, no single set of mitigation strategies can balance the evidence, effectiveness, timeliness, and cost against all possible combinations of risk factors.

In general, policymakers face two broad sets of operating conditions: normal circumstances, where we have a somewhat regular level of risks, and epidemic states, where we have temporarily higher levels of risks.

In a normal state, largely because of the public health measures implemented over time, we experience a relatively similar, relatively low risk of transmission of all disease from infectious aerosols in most buildings. Some buildings and spaces, such as healthcare buildings, normally contain larger numbers of infectious persons and larger numbers of immunocompromised or otherwise vulnerable persons. Those spaces therefore warrant higher levels of risk mitigation under normal circumstances.

In an epidemic state, risks step upwards, generally because of the presence of a particular pathogen with a particularly high reproduction rate and few or no medical controls widely available. The risks will vary with public adherence to various behavior protocols (closing bars and shopping malls, social distancing, mask-wearing, etc.).

To mitigate the risks of infection, policymakers have at their disposal different public health measures. These measures include source controls, pathway controls, and controls to protect vulnerable persons. Source controls include administrative controls (limiting access to a space, requiring screening, etc.), pharmaceutical controls (vaccination), Personal Protective Equipment (PPE), isolation/separation, contact tracing to facilitate isolation/separation, and sometimes cleaning or water management. Pathway controls include both engineering controls (powered or natural ventilation, passive and active filtration, air cleaning, indoor airflow patterns, temperature and humidity controls) and non-engineering controls (daylight, surface disinfection, barriers). Controls to protect vulnerable persons include administrative controls, pharmaceutical controls, PPE, and isolation/separation. Usually, the right response to a particular situation will be a bundle of strategies from within each of these categories, which are likely to vary over time in response to evolving levels of risk.

A complicating factor is the *velocity* of risk variation combined with *uncertainty* about the characteristics of a novel disease. The shift from a normal to an epidemic state can occur so rapidly that significant harm may ensue before controls are implemented. However definitive evidence of transmission modes may not be available for a long time and insistence on incontrovertible evidence can cause long delays in response. Consequently, there is a strong argument for invoking the "precautionary principle" in such cases, i.e., "(o)ne should take reasonable measures to avoid threats that are serious and plausible." (Resnik 2004). Application of the precautionary principle would require that engineering controls capable of coping with the worst likely event are already present and ready for use when needed, or that plans exist for rapidly deploying effective controls. The importance of the precautionary principle also extends to the public health guidance that is essential to the initiation of a timely response to a serious threat.

One important consideration for all policy makers is the need to prescribe controls for the varying states of risk that will be faced by every building. In general, operating at an epidemic-appropriate state all of the time will waste resources. The optimal policy will be one that defines appropriate controls for a normal state (including those spaces with higher than normal levels of risk) with the flexibility to ramp up at appropriate velocity to match a developing epidemic.

An important difficulty that policy makers face in prescribing the optimal bundle of risk mitigation measures is the varying response to administrative controls and PPE measures, and the difficulty of balancing "freedoms." That is, in some cases, people may refuse to socially distance themselves, vaccinate, and/or wear masks. The need for engineering controls in such instances is much greater as a backstop, but forcing all building owners to spend capital for extensive engineering controls in order to enable the freedom of others to not wear masks is a fundamental collision of rights.

This PD assumes a reasonable implementation of non-engineering controls to mitigate risks by the population at large, and policy makers will be well-advised to use their influence to encourage such implementation.

Policymakers will define acceptable levels of risk and propose optimal risk mitigation responses. The optimal response to risk management, then, will begin with an assumption of a reasonable level of public adoption of recommended public health behaviors. Based on anticipated levels of risk and available resources (including time of response), the response will be a layered set of engineering and non-engineering interventions, tiered from least cost and highest benefit/evidence until the appropriate level of mitigation has been achieved.

## ENGINEERING CONTROLS FOR MITIGATING AEROSOL TRANSMISSION

This Position Document uses the term "engineering controls" to refer to a group of measures typically associated with "ventilation." These include introducing outside air and/or removing contaminated air through mechanical or natural means, controlling flow of air within a space or between spaces, air cleaning (inactivation of infectious aerosols), temperature control, and humidity control. Engineering controls interrupt the pathway for aerosol transmission.

Effective application of most engineering controls requires technical and professional expertise in the design, installation, validation, operation, and maintenance of those controls, implying the need for an ecosystem and financial resources for cost-effective applications (Shen et al., 2021). Systems that do not operate correctly may create a false sense of security, similar to the Peltzman effect (Iyengar et al., 2021), leading occupants to take avoidable risks assuming that the engineering controls will protect them.

