



1791 Tullie Circle, N.E./Atlanta, GA 30329  
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**DRAFT**

**TC/TG/MTG/TRG MINUTES COVER SHEET**

**(Minutes of all Meetings are to be distributed to all persons listed below within 60 days following the meeting.)**

TC/TG/MTG/TRG No. TC 2.8 DATE June 25, 2018

TC/TG/MTG/TRG TITLE Building Environmental Impacts and Sustainability

DATE OF MEETING June 24, 2018 LOCATION Houston, TX

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
Ashish Rakheja	2016	Calina Ferraro	2015	Joy Eileen Altwies, PhD
William L Stanton Stafford, PE	2016	Janice K Means, PE	2016	James C Bradburn, PE
Kevin R Brown	2016	David L Grumman, P.E.	2016	Paul A Torcellini
Thomas M Lawrence	2016	John M Swift, Jr	2014	Elbert G Phillips
Fred Betz, PhD	2017			Brittany Carl
J Kevin Cross	2016			Douglas D Fick, PE
Abdel Darwich	2017			Katherine Hammack
Ng Yong Kong, P.Eng., GBIF	2014			Renee Clair
Francis A Mills	2014			Sumayyah Theron
Lisa Chen Ng, PhD	2016			Elizabeth Jedrlinic
Mitchell Swann, PE	2014			Fitsum Tariku
				Aziz Laouadi
				Wahid Maref
				Tracy McKeon
				David Klug
				Tania Ullah
				Eric Haley
				Joseph Rendall
				Sneha Jain

				Priyam Tewari
				Steven Emmerich
				James Zensen
				Gary Riggle
				Bing Dong
				Steven Carlson
				Stan Sveen
				Shawn Walton
				Tim Dwyer
				James Sweeney
				Mike Pascual
				Rafi Karim

**DISTRIBUTION: All Members of TC/TG/MTG/TRG plus the following:**

TAC Section Head: Elbert Phillips	SHx@ashrae.net Where x is the section number
All Committee Liaisons As Shown On TC/TG/MTG/TRG Rosters (Research, Standards, ALI, etc.)	See ASHRAE email alias list for needed addresses.
Mike Vaughn, Manager Of Research & Technical Services	MORTS@ashrae.net

Note: These draft minutes have not been approved and not the official, approved record until approved by the TC.

## TC 2.8 Building Environmental Impacts and Sustainability

Sunday, June 24, 2018, 5:30-7:00 pm

Houston, TX

### 1. Roll call and Introductions (Rakheja)

- 1.1. Meeting called to Order at 5:32
- 1.2. Introductions
- 1.3. Roll Call / Quorum – quorum present (10 members including Chair, one additional joined later)

### 2. Accept Agenda/Approve Minutes of Previous Meeting (Stafford)

- 2.1. Review Meeting Agenda
- 2.2. Approval of Chicago Meeting Minutes:
  - 2.2.1. vote to approve– (10-0-0-4-CNV)

### 3. Announcements/Membership (Rakheja)

- 3.1. Request for articles for ASHRAE anniversary (2019-2020)
- 3.2. From CEC – looking for volunteers to assist with quality review of programs
  - 3.2.1. August 3<sup>rd</sup> deadline for Atlanta programs
  - 3.2.2. August 21 is deadline for paper abstracts for Kansas City
  - 3.2.3. Beginning summer 2019, extended abstracts will be allowed

### 4. Standing Committee Liaisons TAC/RAC/StdCom/Program/SpecPub/ALI

- 4.1. Pawel Wargocki – RAC Liaison Section 2: gave a short report, and mentioned that we will go into Executive session for 1814-TRP bidder selection; asked for comments and questions for RAC
- 4.2. Bert Philips – presented a certificate of appreciation to Ashish Rakheja for his work as TC Chair
- 4.3. Tom Lawrence (For TAC): There's a new TC being formed on Resilience, likely could be approved Wednesday (from an existing TG). Could be a collaboration opportunity. MTG.OBB may also convert to a full TC.

