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Your Guide to the ASHRAE Winter Conference
January 20–24, 2018

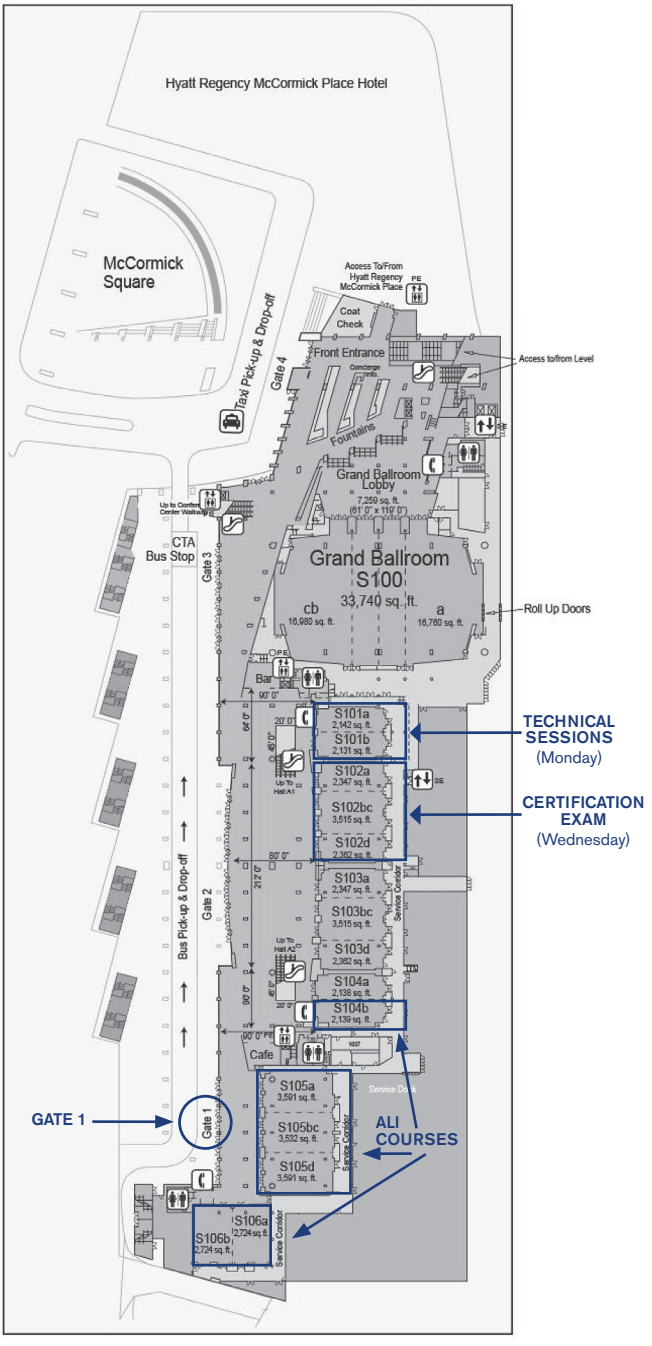
ASHRAE EVENTS APP

Update your ASHRAE App to access the meeting agenda with venue floor plans, social events and tips for your time in Chicago. The app also features the ability to view Virtual Conference presentations, a customizable schedule, speaker evaluations, and live audience polling. The app is made possible through support from the following sponsors:

Get the free mobile app at: www.ashrae.org/app

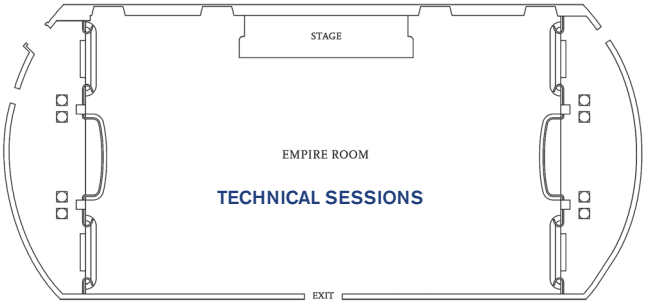
McCORMICK PLACE – SOUTH BUILDING LEVEL 1

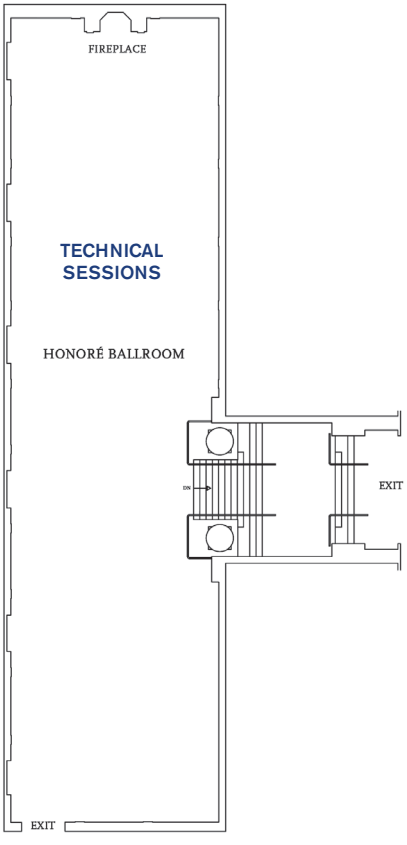
AHR Expo® shuttle buses will drop off at South Building Shuttle drop and pick up area. Enter the South Building through Gate 1 to easily access the 100 rooms for ALI courses, Technical sessions on Monday and Certification Exam on Wednesday.