Engineering controls for which there is a strong evidence basis for both effectiveness and safety, as well as established quantitative design methods, include ventilation, filtration, certain air cleaning and aerosol inactivation technologies, and effective indoor airflow patterns. Other technologies may also be applicable that are not supported by the same level of independent evidence.

### A. Ventilation

Ventilation is the process of supplying air to or removing it from a space by natural or mechanical means for purposes that include control of air contaminant levels. Ventilation may involve supply of outdoor air, recirculated air that has been filtered or otherwise treated, or a combination of the two. Its primary function is to dilute and displace contaminated air in a space by replacing/mixing it with less contaminated or uncontaminated air. Ventilation is closely connected with space air distribution because air flow patterns impact the effectiveness of delivery of ventilation air and can affect occupant exposure.

In many studies, treated outdoor air ventilation rates have shown a positive correlation with indoor air quality, including reduced sick building syndrome symptom incidence and absenteeism and better task performance and learning performance (Sundell et al., 2011). Likewise, higher ventilation rates are associated with lower incidence of airborne diseases. However, systematic reviews of research on the quantitative relationship between risk of infection and ventilation rate have concluded that sufficient data to specify minimum ventilation rates for infection control does not exist (Li et al., 2007).

ASHRAE Standard 62.1 affirms that the rates in the ventilation rate procedure table are not meant for infection control. “The requirements of this table provide for acceptable IAQ. The requirements of this table do not address the airborne transmission of airborne viruses, bacteria, and other infectious contagions.” (ASHRAE 62.1).

Nevertheless, empirically based ventilation rates for the purpose of infection control have been proposed and even implemented in standards and codes in the past. In the early years of the 20th century, Billings proposed, and ASHRAE’s predecessor society ASHVE recommended, outdoor air flow rates of 30 cfm/person (14.2 L/s-person) based on considerations of infection prevention (Janssen, 1999). Current minimum outdoor airflow rates found in standards are typically about 15 cfm/person (ASHRAE, 2019b). During the Covid-19 pandemic, the World Health Organization recommended minimum outdoor airflow rates of 10 L/s-person (21.2 cfm/person) for non-healthcare facilities and 60 L/s-person (127 cfm/person) for most spaces in healthcare facilities (World Health Organization, 2021). What seems indisputable is that existing minimum outdoor air ventilation rates are significantly lower than levels recommended for infection control. This is due to the use of a definition of indoor air quality that does not address infection risk mitigation.

Naturally ventilated buildings, without mechanical ventilation, are common in much of the world. Using a “push-pull” strategy (with features designed both to introduce outside air and to encourage removal of contaminated air) in these buildings will help deliver a continuous supply of outdoor air with minimal stagnant indoor zones (Gilkeson et al., 2013). This strategy will also help to provide a positive or negative pressurization with respect to the external environment for different modes of operation.

Natural ventilation systems are relatively low in both first cost and operating cost, if appropriately integrated into a building during the design phase. These systems also have a low carbon footprint. However, they are difficult to control with precision, they do not permit temperature or humidity control, and they do not filter the incoming air. Mechanical ventilation systems have significantly higher costs, both for initial installation and for ongoing maintenance and operation. Depending on the local fuel mix, these systems also have a relatively high carbon footprint, in the aggregate. However, given the evidence and effectiveness of mechanical ventilation systems, the key to successful deployment is to ensure the maximum effectiveness without incurring excess costs and increasing carbon emissions by ventilating more than needed to reduce transmission risk.

B. Filtration

Filtration removes particles from air within a space or from air that is recirculated by centralized or distributed HVAC system components. Filters used in HVAC applications are typically mechanical filters made from fibers that capture larger particles mainly by interception and impaction, and finer particles mainly by diffusion. Filters are classified by various schemes such as the Minimum Efficiency Reporting Value (MERV) scale defined in ASHRAE Standard 52.2 (2017). The MERV scale runs from 1 to 16, with larger numbers indicating higher efficiency. Filters performance is assessed in three size ranges: 0.3 to 1 μm (E1), 1 to 3 μm (E2) and 3 to 10 μm (E3). ASHRAE Standard 62.1 generally requires filters in HVAC systems of at least MERV 8, which has no specified minimum efficiency in range 1, 20% in range 2, and 70% in range 3. Given the size distribution of respiratory aerosols, MERV 8 filters have low effectiveness for reducing exposure to infectious aerosols. ASHRAE’s Covid-19 guidance

recommended upgrading of filters to MERV 13 if possible. MERV 13 filters have minimum efficiency requirements of 50%, 85%, and 90%, respectively, in ranges 1, 2, and 3. In healthcare and other critical applications, higher MERV filters and even high efficiency particulate air (HEPA) filters tested to be 99.97% or higher efficiency for 0.3 μm particles may be used. It is important to understand that even though filter ratings are generally based on particles 0.3 μm and larger, they can, in fact, capture much smaller particles.