### 5. Subcommittee Reports

- 5.1. GreenGuide (Lawrence)
  - 5.1.1. There was no meeting today (5<sup>th</sup> edition came out last year).
  - 5.1.2. Tom is working on a textbook version, beta testing in his classes this fall
  - 5.1.3. After that, will consider future updates to GreenGuide (possibly 2021).
- 5.2. Standards (Lawrence/Fick/Swift)
  - 5.2.1. SPC 189.1 Standard for the Design of High-Performance Green Buildings except Low-Rise Residential Buildings (Lawrence/Persily)
    - 5.2.1.1. ASHRAE doesn't sell it in North America anymore (now housed inside IgCC).
    - 5.2.1.2. Meetings are Tuesday and Wednesday AM
  - 5.2.2. SPC 189.3P Design, Construction and Operation of High Performance Green Healthcare Facilities (Fick)
    - 5.2.2.1. Meets Monday AM.
    - 5.2.2.2. In process of reviewing 189.1 and updating 189.3 (referencing issue on timing – can't reference an unpublished document).
    - 5.2.2.3. Both documents exist outside of North America.

- 5.2.2.4. Steven Emmerich asked if anyone would be interested in participating on a 189.2 committee (on behalf of Standards). Could be forming due to dissolving of partnership with NAHB.
- 5.2.2.5. Frank asked if these are still international – might want to review the documents to make sure they are still usable in other countries. Doug Fick and Katherine Hammack will bring up in the respective committees.
- 5.2.3. SPC 191P Standard for the Efficient Use of Water in Building, Site and Mechanical Systems (Betz/Swift)
  - 5.2.3.1. Meeting Tuesday AM to go through 2<sup>nd</sup> public review comments
  - 5.2.3.2. Will be a 3<sup>rd</sup> public review
  - 5.2.3.3. Want to get it out before Atlanta.
- 5.3. Handbook (Brown)
  - 5.3.1. Did not meet today
  - 5.3.2. Chapters aren't due until 2022 Fundamentals
  - 5.3.3. Likely to meet in Kansas City
  - 5.3.4. There's a Handbook breakfast meeting on Sundays – new editing and doc sharing scheme
- 5.4. International (Mills)
  - 5.4.1. Hot Climate Design Guide is in progress – strong international participation
  - 5.4.2. Focusing more on Hot Dry climates – looking for low energy, low carbon, net zero solutions, finding some conflicts with water usage
  - 5.4.3. Will be about 80% complete in Atlanta, want to publish by next meeting
  - 5.4.4. Working on a net zero hospital guide with REHVA, may come to Atlanta with draft
  - 5.4.5. Developing economies – possibly in Brazil for next conference (theme of air quality and thermal comfort in the developing world).
- 5.5. Water-Energy Nexus (Karim/Pascual)
  - 5.5.1. Three action items going forward: wholistic water-energy management guidelines in buildings; looking at what data are available on water-energy nexus and proposing an RTAR; propose a program for winter meeting on water reclamation in large facilities, alternative water treatment including cooling towers
- 5.6. Research (Altwies)
  - 5.6.1. 1814-TRP received bids this spring; PES met to select bidder in June
    - 5.6.1.1. TC voted to accept PES recommendation for selected bidder at end of meeting in Executive Session (9-0-0-5 CNV)
  - 5.6.2. New RTAR from Betz and Dong on “Water Use Metrics and Patterns in Residential” ready to submit to RAC with TC approval
    - 5.6.2.1. Vote to approve (11-0-0-3 CNV)
  - 5.6.3. Two additional RTARs are nearing completion:
    - 5.6.3.1. First from Lisa Ng on VOC measurements which is going through some revisions based on feedback from 62.1. This was voted for approval by TC 2.8 in Chicago but will likely need a revote when final wording approved by 62.1.
    - 5.6.3.2. Second from Jim Sweeney and Kevin Cross on embodied energy - this will likely be completed and ready for feedback and TC vote during July (to meet RAC August 2018 deadline).
  - 5.6.4. Full subcommittee meeting minutes attached in Appendix
- 5.7. Programs (Brown)
  - 5.7.1. Full subcommittee minutes attached in Appendix
- 5.8. Existing and Future Building Challenges (Macauley/Brown)
  - 5.8.1. No report for this meeting
- 5.9. Website (Ng)
  - 5.9.1. No report