PALMER HOUSE – LOBBY LEVEL

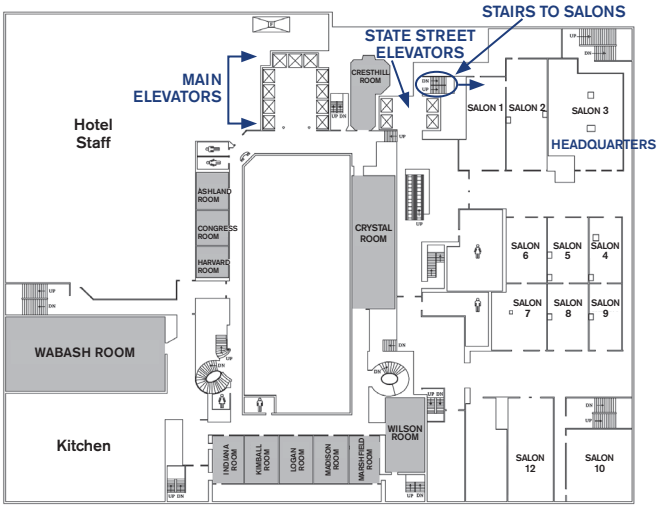
From the street level, take stairs near the Monroe Entrance or the escalators near the Wabash and State Street entrance to the Lobby level. The Empire Room will be near the Lockwood Restaurant & Bar. To get to the Honore Ballroom, go past Potter's Lounge to enter Honore. There is a lift available at both the Empire Room and Honore Ballroom for attendees needing assistance.





PALMER HOUSE – 3RD FLOOR

To access the 3rd floor meeting rooms, use the main elevators. To access the Salons on the 3rd floor, from the main elevators take the stairs on your left. To access the Salons without using the stairs, take the State Street Elevators that can be accessed on the Street Level, Exhibit Hall Level (4th floor), 5th – 11th floors.

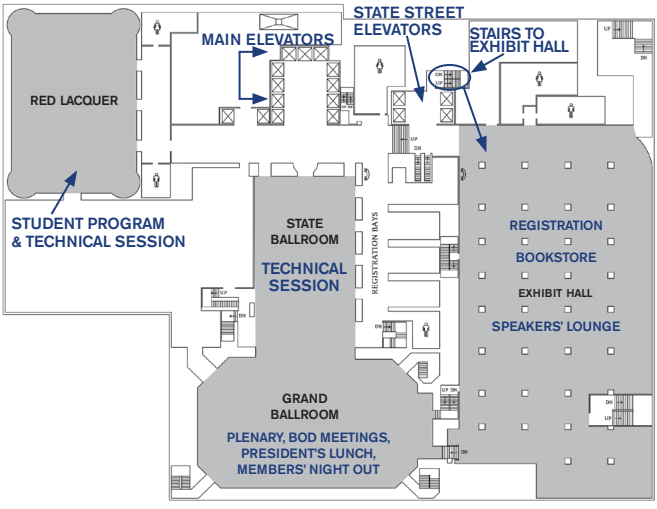


PALMER HOUSE – STATE STREET ELEVATORS

The Salons (3rd floor) and Exhibit Hall (4th floor) are accessible without having to use stairs via the State Street Elevators. The State Street elevators go to the Street Level, Salons (3rd floor), Exhibit Hall Level (4th floor), 5th Floor and up to the 11th floor. If you are on the Mezzanine, 3rd floor (Crystal Room area), 4th floor (Grand/State/Red Lacquer) and need to get to the Salons (3rd floor), Exhibit Hall (4th floor) or 5th floor, take the Main elevators to the 6th floor and then transfer to the State Street elevators.

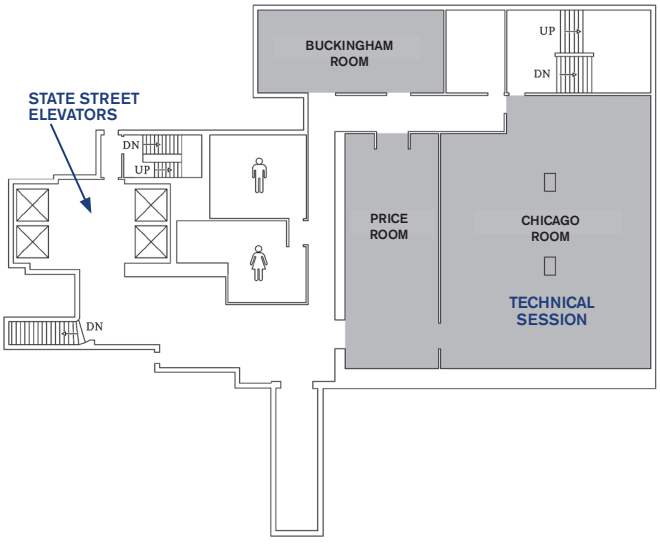
PALMER HOUSE – 4TH FLOOR

From the main elevators, easily access the Grand and State Ballrooms and the Red Lacquer room. To access the Exhibit Hall from the main elevators, use the stairs on your left. To access the Exhibit Hall without using stairs, use the State Street Elevators that can be accessed on the Street Level, Salons Level (3rd floor) and 5th – 11th floors.



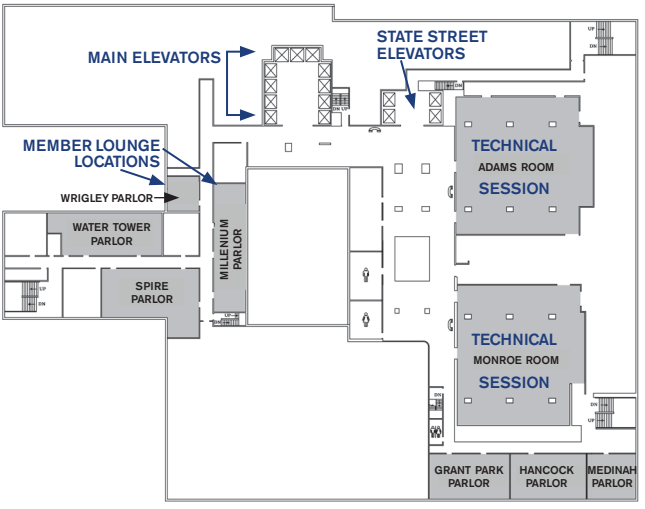
PALMER HOUSE – 5TH FLOOR

The 5th floor is not accessible via the main elevators. You may access the 5th floor only by utilizing the State Street elevators. You can utilize the main elevators and go to the 6th floor where you can transfer to the State Street elevators to access the 5th Floor, Exhibit Hall and Salon level.