Since filtration is a mechanism designed to permit the re-circulation of already heated/cooled air, it can be deployed to mitigate risk from infectious aerosols while avoiding an increase in the amount of heating/cooling energy. A filter provides resistance to air movement, so moving air through a filter does require higher amounts of fan energy compared to unfiltered air. Since filtration and recirculation of air avoids the need to heat/cool air, it provides a way to mitigate risk with a smaller operating cost relative to simply taking air from the outside and treating it before use. The relative benefit of filtration varies with both climate and seasonal weather, as the energy for heating and cooling varies.

Filtration has been demonstrated to effectively remove particles that could be infectious (Bueno de Mesquita et al., 2022, p. 11). In addition, as the electrical grid becomes increasingly renewable, the carbon footprint of this measure will reduce, as well as reducing the need for initial heating or cooling energy, which generally derives from on-site combustion with its higher carbon footprint.

Filtration can be performed within the ducts for a system, or in a room with a recirculating system. The strength of evidence for the effectiveness of filtration for recirculated air is relatively high (Bueno de Mesquita et al., 2022). As with other ventilation interventions, the question for filtration is not whether it works; the question is how much is needed for how much impact. Liu et al. (2022) performed the systematic scientific review and reported that there is sufficient scientific evidence that in-room air cleaners (IACs) can eliminate airborne SARS-Co-V2. Beyond the effectiveness of an IAC to remove virus laden aerosols, the size and number of units need to be chosen in the context of the volume of the space they are cleaning. Similar to other filtration systems, IACs are associated with increased energy consumption.

C. Other Air Cleaning Technologies

In addition to ventilation and filtration, other technologies exist that inactivate airborne microorganisms or increase the rate of removal of infectious aerosols from the air by electrostatic effects. These include germicidal ultraviolet disinfection (GUV, also referred to as ultraviolet germicidal irradiation, UVGI), and a number of “electronic air cleaners” that produce various reactive species such as ions, hydroxyl radicals, and peroxides, among others. With the exception of GUV, which has been extensively studied and applied for nearly a century (Kowalski, 2010) and is approved by the US Centers for Disease Control and Prevention as a control for tuberculosis in healthcare settings (Jensen et al., 2005; Whalen, 2009), most of these technologies are not well characterized due to a combination of quality of evidence, and, for some, concerns regarding byproduct production. The current status of air cleaning technologies is reviewed in the ASHRAE Position Document on Filtration and Air Cleaning (ASHRAE, 2021).

The main byproduct of concern for electronic air cleaners is ozone, which can be produced by corona discharge and by certain wavelengths of ultraviolet light. One of the two positions of the ASHRAE Filtration and Air Cleaning position document addresses ozone production. It states that ozone based air cleaners should not be used and that extreme caution should be used if air cleaners produce ozone as a byproduct. This concern and position is further reflected in ASHRAE Standard 62.1-2019 (ASHRAE, 2019b), which requires that all electronic air cleaners pass the UL 2998 standard, which requires no more than 5 ppb ozone concentration in the emission of an air cleaner (Underwriters Laboratories Inc., 2020). Both germicidal UV sources and some types of reactive species air cleaners have received this certification. However, ozone is not the only byproduct of concern. Recent research has reported production of various chemical contaminants and aerosols when reactive species air cleaners are used (Joo et al., 2021; Ye et al., 2021). Reactive species themselves (ions, H22, etc) can also be potentially hazardous (Collins et al, 2021). Whether the amount of such production represents a significant hazard requires further study and is currently one factor that argues for caution in applying air cleaners known to create byproducts.