## **6. Related Activities Reports**

- 6.1. ASHRAE Advanced Energy Design Guides Update (Torcellini)
  - 6.1.1. AEDG for Zero Energy Offices – peer review will be Labor Day weekend; another review in November
- 6.2. ASHRAE bEQ:
  - 6.2.1. No report

## **7. Old Business**

- 7.1. Net Zero Energy Standard (Torcellini)
  - 7.1.1. Draft Title-Purpose-Scope (T-P-S) is available – does this TC see a need? Should we carry it forward?
  - 7.1.2. Committee voted to move forward with approval (8-0-0-6 CNV)

## **8. New Business**

- 8.1. Developing guidelines on passive survivability
  - 8.1.1. USGBC is coming out with a resiliency certification
  - 8.1.2. One of the elements is passive survivability – can the occupants shelter in place? For how long?
  - 8.1.3. USGBC was starting to develop guidance – but this is ASHRAE expertise (temperature and humidity ranges will be wider, for example)
  - 8.1.4. USGBC wants something in 12 months
  - 8.1.5. Katherine Hammack sent out a Title-Purpose-Scope (TPS) today
  - 8.1.6. May not be entirely passive systems
  - 8.1.7. Next step would be for this TC to approve TPS and create a committee
  - 8.1.8. Some concern about being able to do this fast enough
  - 8.1.9. Mitchell noted that there's some faster processes (such as used in TC 1.7), "survival guides", that are shorter and faster to create (guidance documents)
  - 8.1.10. Evolution of the Existing Buildings committee will take this on
  - 8.1.11. TG2 on HVAC Security will participate – meet on Tuesday at 9AM
  - 8.1.12. Vote to support further development of Resilience scoping documents (10-0-0-5 CV)

## **9. Adjourn**

- 9.1. Motion passed (9-0-0-5-CNV)

***NEXT MEETING: Sunday, January 13, 2019, Atlanta, GA***

**TC 2.8 Web Site**

<http://tc0208.ashraetcs.org>

To subscribe or unsubscribe to the list, you can go to the TC 2.8 list web site:

<http://lists.onebuilding.org/listinfo.cgi/tc28-l-onebuilding.org>

This list is only for communications related to ASHRAE TC 2.8 Building Environmental Impacts and Sustainability. Do not distribute messages of any commercial nature.

To send a message to all subscribers to the list, address your message to:

[tc28-l@lists.onebuilding.org](mailto:tc28-l@lists.onebuilding.org)

*Note: ASHRAE does not operate this list. Please do not ask them for help. If you have any questions, please contact: Jason Glazer [JGlazer@gard.com](mailto:JGlazer@gard.com)*

*Thanks to Jason and GARD Analytics for hosting this list!*

**Upcoming Conferences:**

2019 Winter Conference: Atlanta, GA  
2019 Annual Conference: Kansas City, MO

Information on these ASHRAE Conferences can be found on ASHRAE's website under Events –

[www.ashrae.org](http://www.ashrae.org)

**TC2.8 Research Subcommittee Minutes**  
 June 24, 2018, Houston GRBCC Floor 3, 382C  
 3:00 PM to 3:45 PM

Attendees: Joy Altwies, Brittany Carl, Fred Betz, Kevin Brown, Bing Dong, Steven Carlson, Mitchell Swann, Jim Sweeney, Kevin Cross, Lisa Ng, Xiaohui Zhou, Sadam Abdelmetaal, Hannah Fontenot, Alberto Samaniego, Tania Ullah, Scott Hackel, Aziz Laouadi