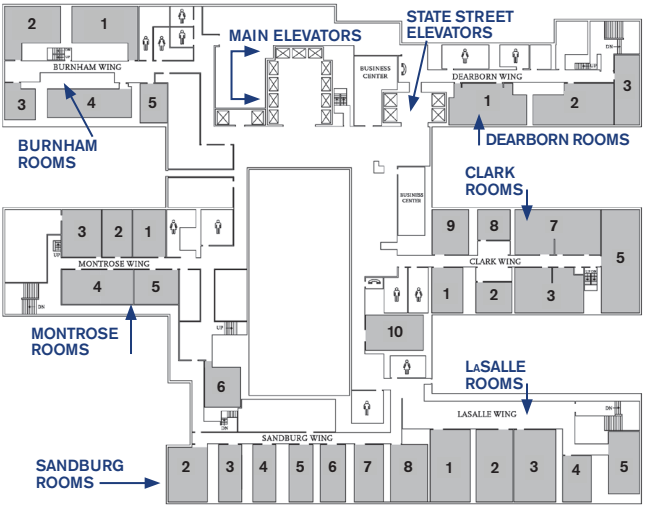
PALMER HOUSE – 6TH FLOOR

The 6th floor is accessible via the Main Elevators and the State Street Elevators.



PALMER HOUSE – 7TH FLOOR

The 7th floor is accessible via the Main Elevators and the State Street Elevators.



CONFERENCE SPONSORS

ASHRAE thanks the following sponsors for their support of the 2018 ASHRAE Winter Conference:

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A special thanks to all the members in the Illinois Chapter who helped make the 2018 ASHRAE Winter Conference a success!

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Mallory Schaus, President-Elect
Patrick Krause, Secretary
Fiona Martin, Treasurer

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Vice Chair, Chad Powell
Sessions, Cory Abramowicz, Jason Greenberg
Entertainment, John Song, Kevin Summers, Mark Hegberg
Hospitality, David Lippe, Liz Zakelj
Tours, Maggie Moninski, Drew DePriest, Mike Kuk
Sustainability Project, Mallory Schaus

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Raul Simonetti
Walid Chakroun, Consultant
Jon Cohen, Consultant
Daniel R. Rogers, BOD Ex-Officio
Sheila Hayter, Coordinating Officer

GENERAL INFORMATION

BADGE SCANNING AND SESSION EVALUATION

Badges must be worn for admission to the technical program. Room monitors will scan badges at the door. The scanning process will provide you with a summary of all sessions attended at the conclusion of the conference and will be emailed to you. Please keep track of the sessions that you attend at the conference. If you do not desire to have a summary of the sessions you do not need to be scanned. Response cards are distributed to audience members that comment during Technical Paper sessions. Please complete the question/comment card and return it to a monitor. Questions are given to the author for reply and published with the Technical Paper in ASHRAE Transactions. Please access the ASHRAE app to complete technical program speaker and session evaluations. Paper evaluation forms are distributed for Forum sessions only. Please return the completed Forum evaluation forms to the monitors.

VENUE ADDRESS, TELEPHONE

Palmer House Hilton
17 E Monroe St, Chicago, IL 60603
312-726-7500

ON-LINE REGISTRATION

Need to register or buy a ticket for social events, tours, or Learning Institute courses? You can register online throughout the conference. You can also register during registration hours in the Exhibit Hall on the 4th floor (Exhibit Level) of the Palmer House. Come to registration to pick up your tickets or badge.

INTERNET ACCESS

Internet access for e-mail is available in the Cyber Café located in the registration area during operating hours. Please be considerate to others and limit your usage to five minutes.

Wireless internet will be available in all meeting rooms at the Palmer House. Due to the number of users, please limit usage to functions that do not use excessive bandwidth such as Facebook, YouTube, streaming videos, etc.

To access meeting room internet at the Palmer House, follow these instructions:

1. Turn on your laptop's/tablet's/smartphone's wireless connections to view available Wi-Fi networks.
2. Choose and connect to **PH_Meeting_Room** as your wireless network.
3. After connecting to **PH_Meeting_Room** launch your web browser which will redirect you to a splash page.
4. Type in the username and password:
   Username: **ASHRAE18**
   Password: **chicago**
5. Check the box "agree to terms".

6. Lastly, click "log-in".
7. From here you can begin browsing the internet.

ASHRAE APP

Download or update the ASHRAE App for access to content such as the meeting agenda, floor plans, social events and tips for your time in Chicago. App features also include the capability to view Virtual Conference presentations from your mobile device, a customizable schedule, an attendee list and speaker evaluations.

To download the app, visit **www.ashrae.org/app**.

NOTICE

ASHRAE regards the materials presented at these sessions to be the unique work of ASHRAE and exercises control over the dissemination and/or use of such products in the future. Accordingly, videotaping and recording of this program are not allowed without ASHRAE's prior written consent.

COMPANY-SPONSORED HOSPITALITY SUITE POLICY

Hospitality suite hours must not conflict with ASHRAE meetings or social functions. Product displays, literature handouts, posting of signs in hotel lobbies or hallways, and commercial advertising or recruiting are not allowed in the Palmer House.

SALE OF MERCHANDISE

Sale of merchandise, or the solicitation to sell merchandise, of any type at the Annual and Winter Conferences will only be permitted by prior approval of the Conferences and Expositions Committee and any surplus will go to the Society.

SIGNS/DISPLAY OF AFFILIATE MEETING INFORMATION

Signs and information concerning affiliate or related organizations must be approved by the Society prior to display. No signs are to be attached to walls, and all signs must be professionally printed.