UV radiation in the UV-C band inactivates microorganisms by affecting genomic and structural components.. The susceptibility of hundreds of microorganisms has been determined experimentally (Kowalski, 2010). The most commonly used germicidal wavelength is 254 nm UV-C produced by mercury vapor or amalgam lamps. Because this wavelength can cause short term eye and skin irritation, and even severe and lasting eye damage, it is applied in ways that prevent or minimize exposure of building occupants. Germicidal ultraviolet systems can be applied in a variety of ways. The oldest implementation of GUV to disinfect air is the “upper room” system in which wall mounted or pendant fixtures create a disinfection zone above the occupied zone. Such systems were first used in the 1930s and demonstrated very good effectiveness against measles and other childhood diseases in schools (Wells et al., 1942). GUV is also effective for airstream disinfection in HVAC systems and in closed air cleaners. (ASHRAE, 2019a) Airstream disinfection systems installed in air handling units can simultaneously prevent microbial growth on cooling coils with resulting reductions in maintenance cost and energy use (Bahnfleth, 2017). Germicidal UV also has been used to disinfect surfaces in unoccupied spaces, in particular, to control healthcare associated infection (HAI) pathogens in healthcare facilities (Weber et al., 2016; Wong et al., 2016).

Emerging germicidal UV source technologies (LEDs and excimer lamps) have the potential to enable new applications of GUV. In particular, “far UV-C” at shorter wavelengths in the UV-C range (approximately 200-230 nm), have demonstrated both good germicidal effectiveness and the potential for safe exposure of occupants. This would permit full-volume irradiation of occupied spaces to simultaneously disinfect air and surfaces, providing protection against both airborne and fomite transmission (Buonanno et al., 2020).

D. Indoor Airflow Patterns

Indoor airflow patterns can affect the flow path of aerosols from the source. The breathing zone of occupants is the most critical space where the concentration and movement of aerosols can directly affect the risk of infection. The effectiveness of ventilation in indoor spaces depends on several factors related to the design and operation of HVAC systems, which can impact the airflow patterns in indoor spaces. Ideally, the clean supply air should sweep the contaminants from the breathing zone

without significant recirculation and stagnation that form pockets of high concentration. Clean air should not escape the space without collecting contaminants from the breathing zone. Indoor airflow patterns, the resulting flow path of airborne contaminants, and the risk of infection can depend on several factors including the number, location, and type of supply diffusers in space; supply airflow rates, air change rates, and associated diffuser throws; supply air temperature; number, size, and locations of return/exhaust grilles; the location and strengths of various heat sources in a room; arrangement of furniture and other obstructions to airflow; location, type, and capacity of in-room air cleaners; and importantly, the relative positions of contaminant sources in space. Strategic selection and layout of air supply diffusers and exhaust grilles can form aerodynamic containment zones of the indoor airflow patterns that can help reduce the risk of contaminant exposure in indoor spaces (Khankari, 2021).

Physical testing and real-time measurements of all the parameters that affect the ventilation performance of enclosed spaces are often time and labor-intensive, if not impossible. In such situations, Computational Fluid Dynamics (CFD) analyses provide a feasible alternative to gain comprehensive insights into the ventilation performance. CFD analyses, if performed properly with adequate expertise, can help designers understand complex indoor airflow patterns and the flow path of aerosols. Such insights gained during the early stages of the design and retrofit process can help improve the ventilation performance and reduce the risk of infection in indoor spaces (Khankari, 2016, 2021).

Effective indoor airflow patterns (Bolashikov & Melikov, 2009; Khankari, 2021) are a primary factor that drives the dilution and not solely quantity of air that is supplied to the space. No studies have provided sufficient data to quantify the amount of ventilation needed to achieve effective risk mitigation (Bueno de Mesquita et al., 2022; Li et al., 2007). The key underlying reason is the lack of data related to the infectious source strength and dose-response to estimate the necessary level of dilution (Li et al., 2007; Pantelic & Tham, 2012).

There has been an increased awareness of IAQ in the microenvironment during the COVID-19 pandemic that has led to the exploration of innovative ventilation systems and indoor airflow strategies. Personalized ventilation systems that supply 100% outdoor, filtered, or UV-disinfected air directly to the occupant's breathing zone could offer protection against exposure to contaminated air and mitigate the risk of infectious aerosol transmission (Bolashikov et al., 2009; Cermak et al., 2006; Danca et al., 2022; Ghaddar & Ghali, 2022; Licina, Melikov, Pantelic, et al., 2015; Licina, Melikov, Sekhar, et al., 2015; Pantelic et al., 2009, 2015). Personalized ventilation systems, when coupled with localized or personalized exhaust devices, further enhance the overall ability to mitigate exposure in breathing zones, as seen from both experimental and CFD studies in healthcare settings (Bivolarova et al., 2016; Bolashikov et al., 2015; Yang et al., 2014; Yang et al., 2013, 2014, 2015). There are no known epidemiological studies that clearly demonstrate a reduction in infectious disease transmission from indoor airflow patterns.