1. Introductions
2. Update on status of active TC 2.8 research:
  - 1814-TRP** Actual Energy Performance of Buildings Designed to Comply with ASHRAE Standard 90.1-2010
    - Was released for bids in spring 2018
    - Bids were received in May 2018, PES met in June 2018 to select recommended bidder
    - Recommendation will be voted on by full TC 2.8 voting members during Executive Session in Houston
    - At this time no further details can be provided publicly until ASHRAE awards the contract
3. Follow up on previous business and research topic ideas.
  - Review of topics in table below
4. Info from RAC
  - Next deadline for submitting items to RAC: August 15 - will use 4 dates every year from now on (March May August December). **The December 2018 date is earlier (Dec. 3) due to the early dates of the Atlanta meeting.**
  - RAC will have a webinar for PMS training, likely in September. They will send out an announcement.
  - RAC would like us to create a "Plain English Abstract" to accompany Work Statements. This will help disseminate ASHRAE research to a wider audience of non-technical readers.
  - There is a searchable database of past research reports. This link allows you to access final information, such as, title, source, contractor, principal investigator, start and end dates, resulting papers, and if final report is available. Find it here: **[research.ashrae.org](http://research.ashrae.org)**

List of research topic ideas:

Research Topic Idea	Generated by	Update/Status	Next Step
ACTIVE: <i>Training Requirements for Sustainable, High</i>	TC 7.3, Michael Bobker	Kevin Brown (and Lisa Ng) volunteered to	Kevin will continue to participate as the liaison.

<i>Performance Building Operations (TC 7.3, 1650-RP)</i>		attend. They will always meet on Tuesdays. RP is on-going and working on the definitions. They have been slowed due to smaller than expected response to survey.	
ACTIVE: Ventilation – Field Analysis of Low-Emitting Buildings (Study of Contaminants – Update an VR Table in 62.1, Area-Based)	Lisa Ng. 62.1 Ventilation Subcommittee	Full TC 2.8 voted to cosponsor at main meeting in Jan 2018.	Lisa made some updates based on feedback from 62.1. Once they vote and a final RTAR is ready, TC2.8 will revote on it.
ACTIVE: Water Use Metrics and Patterns in Residential	Bing Dong and Fred Betz	An RTAR was written and discussed with RAC liaison in May 2018. Too close to May 15 deadline to get a full TC vote to submit.	TC 2.8 voted at the main meeting to approve this RTAR for submission to RAC. Bing is expecting to get a co-sponsor during this meeting and will update the form before submitting.
ACTIVE: Embodied energy of building systems & equipment – how much more efficient does it need to be to outweigh its embodied energy?	Kevin Cross & Dunstan Macauley, Jim Sweeney	Jim is working on an RTAR – it is tentatively titled “A simplified approach to evaluate the life cycle energy of building components and equipment.”	Jim got some final comments from Kevin and plans to send it around for input during July. Plan is to get a vote from TC 2.8 by mid-late July to submit to RAC by August 15 deadline.
NEEDS STATUS UPDATE: Review of What Makes Water Reuse Systems Work (or Not Work) from an O&M Perspective	Michael Bobker (7.3, 3.6)- Energy-Water Nexus	New topic added June 2017. Idea is somewhat of a “lessons learned”, perhaps start with a forum at a meeting.	Kevin Brown will follow up with Michael on status of this idea.
NEEDS STATUS UPDATE: Comparing high-performance homes to code-built homes	Dunstan Macauley	Keep on list or drop?	Dunstan was not present at the TC 2.8 meeting(s) in Houston. Will keep on list one more meeting then drop (after Atlanta).
NEEDS STATUS UPDATE: Geothermal technologies in hot climates – international	Ashish Rakheja	Ashish will work to find someone to write the RTAR.	No update on this from Ashish. Will keep on list one more meeting then drop (after Atlanta).