PHOTO RELEASE

Photographs will be taken at the ASHRAE Winter Conference. By registering for this conference, you agree to allow ASHRAE to use your photo in any ASHRAE-related publications or Web site.

WHAT TO WEAR

Business casual attire is appropriate for meetings and social events; however, Members' Night Out will be "dress to impress."

LOST AND FOUND

Items found during the conference should be turned into the ASHRAE registration located in the Exhibit Hall, 4th floor (Exhibit Level) of the Palmer House. The ASHRAE App also has a Message Board called "Lost and Found" where attendees can post about items lost or found while at the Conference.

TECHNICAL PROGRAM PDHs

All of the sessions presented in the technical program are approved for professional development hours (PDHs), including State of Florida PDHs. In addition, some sessions are approved for the State of New York PDHs and AIA Learning Units. Those programs are indicated with a NY PDH symbol. Others are approved for LEED AP credits and are indicated with a G symbol. Certain sessions may be acceptable for ASHRAE certification renewal. Send questions to certification@ashrae.org. In order to report your attendance at the session, PDH and AIA sign-in sheets in the session room. Sessions are approved for 1, 1.5 or 2 PDHs depending on the length of the session.

CONFERENCE PAPERS

During the Annual and Winter Conferences, papers presented in the technical and conference paper sessions can be purchased in the ASHRAE Bookstore onsite, as individual hard copies or a collection of downloadable PDFs. After the conference, all papers can be purchased in the ASHRAE Bookstore online (ashrae.org/bookstore). Final technical papers are published with discussion in ASHRAE Transactions. Papers are not available for seminars, forums, panels, workshops or debates. All papers published between the years 1980–1997 may be searched online in the Abstract Archive Center. Access to the Abstract Archives is a member benefit. For ordering information, contact ASHRAE Customer Service at 1-800-527-4723 or cservice@ashrae.org.

VIRTUAL CONFERENCE

Don't miss the state-of-the-art concepts and latest design techniques presented in the Society's technical program available through the virtual conference. The Chicago Virtual Conference allows you to view presentations and to interact with an online audience through a discussion board. All registered conference attendees will receive an email notification when sessions are available for viewing. The email will include a link to the Chicago Virtual Conference. If you do not have your password, go to www.ashrae.org/chicagovirtual and click on the link to access the Virtual Conference and put in your email address to request your password.

Virtual Conference registration includes:

- Synced audio and PowerPoint presentations from all, conference paper sessions, seminars, technical paper sessions and workshops.
- Ability to post comments and rate presentations.
- Print presentation slides in notes format.
- Ability to post questions or answers for selected sessions through Monday, February 12. Presentations available online for 18 months.

A full slate of technical programs will be posted beginning Monday, January 22, of the sessions that were presented the

previous day, with additional content posted through Thursday, January 25.

Access to the Chicago Virtual Conference is free with your conference registration. To register only for the Virtual Conference, go to ASHRAE Registration in the Exhibit Hall, 4th Floor (Exhibit Level) of the Palmer House, or register online.

$249 ASHRAE member; $445 non-member

AHR Expo®

See new products from 2,000+ Exhibitors
McCormick Place
2301 S King Dr, Chicago, IL 60616

If you have registered for the ASHRAE Conference, your conference badge is your admission into the exposition.

If you are attending the exposition only and you did not register in advance, the fee for admission is $30.00 and can be paid at McCormick Place. **Registration for the AHR Expo® will be open from 12:00 to 4:00 p.m. on Sunday, January 21. Starting Monday, January 22, you can register two hours before the doors open and one hour before the doors open on Tuesday, January 23 and Wednesday, January 24.**

Show Hours:

Monday, January 22 . . . . . 10:00 a.m. – 6:00 p.m.
Tuesday, January 23 . . . . . 10:00 a.m. – 6:00 p.m.
Wednesday, January 24 . . . . . 10:00 a.m. – 4:00 p.m.

You must be 18 years or older to be admitted to the show floor. Ages 16 and 17 will be admitted only if accompanied by an adult.

The ASHRAE Headquarter shuttle between the Palmer House and McCormick Place is free to ASHRAE attendees and will run on 20-minute intervals. Shuttles depart from the Wabash entrance of the Palmer House located on the Street Level.

Shuttle Bus Hours of Operation:

Monday, January 22 . . . . . 7:00 a.m. – 7:00 p.m.
Tuesday, January 23 . . . . . 8:00 a.m. – 7:00 p.m.
Wednesday, January 24 . . . . . 8:00 a.m. – 6:00 p.m.

SAFETY TIPS

Street Safety. The streets of any city at any time can be unsafe. When you leave your hotel to go out during the day or the evening, make sure you take off your badge. Wearing a badge is an advertisement that you are a visitor to the city and that you are probably unfamiliar with your location.

Walk "smart" when you leave the convention site —know your destination and the best way to reach it. Walk along lighted sidewalks at night and don't walk alone. Trust your instincts—if you're uncomfortable with a situation, get out of it.

Hotel Safety. Don't answer the door in a hotel room without verifying who it is. If a person claims to be an employee, call the front desk and ask if a staff person is supposed to have access to your room and for what purpose. Use the hotel safe-deposit box. When you're in your hotel room, use all of the locking devices provided. Don't reveal your room number or discuss plans for leaving the hotel within earshot of strangers.

EMERGENCY SITUATIONS

In case of an emergency, follow these instructions:

Dial 5565 from any house phone to access the Palmer House in-house security department. The Security team at the Palmer House knows the property better than anyone and should be called before dialing 911. All security officers are CPR First Aid certified.

The Palmer House has the ability to alert all guests via public address system in the event of an emergency/evacuation.

The closest hospital to the Palmer House is Northwestern Hospital, 233 East Superior, approximately 2 miles away. The phone number is (312) 926-2000.

The closest hospital to McCormick Place is Mercy Hospital located at 2525 S. Michigan Ave. The phone number is 312-567-2000.