Evidence of the effectiveness for indoor airflow control to mitigate risk from infectious aerosols is moderate (Bueno de Mesquita et al., 2022, p. 15).

Indoor airflow pattern control incurs little additional cost or carbon beyond basic ventilation strategies, but may require more extensive design expertise with attendant costs.

E. Humidity and temperature control

Research suggests that the persistence of various infectious pathogens in aerosols may be affected by environmental conditions, including temperature and humidity (Tang, 2009). Different pathogens respond differently to varying temperature and humidity conditions. Therefore, attempting to modify risk through these mechanisms is problematic. "Although evidence exists that survival time of SARS-CoV-2 virus is longer at low temperature and humidity, it is not clear that manipulation of either temperature or humidity as risk mitigation measures will have a major impact compared to other controls." (W. Bahnfleth & Degraw, 2021) (Yang & Marr, 2011).

Humidification imposes significant costs for both installation and operation, and generates a significant energy and carbon footprint It can also create other microbial issues (e.g. mold growth) within the built environment.

F. Demand-controlled ventilation

Ventilation has long been based on estimates of the number of people in a space or the volume of the space. These are static estimates of the necessary flow and do not always adjust as occupancy changes. The use of carbon dioxide (CO2) concentration as a proxy for ventilation rate per occupant, is commonly used to modulate the flow of ventilation air (Bhagat et al., 2020; Franco & Schito, 2020; Zivelonghi & Lai, 2021). However, there are challenges with this approach as CO2 measurements may not always be representative of the actual demand in a given space, especially with multi-zone recirculation type VAV systems. Additionally, it is important to note that CO2 concentration is unaffected by filtration and most other air cleaning methods, so it should not be used as a direct indicator of infection risk. ASHRAE has developed a separate Position Document and guidance documents that address the use of CO2 for control of indoor air quality, including risk of airborne infection. (ASHRAE, 2022).

New sensor technologies allow for the direct measurement of fine airborne particulate (PM2.5), which may include infectious aerosols (Kaliszewski et al., 2020). Increasing availability and falling cost of PM sensors suggests that their use for ventilation control may be feasible. Low-cost IAQ sensors for continuous monitoring (Zhang et al., 2021) and as early warning systems for COVID-19 infections (Peladarinos et al., 2021) have been reported. While the sensors cannot differentiate between infectious aerosols and other types of particulate matter, the concentration of fine particulates is an important measure of air quality that can be used to modulate the flow of ventilation or control of air cleaning systems. Additional research and application protocols are needed, including protocols to validate performance..

**NON-ENGINEERING CONTROLS FOR AEROSOL TRANSMISSION**

Non-engineering controls generally target reduction of the source, and protection of vulnerable new hosts.

A. Pharmaceutical Controls

Pharmaceutical controls include vaccination, prophylaxis, treatment, and other strategies. In general, these strategies work to reduce the source (e.g. number of infected persons, amount of aerosolized

pathogens), and to protect the vulnerable new host. These strategies generally do not work to affect the path of transmission.

Two features of pharmaceutical controls make them problematic in some ways. First, pharmaceutical controls rely on public adherence, and adequate access. Experience shows that neither is perfect, and, so, by themselves, pharmaceutical controls can be insufficient to the task. Second, especially in the context of an epidemic, where velocity of change in risk is high, these controls may not be adequate to the risk mitigation need.

Therefore, as with other non-engineering control measures, this one is vitally important, but often insufficient by themselves .

B. Elimination of the Hazard

Elimination of the hazard literally separates sources of infection from uninfected populace. Examples of such interventions might include stay at home orders to keep people from coming into contact with one another to minimize risk of transmission or closing buildings or spaces to some or all people. Other examples of this kind of elimination strategy are social distancing (separating the source of infection by a distance calculated to mitigate the risk of transmission) and barriers between persons in a space. In the case of droplets, but not aerosols, barriers between people in a space can mitigate transmission risk (Wang et al., 2021, p. 15).

Elimination-of-the-hazard strategies are highly dependent upon compliance by the population, and therefore, they are heavily dependent upon voluntary compliance. During normal times, threat levels are low enough that sloppy uptake and adherence is relatively unimportant. Variation in compliance during epidemics and in high-risk locations may be highly problematic and will call on leaders to lead responsibly and effectively.

The recent experience with COVID-19 shows dramatically the potential variance in uptake of such measures, and the ensuing results for local, regional, national and international populations.