ON HOLD: Net Zero Energy Hospitals	Frank Mills	This was added at the Jan 2017 main TC 2.8 meeting. REHVA is looking for ASHRAE to publish a design guide on this. They are working on funding.	Frank said to keep this idea on hold for now.
ON HOLD: Do buildings built to Standard 189.1 perform as expected?	Kevin Cross, Joy Altwies, Tom Lawrence	Kevin Cross and Brent Stephens developed an early stage RTAR. Keep on list, pending research from 1814. Will keep this one as “special” long-term idea since it would be a follow-on in the same format as previous successful research projects.	Keeping on hold.
DROPPED: <i>A Guideline for Calculating the Avoided Source Energy Consumption (ASEC) Due to Waste Heat Recovery (WHR) and Heat Pump (HP) Technologies (MTG.ASEC 1804-WS)</i>	MTG.ASEC	As of RAC’s winter 2017 meeting, WS was <b>Returned with comments.</b>	At the RAC Breakfast on 6/25/18, it was determined that the MTG.ASEC was disbanded and this WS was dropped. Will be removed for Atlanta agenda.
DROPPED: Grid impacts – can buildings be an energy storage mechanism that shifts efficiency strategy?	Mark MacCracken	Drop from list – Mark noted that similar research is already in progress.	Will remove from list for Atlanta agenda.
<b>New Research Topic Idea</b>	<b>Generated by</b>	<b>Update/Status</b>	<b>Next Step</b>

For more information, visit ASHRAE’s research web site here: [ashrae.org/research](http://ashrae.org/research)

Anyone interested in pursuing research topics (including those who generated ideas above) are asked to take a look at the RTAR form to start fleshing out their ideas. You may need to **copy the links and paste into your browser address bar:**

- The latest RTAR template form can be accessed here:  
[https://www.ashrae.org/File%Library/docLib/Research/RTARs/RTAR-Form-Template\\_2015.08.28.r1.docx](https://www.ashrae.org/File%Library/docLib/Research/RTARs/RTAR-Form-Template_2015.08.28.r1.docx)
- and an example RTAR is shown here:  
<https://www.ashrae.org/File%20Library/docLib/Research/RTARs/EXAMPLE-RTAR.pdf>

**For reference:** Current (extended through 2018) ASHRAE Strategic Research Plan Goals. Ideally, research topics should address one of these goals:

1. Maximize the actual operational energy performance of buildings and facilities
2. Progress toward Advanced Energy Design Guide (AEDG) and cost-effective net-zero-energy (NZE) buildings
3. To reduce significantly the energy consumption for HVAC&R, water heating and lighting in existing homes
4. Significantly advance our understanding of the impact of indoor environmental quality (IEQ) on work performance, health symptoms and perceived environmental quality in offices, providing a basis for improvements in ASHRAE standards, guidelines, HVAC&R designs and operation practices
5. Support the development of ASHRAE energy standards and reduce effort required to demonstrate compliance
6. Building Information Modeling (BIM) of energy efficient, high-performing buildings
7. Support development of tools, procedures and methods suitable for designing low energy buildings
8. Facilitate use of natural and low global warming potential (GWP) synthetic refrigerants and seek methods to reduce refrigerant charge
9. Support the development of improved HVAC&R components ranging from residential through commercial to provide improved system efficiency, affordability, reliability and safety
10. Significantly increase the understanding of energy efficiency, environmental quality and the design of buildings in engineering and architectural education
11. Understand influences of HVAC&R on airborne pathogen transmission in public spaces and develop effective control strategies

The full ASHRAE document explaining these goals in detail can be found here (copy/paste into browser address bar):