The Chicago Police Department is located at 1718 S. State, Chicago, IL, approximately 1 mile away. The phone number is (312) 745-4290. Dial 311 from any phone for the Chicago Police Department's Non-Emergency line.

Fire Emergency… Preparedness in Hotels

In case of a fire, dial 66 from any house phone. It is important not to panic. If a fire emergency does in fact happen, take all cues from security and hotel staff. The Palmer House has a sprinkler system as well as smoke detectors throughout. In case of a fire, the fire alarm system includes one-way communication to all floors and guest rooms.

Plan ahead—when you check into your room, check the location of exits. Walk to the nearest exit; learn the route, obstacles, etc. Keep your room key on the night stand when you are in your room. Examine your room. Check the windows to see if they open and how. Examine the area outside your window.

The closest fire station is Station 419 S Wells, Chicago, IL, 1 mile away. The phone number is 312-566-0079.

MEALS

Meals are not included in your conference registration, however, we know that sometimes you have limited time to grab a quick meal between meetings and technical sessions. Here are few grab-and-go options, as well as other dining options, in the Palmer House.

Starbucks
Monday – Saturday
5:30 a.m. – 8 p.m.
Sunday
6:00 a.m. – 7:00 p.m.
Located on the Street Level, this full-service Starbucks serves Starbucks beverages and breakfast and lunch grab-and-go-options.

Lockwood Restaurant
Breakfast
6:30 a.m. – 11 a.m.
Lunch
11 a.m. – 2 p.m.
Afternoon Tea
2 p.m. – 4 p.m.
Dinner
5 p.m. – 10 p.m.
Bar
Open daily at 11 a.m.
Located in the main lobby, Lockwood Restaurant features a menu offering seasonally inspired American cuisine prepared with locally grown produce.

Potter's Chicago Burger Bar
Open daily at 4 p.m.
Located on the Lobby Level, Potter's Chicago Burger Bar serves up one "L" of a Burger!

Wake Up and Go-Go Breakfast
Available 5 a.m. – 8 a.m.
Wake Up & Go-Go Breakfast bags are available to pre-order on the in-room HCN Navigator Tablet, or call ext. 21, for next day pick up at the Front Desk.

THINGS TO DO IN CHICAGO

Stop by the Chicago Host Committee Concierge Desk to ask Alexa if you need your mittens to go grab lunch or hear what sessions, tours, and parties are on the calendar for the day. You can also find recommendations for Liz and Dave's favorite lunch, dinner, and most importantly, drink spots in the loop and near ASHARE events. Human staff also available.

The Chicago Host Committee desk will be located in the ASHRAE Registration area in the Exhibit Hall, 4th Floor (Exhibit Level) of the Palmer House.

FAMILY SERVICES

Choose Chicago, the Chicago Convention and Visitors Bureau, recommends the following two companies for child care services while in Chicago:

Sitters Studio (Child care by artists)
www.sittersstudio.com
Phone: 312-890-8194

American Childcare Services
www.americanchildcare.com
Phone: 312-644-7300

ASHRAE makes no representation as to the quality or suitability of the child care options available. ASHRAE has done no investigation or inquiry into these options and accordingly assumes no liability for these services. All participants considering these facilities should perform their own investigation into the quality, suitability or desirability of these child care facilities.

MOTHERS' ROOM

ASHRAE is pleased to offer a private room to nursing mothers. The Mothers' rooms is located in Bay Office #4 on the 4th floor of the Palmer House. Please visit the Registration desk in the Exhibit Hall (4th Floor, Exhibit Level) to receive a key to the room. A refrigerator is also available for storage.

notes

COMPANION/GUEST GUIDE

ASHRAE MEMBER LOUNGE

Millenium and Wrigley, 6th Floor

The ASHRAE Member Lounge is open daily for all individuals who are registered for the conference. Light refreshments are available in the morning each day and beverages are available all afternoon in both rooms. Members of the Chicago Host Committee will be present to answer questions about local activities in the morning. Detailed information on the city including brochures and maps can be found at the Host Committee Desk located in the ASHRAE Registration area in the Exhibit Hall, 4th Floor (Exhibit Level).

SPOUSE LOUNGE

Mezzanine

The Spouse Lounge is open daily with light refreshments available in the morning and beverages available all day. The lounge is open to all registered spouses and is a great place to meet other spouses and guests of conference attendees. The Mezzanine is accessible via the escalators in the lobby and the main elevator bank.

Member and Spouse Lounge Hours:

Saturday, January 20 ..... 7:30 a.m. – 3:00 p.m.
Sunday, January 21..... 7:30 a.m. – 4:00 p.m.
Monday, January 22 ..... 7:30 a.m. – 4:00 p.m.
Tuesday, January 23 ..... 7:30 a.m. – 4:00 p.m.
Wednesday, January 24..... 7:30 a.m. – 1:00 p.m.

MEET AND GREET

Crystal, 3rd Floor
Monday, January 22
9:30-11 a.m.

The Meet and Greet, open to all registered spouses and guests, gives spouses an opportunity to meet with old friends and greet new ones. "History is Hott!" is a nationally recognized award-winning program created by the Palmer House Hilton. For the Meet and Greet, a special version of the program will be offered. The presentation will include discussion of the remarkable relationship between two of Chicago's founding personalities – Potter Palmer and his amazing wife and life partner, Bertha Honore Palmer. The thrust of the presentation will include their contributions to American lodging, women's rights, the nation's introduction to French Impressionist painting, land development – and most importantly, their respective commitment to growth in life through change.

The presentation will be given by Ken Price, Director of Public Relations at the Palmer House Hilton. Price is a well-known Chicagoan who has garnered a reputation for being one of the most active and involved promoters of the city.

The Crystal room is accessible via the main elevator banks.

Light refreshments will be served.

SOCIAL EVENTS

PLENARY SESSION KEYNOTE SPEAKER – DEBBIE STERLING

Grand Ballroom, 4th Floor
Saturday, January 20
3:15 – 5:30 p.m.