In some sense, stay at home orders might be seen to be relatively low-cost, low-energy interventions. However, they also have serious economic implications to certain segments of the working population, as well as to the economy as a whole. Some workers, deemed to be essential, must continue to work through a time of elevated risk, creating stark inequities in terms of risk exposure. These factors accumulate as their enforcement endures over time.

C. Administrative Controls

Administrative controls are exercised by the entities who control access to, and use of particular spaces. These strategies include shutting down buildings or spaces; limiting the number of people and duration of occupancy in buildings or spaces; and requirements for vaccinations, testing, and PPE.

The strategy of shutting down buildings or spaces altogether by definition eliminates the risk within those buildings and spaces. The cost and energy/carbon impacts are both relatively low, in terms of direct cost. However, the cost to an economic entity, the people who must derive their incomes from

working there, the people who are denied services that might have come from the activities in the building, and the cost to the economy as a whole can be huge.

A more nuanced approach is to use administrative controls to limit the number and distance between people in a building or space, including limiting the amount of time that one or more persons are permitted into a space. The efficacy of this strategy will vary as a function of pathogen reproduction rates, and the details and effectiveness of the implementation. On the whole, however, this strategy can mitigate the costs of the building shut-down strategy while capturing many of the benefits. It will therefore reduce many of the indirect costs of the building shut-down strategy while imposing additional costs to the entity implementing the administrative controls.

A third class of administrative controls is over the personal behaviors of the building occupants. That is, the entity controlling access to a building or space can require proof of vaccination, or testing, or PPE as a condition precedent to a person entering a space. This strategy uses the high efficacy of the individual strategies with an overlay of administrative control to enforce certain levels of risk mitigation. In general, this kind of strategy is a higher cost than administrative controls focused strictly on numbers, but with higher efficacy. Building owners must account for jurisdictional laws regulating the disclosure of personal health information when requiring roof of vaccination or testing.

D. Cleaning

Cleaning may provide a benefit when aerosolized or droplet pathogens may be deposited on surfaces where they have a long enough life to come into contact, either physical or re-entrainment in the air – with an uninfected person. Thorough cleaning in its many forms can greatly mitigate this risk, where it occurs. Evidence of benefits of cleaning to reduce transmission of aerosolized pathogens, however, is weak (Bueno de Mesquita et al., 2022, p. 15).

E. Masking and PPE

Masking can either contain a pathogen, if the wearer is infected, or protect against a pathogen, for non-infected persons. Evidence shows that this strategy can be highly effective, and has very low costs and very low carbon impact (Wang et al., 2021).

F. Barriers

The use of plastic barriers within a space may provide some mitigation against spray of droplets at short distances, but only with corresponding modifications to ventilation systems (Capron, et. Al 2022). In some cases, plastic barriers within rooms increase risk (de Meszuita, 2021) . Height of barriers are more impactful than width of barriers. Evidence for the effectiveness of barriers is low, but costs and energy costs are low.

## Appendix B: Strength of Recommendations Taxonomy Analysis

A. Introduction

This appendix attempts to bridge the world of evidence based medicine (EBM) and the imperative to use available evidence to make needed recommendations in the practical world of application of ventilation systems. Historically, the world of application of ventilation systems has not had the kinds of investments into research necessary to reach the levels demanded by the rigors of EBM. However, decisions have to be made, based on the best available evidence. Bringing these worlds together brings a level of transparency and rigor to the practical need for guidance to policymakers, while also representing a call for further research to provide us with better data in the future.

Policymakers confront innumerable challenges in determining how to allocate incentives and penalties in guiding the public towards outcomes that best balance risks and rewards. The science of ventilation is still imprecise with respect to the specification of minimum rates to control transmission of infectious aerosols. Thus, policymakers need to have the most rigorous, transparent information at their disposal with which to make needed determinations. Policymakers also need to prioritize research to better determine the effectiveness of the various strategies so as to permit better prescriptions in the future. The methodology used in this exercise takes an important step towards addressing this need.

Because we are dealing with interventions targeting a health outcome - we are using ventilation as an intervention to reduce risk of infection - we have chosen to develop a version of a tool commonly used in Evidence Based Medicine (EBM).

The essence of EBM is to provide guidance to practitioners and policymakers by integrating the best research evidence with clinical expertise and patient values (Sackett et al, 2000), as well as the setting and circumstances in which health interventions are being delivered (G. Guyatt et al., 2008). A central methodology for EBM is the use of Strength of Recommendation Taxonomy (SORT). In general, SORT methodologies try to assess the evidence supporting the use of a particular intervention, balanced against undesirable aspects of the intervention, such as side-effects (G. H. Guyatt et al., 2008).