<https://www.ashrae.org/File%20Library/docLib/Research/StrategicPlan/ASHRAE-RSP-10-18-Brochure-v3.pdf>

# TC 2.8 Program Subcommittee Minutes

2018 ASHRAE Annual Meeting; George R. Brown 3<sup>rd</sup> Floor: 371 DE  
Houston, TX  
4:15pm – 5:00pm

## I. Sign in

## II. Houston Programs

Sunday, 9:45 AM – 10:45 AM

### **Forum 1: Expanding Our Perceptions of Building Performance Updating Standard 105**

George R. Brown, 3<sup>rd</sup> Floor, 370 CF

Sunday, 9:45 AM – 10:45 AM

### **Workshop 3: New ASHRAE Hot Climate Design Guide**

George R. Brown, 3<sup>rd</sup> Floor, 372 AD

Tuesday, 9:45 AM – 10:45 AM

### **Seminar 46: Comparing the Energy, Emissions, and Economic Impacts of Building Energy Performance Calculations**

George R. Brown, 3<sup>rd</sup> Floor, 371 AB

Tuesday, 9:45 AM – 10:45 AM

### **Seminar 48: New ASHRAE Hot Climate Design Guide**

George R. Brown, 3<sup>rd</sup> Floor, 372 BE

Wednesday, 8:00 AM – 9:30 AM

### **Seminar 59: Beneficial Carbon Reduction Strategies: Cogeneration, Electrification, and Consumer Options**

George R. Brown, 3<sup>rd</sup> Floor, 372 BE

## III. Call for New Seminar/Forum/Workshop Ideas for Atlanta 2019

- Subcommittee Water- Energy Nexus:
  - Resubmit Water Quality Seminar – Ashish and Fred
  - Seminar: Sewer Heat Rejection and Recovery
  - For Atlanta: Budweiser, Coke, Emory (Water Hub), water conservation strategies – Kevin B. to chair, Stanton to help find speakers

- Alternative Water Treatment Technologies for Cooling Towers – Michael Deru will gather other speakers and Chair
  - Forum on what to do with blowdown: sanitary, ground injection, evap pond, on-site treatment
- The Solar Marketplace: Paul to coordinate additional speakers, build off of Renewable Myths. Co-Sponsor TC 6.7 - Chair = Janice
- Paul T – What do ASHRAE members do in their own houses? Actual data, Case Studies on actual residences. Kevin Brown. TC 6.7 Net Plus house. Co w/ Residential Buildings Committee RBC– Standing Committee (Chair = Jim Sweeney) Target Future
  - From Paul “ASHRAE members make decisions professionally everyday related to clients purchasing decisions and energy efficiency. When given the opportunity, how do ASHRAE engineers make decisions for their own homes and offices? This series of papers looks at case studies of ASHRAE member’s homes and the measured energy performance of these homes. Papers are requested that describes the technologies used, how the decisions were made to use certain technologies, and the measured energy performance of the homes.”
- 1/21/2018: Myths and Realities for Solar Design... 6.7 Co-Sponsor. Include UL code for fire break requirement on rooftop solar installations. Talk to Paul about design factors that should be considered for solar installations.
- 6/24/2018: Air quality impacts on the built environment in developing economies. Ashish may have several international speakers.
- Low priority: Comparing Green Building Rating systems As-Designed vs. Actual Performance – Frank Mills, Janice Means, NYK – probably needs a paper as foundation (Ashish, Costas, Means, Lawrence) 7.2 would co-sponsor (need timeline from Janice, maybe ???)... somewhat related = MTG proposal to investigate impact on All ASHRAE Standards and the built environment

## Review Timeline for Future Meetings

### 2019 ASHRAE Winter Conference in Atlanta, January 12-16:

- <http://www.ashrae.org/atlanta>
- Conference Papers are due July 9
  - Seminar, Forum, Debate, Panel and Workshop proposals are due August 3
  - Program notifications go out September 14
  - Web site opens for presentation uploads on November 30
  - All presentations due online January 4, 2019