Debbie Sterling is the Founder and CEO of GoldieBlox, an award winning company on a mission to "disrupt the pink aisle" with toys, games, and media for girls. Debbie is an engineer, entrepreneur, and one of the leaders in the movement toward getting girls interested in science, technology, engineering, and math. She was named TIME's "Person of the Moment," Business Insider's "30 Women Who Are Changing the World," and was recently added to Fortune Magazine's prestigious "40 Under 40" list. In early 2015, Debbie was inducted as a Presidential Ambassador for Global Entrepreneurship and honored by the National Women's History Museum with a "Living Legacy" Award for her work to empower girls around the world. Debbie received her degree in Engineering at Stanford University in 2005.

WELCOME PARTY

Chicago Cultural Center
Saturday, January 20
6:30 – 8:30 p.m.
Cost: $60

The Welcome Party will be held at the Chicago Cultural Center, a few walkable blocks from the Palmer House Hilton.

Limited shuttle service will be provided starting at 6:20 p.m. Shuttles leave from the Wabash Entrance of the Palmer House accessible via the State Street Level every 20 minutes. The Cultural Center is an approximate three block walk from the Palmer House. Exit the Wabash Entrance on the State Street level of the Palmer House and turn left onto Wabash. Walk two blocks to E. Washington Street and turn right. The Cultural Center will be on the right side of the street. Chicago Host Committee members will be scattered along the path to help direct attendees.

About the Chicago Cultural Center

Completed in 1897 as Chicago's first central public library, the building was designed to impress and to prove that Chicago had grown into a sophisticated metropolis. Located on the south side of the building in Preston Bradley Hall, the world's largest stained glass Tiffany dome was restored to its original splendor in 2008.

Welcome Party Menu

Flatbread Bar

- Kale, Burrata and Toasted Almond Pizza with Bianca White Cream Sauce and Fresh Basil
- Spring Pea, Pancetta and Smoked Mozzarella Flatbread with a Spring Pea Pesto and Watercress
- San Marzano Tomato, Fresh Basil and Fontina Flatbread with Hearty Tomato Sauce and Roasted Garlic
- Caramelized Onion and Bleu Cheese Pizzetta with Diced Pears

Slider Station

- American Slider, Beef with Melted Brie Cheese and Caramelized Onions on Pretzel Roll
- Chicken Parmesan Slider, Melted Mozzarella and Tomato Ginger Jam on Brioche Roll
- BBQ Pulled Pork Slider, with Coleslaw and Dill Pickles on Slider Rolls
- Veggie Black Bean Burger with Chipotle and Sliced Avocado on a Brioche Bun

Small Plates

- Uniformed Chef Carving Bistro Beef with Herb Crusted Bistro Beef Filet served with Bowls of Whipped Horseradish and sliced pretzel rolls
- Mini Twice Baked Potatoes topped with Melted Cheddar Cheese
- Grilled Seasonal Vegetables with Olive Oil and Fresh Herbs

There will be an open bar. No drink tickets are needed.

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BROWSE WITH A BREW EVENT

Plan to meet your colleagues at our first Browse with a Brew event after the Technical Program concludes on Sunday from 5:00 – 6:00 p.m. in the Bookstore (Exhibit Hall, 4th Floor). Browse all that the ASHRAE Bookstore has to offer while sipping on a brew. ASHRAE will provide one glass of wine or beer per person. We hope to see you there!

Among new Bookstore titles are: *Dedicated Outdoor Air Systems • ASHRAE GreenGuide 5th Edition • HVAC&R Pocket Guide 9th Edition • Clean Room Design Guide • Air Terminal Design Guide • DataCom Equipment Power Trends Cooling Trends 3rd Edition*

And lastly, learn about new ASHRAE Learning Institute courses, ASHRAE Certification and eLearning.

WOMEN IN ASHRAE BREAKFAST

Crystal, 3rd floor
Monday, January 22
7:00 – 8:30 a.m.
Cost: $20

SOLD OUT

Join women from around the world to share ideas and learn how to be active at the chapter, region, and/or Society level. Current ASHRAE members will share insight and experiences. This event requires pre-registration. Breakfast will be served.

PRESIDENT'S LUNCHEON

Grand Ballroom, 4th Floor
Monday, January 22
12:15 - 2:00 p.m. • Doors open at 12:00 p.m.
Cost: $50

2017–18 ASHRAE President Bjarne Olesen provides an update on his presidential theme, "Extend." Major contributors to the ASHRAE RP Campaign are also recognized.

LIFE MEMBERS' LUNCHEON

Salon 6, 3rd Floor (Salon Level)
Tuesday, January 23
12:00 – 1:30 p.m.
Cost: $35

Enjoy lunch, share ideas about the future of technology and swap memories of the Society while dining with Life Members. This member grade is for members who have completed 30 years of continuous membership and are at least 65 years of age. A ticket is required.

Salon 6 is located on the Salon Level of the Palmer House. You may take the stairs from the 3rd floor to the Salon Level. To access the Salon Level without using stairs you must use the State Street elevators. The State Street elevators go to the Street Level, Salons (3rd floor), Exhibit Hall Level (4th floor), 5th Floor and up to the 11th floor. If you are on the Mezzanine, 3rd floor (Crystal Room area), 4th floor (Grand/State/Red Lacquer) and need to get to the Salons (3rd floor), Exhibit Hall (4th floor) or 5th floor, take the Main elevators to the 6th floor and then transfer to the State Street elevators.

MEMBERS' NIGHT OUT

Grand Ballroom, 4th Floor
Tuesday, January 23
Cost: $60

Reception and Cash Bar
6:15 p.m. – 7:15 p.m.
State Ballroom Foyer

Dinner and Entertainment
7:15 – 10:00 p.m.

Feeling lucky? Take a chance and join us for an evening of fun with another Chicago "back room" action casino party. Here's the deal, come and test your skills or enjoy being serenaded by Stephanie Browning and her jazz trio. Please dress to impress!