Direct translation of EBM methodologies to the science of ventilation is difficult, due to the type of evidence generally available for informing ventilation decisions. This effort uses an appropriate SORT to provide both rigor and transparency, in ways that should elevate the credibility of the recommendations.

B. Measuring Quality of Evidence

The SORT begins with an assessment of available evidence. Here, the Quality of Evidence was assessed using the below described methodology. A search question was developed for each intervention comparing outcome with and without the specific engineering measure. i.e., in areas with airborne pathogen transmission (Population), what is the effect of Air Cleaning (UVGI) (Intervention) on respiratory pathogens transmission (Outcome) compared with settings without UVGI technology (Control). With the developed PICO (Population, Intervention, Control, Outcome), a literature search was done in JSTOR digital library, PubMed and ScienceDirect.

Only systematic reviews addressing the specific intervention and respiratory pathogens were included. Only 6 papers were finally included.


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While the quality of evidence from the strict perspective of Evidence-Based Medicine is low, another class of studies, properly classified as “Natural Experiments” has gained attention in areas where controlled trials are difficult (DiNardo, 2008) (Dinardo, 2010). Indeed, the 2021 Nobel prize in economics was awarded to pioneers in the use of Natural Experiments. In some sense, the kinds of studies generally available with respect to the value of ventilation in mitigating risk, as powerfully exemplified by the work of the ASHRAE Epidemic Task Force during the Covid crisis, fall squarely in this domain. And, while the worlds of science and law may have an uneasy relationship, various legal standards for decision making use a preponderance of such evidence in the face of uncertainty – the kind of uncertainty that inevitably faces policymakers. In coming to their conclusions, experts such as those carefully assembled for this Position Document must rely heavily on such Natural Experiments, along with fundamental, inviolable laws of physics combined with an understanding of exposure and dose, to inform their judgments. And, so, we have expressed the available evidence from the strict perspective of Evidence Based Medicine and the indirect evidence from the perspective of the Natural Experiments and fundamental science currently available to us.

C. Assessing the Benefit, Cost, and Energy/Carbon Impacts of an Intervention

A key insight for SORT is the balance between "the desirable and undesirable consequences of the alternative management strategies, on the basis of the best estimates of those consequences" G. H. Guyatt et al., 2008). In our case, the benefits are impossible to quantify. That is, given the wide range of pathogens of different virulence and infectivity, coupled with the uncertain adoption of other non-ventilation interventions, the line-drawing problem associated with ventilation strategies (how much better are 4 air changes per hour than 2?); and the difficulty of predicting the frequency of occurrence make the benefits impossible to state with precision. Therefore, we rely on a multi-disciplinary, expert consensus-based estimate of effectiveness using the Delphi Technique. (Yousuf, 2007)

The Delphi Technique obtains consensus within a panel of experts through a series of questionnaires that are fed back to the panel after each subsequent round. It was the most suitable method for this committee because:

1. The Delphi methodology gathers opinion without the need to bring panelists together physically; especially problematic with a cohort of experts geographically dispersed.
2. Questionnaires are completed independently and confidentially, preventing the dominance of particular individuals and allowing participants to express their ideas without worry of being associated with those ideas. This could not be achieved using focus group discussion.
3. The feedback process encourages participants to consider items raised by others which they may have missed themselves and allows them to change opinion throughout the process (Couper, 1984) . It also presents the group collective opinion in a non-adversarial manner (Hasson et al., 2000). This type of feedback mechanism is absent from direct interviews. (Smithson, 2000)

The technique involves three basic steps.

The first survey or questionnaire sent to the panel of experts (in this case, the members of this committee) asks for a list of opinions involving experiences and judgments and a list of predictions. In the second round, a copy of the collective list is sent to each expert, and the expert is asked to rate each item by criterion of importance provided in the survey. The third questionnaire includes the list, the ratings indicated, and the consensus. The experts are asked to either revise their opinions or discuss their reasons for not coming to consensus with the group.

The cost of each item was assessed as an "average" of life cycle cost, including both first cost and on-going cost. These costs are a kind of aggregate average, and do not necessarily reflect the relative costs in any particular location. Note that this estimate is a relative one, in that it distinguishes between absolute costs, and not costs in the context of available resources. So, for example, one strategy might be considered low cost in a relatively affluent setting, but a high cost in a relatively low-resourced setting. Nonetheless, in either event it will be lower in cost than other alternatives, and, so, we note it to be a low-cost strategy.