2019 Winter Conference Chair is Corey Metzger, [corey.metzger@resourcece.com](mailto:corey.metzger@resourcece.com)

Tracks and Track Chairs

#### Track 1: Systems and Equipment

Joe Firrantello, [j.firrantello@gmail.com](mailto:j.firrantello@gmail.com)

#### Track 2: HVAC& R Fundamentals and Applications

Rick Hermans, [herma015@umn.edu](mailto:herma015@umn.edu)

#### Track 3: Refrigeration

Sonya Pouncy, [sonya.pouncy@gmail.com](mailto:sonya.pouncy@gmail.com)

#### Track 4: Construction, Operation and Maintenance of High Performance Systems

Leticia De Oliveira Neves, [leneves@gmail.com](mailto:leneves@gmail.com)

#### Track 5: Common System Issues and Misapplications

Lee Riback, [lee.riback@gmail.com](mailto:lee.riback@gmail.com)

#### Track 6: The Convergence of Comfort, Indoor Air Quality and Energy Efficiency

Ashish Rakheja, [ashish.rakheja@aeonconsultants.in](mailto:ashish.rakheja@aeonconsultants.in)

#### Track 7: Building Integrated Renewables and Natural Systems

Maggie Moninski, [maggie.moninski@gmail.com](mailto:maggie.moninski@gmail.com)

#### Track 8: The Engineer's Role in Architecture

Ashu Gupta, [ashu.energy@gmail.com](mailto:ashu.energy@gmail.com)

### 2019 ASHRAE Annual Conference in Kansas City, MO:

- [www.ashrae.org/kansascity](http://www.ashrae.org/kansascity)
- Conference Paper Abstracts, Technical Papers and Paper Session requests due August 21, 2018
  - Conference Papers due November 30, 2018

2019 Annual Conference Chair is Carrie Anne Monplaisir, [carrie.monplaisir@gmail.com](mailto:carrie.monplaisir@gmail.com)

Tracks and Track Chairs

#### Track 1: Systems & Equipment in the Built Environment

Kimberly Pierson, [kdpwildcat@gmail.com](mailto:kdpwildcat@gmail.com)

#### Track 2: Fundamentals and Applications

Gary Debes, [gary.debes@comcast.net](mailto:gary.debes@comcast.net)

#### Track 3: Optimization in HVAC&R

Vikrant Aute, [vikrant@umd.edu](mailto:vikrant@umd.edu)

**Track 4: Commissioning New & Existing Buildings**

Raul Simonetti, [raul.simonetti@carel.com](mailto:raul.simonetti@carel.com)

**Track 5: Occupant Health & Safety**

Chris Reinders-Caron, [creinders@cannondesign.com](mailto:creinders@cannondesign.com)

**Track 6: Modeling Throughout the Building Life Cycle**

Nivedita Jadhav, [nivi2307@gmail.com](mailto:nivi2307@gmail.com)

**Track 7: Professional Development**

Rich Rose, [richr@mticontrols.com](mailto:richr@mticontrols.com)

**Track 8: Research Summit**

Bing Liu, [bliu@neea.org](mailto:bliu@neea.org)

**Track 9 (Mini-Track): Radiant Heating & Cooling Mini-Track**

Devin Abellon, [devin.abellon@yahoo.com](mailto:devin.abellon@yahoo.com)

**Future Winter and Annual Conferences**

Winter 2019 – Atlanta, GA Jan 12-16, 2019

Annual 2019 – Kansas City, MO June 22-26, 2019

Winter 2020 – Orlando, FL Feb 1-5, 2020

Annual 2020 – Austin, TX Jun 27-Jul 1, 2020

**Please feel free to contact me if you have any questions or need assistance; [kevin.brown@abm.com](mailto:kevin.brown@abm.com) mobile: 404-825-0716**