HOW TO GET THE MOST OUT OF THE ASHRAE CONFERENCE

ASHRAE conferences provide opportunities for you to learn about the latest technology in the HVAC&R industry, express your opinion about controversial issues, explore new applications for fundamental ideas, to meet the people behind those ideas and to help shape the Society that serves your profession.

Whether you are attending your first conference or your tenth, chances are that you will have questions about what is available, which events you want to attend, how to hear one speaker without missing another or where to go to give input regarding a standard or research project. The following summary should answer some of your questions and aid you in getting the most out of an ASHRAE conference and meeting.

SHARING TECHNOLOGY: The ASHRAE Conference Technical Program

The technical program for the ASHRAE Conference includes technical paper sessions, conference paper sessions, seminars, workshops and forums. Check the program book or conference app to see what you want to attend. You can jump between sessions if you want to hear one specific presentation in each session. Host committee volunteers will be at the door checking and scanning badges.

See page 48 for more information on the five types of sessions that are presented in the Technical Program.

PowerPoint presentations with audio descriptions are posted online in the Virtual Conference for all Technical Paper Sessions, Conference Paper Sessions, Seminars and Workshops. The Virtual Conference is included with full Conference registration.

Each hour attended in a session equals one PDH. For forums and other one-hour sessions, you must be present for the entire 50-minute program to earn a PDH. Sign-in sheets will be available in all session rooms for attendees to complete to be awarded credit. State PDHs, AIA LUs and LEED AP credits are awarded for select sessions. Also, certain sessions may be acceptable for ASHRAE certification renewal. Send questions to certification@ashrae.org. Your badge will be scanned as you enter the session and a summary of sessions attended will be emailed to you upon conclusion of the conference.

ADVANCING THE INDUSTRY: SOCIETY MEETINGS

The technical expertise of ASHRAE is concentrated in its technical committees, task groups and technical resource groups, which are responsible for preparing the ASHRAE Handbook volumes, initiating and supervising Society research projects, presenting programs at ASHRAE conferences, reviewing technical papers and evaluating the need for standards.

To be a member of a technical committee (TC), you must be active in the field addressed by the committee. You do not have to be an ASHRAE member to participate in a technical committee, nor do you have to be a member of a technical committee to attend committee meetings.

Standards project committees (SPCs) are appointed specifically by the Standards Committee to develop and revise standards to reflect technical advances in the areas that they cover. To qualify for membership in a committee, you must be knowledgeable in the discipline of the proposed standard.

A schedule of all meetings is included in the conference program and app. Attendance at TC and SPC meetings is open. Please consult your schedule and plan to attend the committee meetings that interest you.

SUPPORT SERVICES

The ASHRAE Bookstore and membership booth are set up on site to offer conference participants the latest information about the industry and to answer questions concerning ASHRAE membership.

ASHRAE publications, including conference papers, are available for sale in the ASHRAE Bookstore. Located in the registration area the bookstore features a display of books devoted entirely to the HVAC&R industry. Publications from ASHRAE's publications catalog, as well as a variety of new publications and books from allied organizations are on display. ASHRAE publications may be purchased individually on site, or you may wish to order several books and have them shipped to you at a later date or use the online bookstore at www.ashrae.org/bookstore.

The membership booth is located in the registration area. Membership applications are available, as well as brochures about the HVAC&R industry, information on student membership and information about the ASHRAE group insurance plan. Registrants paying the non member registration fee receive their first year of membership free. To obtain membership an application form must be submitted with the meeting registration form or within 60 days following the meeting. A staff member will be present during registration hours to assist you.

NETWORKING: Getting Involved

ASHRAE conferences and meetings provide an international setting for attendees to gather and exchange ideas, to explore possibilities in the industry and to examine its problems. Opportunities to get involved range from presenting a conference paper to participating in a seminar or attending committee meetings. By reviewing your program and planning ahead, you can ensure that the conference will be a success instead of a series of missed opportunities.

AWARDS PRESENTATION

Saturday, January 20, 2018, 3:15-5:30 p.m.
Plenary Session, Palmer House Hilton
Grand Ballroom, 4th Floor

STUDENT DESIGN PROJECT COMPETITION

"Given in recognition of outstanding student research and design projects"

HVAC DESIGN CALCULATIONS

First Place: **Wilton Chang, Matthew Le, Aditya Mairal, Austin K. Stevenson, Suraj Thapa**
San Jose State University (Faculty Advisors: Nicole Okamoto, Ph.D, P.E., Sargon Ishaya, P.E., and Raghu Agarwal, Ph.D.)

HVAC SYSTEM SELECTION

First Place: **Dagmara Ćwiek, Tomasz Kolsicki, Karolina Kowal, Bartłomiej Tokarzewski**
Warsaw University of Technology (Faculty Advisors: Piotr Bartkiewicz, Ph.D., Pawel Wargocki, Ph.D., Maciej Sobczyk, P.Eng.)

INTEGRATED SUSTAINABLE BUILDING DESIGN

First Place: **Itza Beltran, Mathew B. Coalson, Karena Wai-Ling Edminister, Toby Miles, Samad Syed, Woranart Timsuwan**
University of Central Florida (Faculty Advisor: Muthusamy V. Swami, Ph.D., and Nathaniel Boyd, P.E.)

THE SETTY FAMILY FOUNDATION APPLIED ENGINEERING CHALLENGE

First Place: **Sean Bybee, Sunghoon Chung, Antonio De Jesus Aguayo, Austin Hochstetler**
Cal Poly San Luis Obispo (Faculty Advisors: Jesse Maddren and Steffen Peuker

TECHNOLOGY AWARDS

"Given in recognition of innovative designs that comply with ASHRAE standards for indoor air quality and energy efficiency"

Award of Engineering Excellence Winner

"Recognizing a first place winner of the Society-level Technology Award Competition for an outstanding application of innovative design and effective energy utilization."