A second dimension of cost is the cost in energy consumption and resulting carbon emissions. Recognizing the science and the urgency of the need to address climate change, together with the heavy influence of the built environment on this critical issue, ASHRAE has recently created a team to study ways to decarbonize buildings. Consistent with the science and the direction of this

organization, we thus provide relative estimates of the lifetime emissions potential of the strategies under consideration. Obviously, the urgency of an epidemic may outweigh the much more diffuse and longer-range impacts of climate change associated with a particular strategy. However, we also recognize that the mass deployment of a particular strategy that is higher in global warming potential (GWP) will create a permanent source of emissions. So, in comparing two potential strategies, each with similar evidence and similar benefit, we should prefer the solution with lower GWP.

## D. Recommendations

The final step in a SORT is to reach a recommendation based on the strength of evidence and the balance between desirable and undesirable aspects of a particular intervention.

Some versions of SORT use algorithms to derive the strength of recommendation from the Benefit, Cost and Strength of Evidence. In our assessment, due to the relative lack of definitive research, we again used the Delphi technique to best determine the consensus of our Committee of Experts. The resulting table, then, expresses our best attempt to tier our recommended measures for risk mitigation, based on the best evidence we were able to assemble. This exercise indicates a need for a multi-disciplinary in-depth research involving these techniques and a large pool of subject matter experts from a wide variety of disciplines.

## E. Summary of Strategies

The current evidence of the association between ventilation rate and airborne infection is weak in terms of study design. However, there is solid indirect evidence to show that increased ventilation and related strategies discussed herein are associated with a reduced risk of airborne infection(Li et al., 2007). Ventilation mitigates risk, but the minimum ventilation requirements to mitigate the risk of infectious aerosols demand further investigation.

We acknowledge that, from the strict perspective of rigorous evidence-based medicine, the available evidence has low quality due to the specific set of methods and procedures used to collect and analyze data in ecological and retrospective studies. The ethical limitations, the multiple factors involved in airborne mechanisms and the specificity of indoor ventilation dynamics, urge an innovative methodology to produce solid evidence to inform building environment regulatory bodies and public health institutions.

| Strategy | Quality of evidence (from EBM perspective) | Indirect evidence | Magnitude of Benefit | Life Cycle Cost | Energy and Carbon | Strength of Recommendation |
|---|---|---|---|---|---|---|
| Physical distancing | Moderate | High * | Moderate | Low | Low | Strong recommendation |
| Barriers between occupants | Low | Low * | Low | Moderate | Low | Conditional recommendation |
| Surface and object cleaning | Low | Moderate * | Low | Low | Low | Conditional recommendation |
| Face mask | Moderate | High * | High | Low | Low | Strong recommendation |
| Right-sized ventilation -Natural | Low | High ** | Moderate | Low | Low | Strong recommendation |
| Right-sized ventilation - Mechanical | Low | High ** | High | High | High | Strong recommendation |
| Filtration (requires mechanical ventilation) | Moderate | High ** | Moderate | Moderate | High | Recommendation |
| Air Cleaning (UVGI) | Moderate | High ** | Moderate | High | Moderate | Conditional recommendation |
| Air Cleaning (Other) | None | Low ** | Low | High | Moderate | Weak recommendation |
| Indoor airflow patterns | Moderate | High ** | High | Moderate | Low | Recommendation |
| Humidity control (requires mechanical ventilation) | None | Low ** | Low | High | High | Weak recommendation |

* Schenk et al., 2021

** Bueno de Mesquita et al., 2022

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## DOCUMENT REVISION COMMITTEE ROSTER

*The ASHRAE Position Document on Infectious Aerosols was developed by the Society's Position Document Revision Committee formed on Date (Month, day, year), with Walt Vernon as its chair.*


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*The chair of Environmental Health Committee also served as an ex-officio member.*


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## DOCUMENT HISTORY

The following summarizes the revision, reaffirmation, or withdrawal dates:

6/24/2009—BOD approves Position Document titled *Airborne Infectious Diseases*

1/25/2012—Technology Council approves reaffirmation of Position Document titled *Airborne Infectious Diseases*

1/19/2014—BOD approves revised Position Document titled *Airborne Infectious Diseases*

1/31/2017—Technology Council approves reaffirmation of Position Document titled *Airborne Infectious Diseases*

2/5/2020—Technology Council approves reaffirmation of Position Document titled *Airborne Infectious Diseases*

4/14/2020—BOD approves revised Position Document titled *Infectious Aerosols*

xx/xx/2022—BOD approves revised Position Document titled *Infectious Aerosols*