Category II – Education Facilities – Existing

Jonathan R. Rumohr, P.E., and **Jesse Hendershot**, for Heritage Hall Alumni Center
Owner Representative, John Seelman, P.E., Western Michigan University

First Place

"Recognizing the first place ASHRAE Technology Award project which demonstrates the most outstanding achievement in the design and operation of energy efficient buildings"

Category I – Commercial Buildings – New

Roland Charneux for Mountain Equipment Co-Op Head Office
Owner Representative, Sandy Treagus, Mountain Equipment Co-Op

Category I – Commercial Buildings – Existing

Mark C. Hersch, P.E. and **Holly M. Stevens**, P.E., for Market One
Owner Representative, Justin Doyle, P.E., Market One LLC

Category II – Educational Facilities – New

Raymond L. Beaufait, P.E., for Discovery Elementary School
Owner Representative, John C. Chadwick, Arlington Public Schools

Category II – Other Institutional Buildings – New

Steven T. Taylor, P.E., **Todd Gottshall**, P.E., **David Heinzerling**, P.E., and **Allan Daly** for San Francisco Museum of Modern Art
Owner Representative, Noah Bartlett, San Francisco Museum of Modern Art

Category III – Health Care Facilities – EBCx

Eric Michael Fullerton, P.E., **Adam M. McElderry**, and **Andrew Jester** for Pineville Enterprise Energy Management Phase 1
Owner Representative, Michael Roberts, Carolinas Healthcare System

Category V – Public Assembly – New

Samuel Paradis, Ing., for Amphithéâtre Multifonctionnel de Québec (Centre Videotron)
Owner Representative, Jean Rochette, P.Eng., Ville de Québec

ASHRAE PIONEERS OF INDUSTRY AWARD

"Given to recognize deceased individuals who have made milestone contributions to the growth of air conditioning, heating, refrigeration and ventilation"

Sadi Carnot

E.K. CAMPBELL AWARD OF MERIT

presented by the Life Members' Club

"Given in recognition of outstanding service and achievement in teaching"

Julia Keen, Ph.D., P.E.
Manhattan, KS

JOHN F. JAMES INTERNATIONAL AWARD

"Given to an ASHRAE member who has done the most to enhance the Society's International activities"

Timothy C. Dwyer, C.Eng.
London, United Kingdom

ASHRAE FELLOW

"Given in recognition of distinction in the arts and sciences of heating, refrigeration, air conditioning and ventilation"

Andreas Athienitis, Ph.D.,Eng., Montreal, QC, Canada

Frederick W. Betz, Cincinnati, OH

Jeff G. Boldt, P.E., Madison, WI

James A. Carlson, Omaha, NE

B. Keith Dunnavant, P.E., Buena Vista, VA

Deep Ghosh, P.E., Birmingham, AL

Katherine G. Hammack, McLean, VA

Traci A. Hanegan, P.E., Spokane, WA

Adam W. Hinge, P.E., Tarrytown, NY

Ronald E. Jarnagin, Richland, WA

Shaobo Jia, Ph.D., Stone Mountain, GA

Jay A. Kohler, P.E., New Freedom, PA

Edwin J. Langebartel, P.E., Spokane, WA

Qiao Lu, Ph.D., P.E., Anaheim, CA

Raj. M. Manglik, Ph.D., Cincinnati, OH

Mark O. McLinden, Ph.D., Boulder, CO

R. Lee Millies, Jr., P.E., Munster, IN

Alessandro Sandelewski, Ph.D., Ing., Milano, Italy

Dilip R. Sarda, Ahmedabad, Gujarat, India

Jeffrey Siegel, Ph.D., Toronto, ON, Canada

Luca Stefanutti, P.E., Milano, Italy

Rex Stockwell, P.E., Albuquerque, NM

Wei Sun, P.E., Ann Arbor and Farmington Hills, MI

Adrienne Thomle, Reno, NV

Gerald J. Williams, P.E., St. Louis, MO

ASHRAE HALL OF FAME AWARD

"Given to honor deceased members who have made milestone contributions to the growth of ASHRAE-related technology"

Lynn G. Bellenger, P.E.

Seichi "Bud" Konzo

F. PAUL ANDERSON AWARD

"Given in recognition of notable achievement, outstanding work, or service in any field of the Society"

Steven T. Taylor, P.E., Fellow ASHRAE, Alameda, CA

ROOMS/HOURS

FINDING YOUR ASSIGNED MEETING ROOM

Please refer to the Palmer House floor plans located on pages 2 – 6 in this program.

The Palmer House's meeting space is located on the lobby level, 3rd floor (and Salon Level), 4th floor (and Exhibit Level), 5th, 6th and 7th floor. The Salon Level (3rd floor Salon rooms), the Exhibit Level (Exhibit Hall: Registration, Bookstore and Speakers Lounge), the 5th floor and up to the 11th floor can be accessed using the State Street Elevators.

CONFERENCE REGISTRATION

Exhibit Hall, 4th Floor (Exhibit Level)

Registration is required for all conference participants. Official badges must be worn at all functions and for admission into the technical sessions. ASHRAE conference registration will be open during the following hours:

Friday, January 19 . . . . . 10:00 a.m. – 5:00 p.m.
Saturday, January 20 . . . . . 7:15 a.m. – 6:00 p.m.
Sunday, January 21 . . . . . 7:00 a.m. – 5:00 p.m.
Monday, January 22 . . . . . 7:00 a.m. – 5:00 p.m.
Tuesday, January 23 . . . . . 7:30 a.m. – 4:30 p.m.
Wednesday, January 24 . . . . . 7:30 a.m. – 11:00 a.m.

ASHRAE BOOKSTORE AND LOGO STORE

Exhibit Hall, 4th Floor (Exhibit Level)

More than 300 books, conference papers and other recent publications will be available for purchase in the ASHRAE Bookstore. The bookstore provides HVAC&R technical literature from ASHRAE and other publishers and ASHRAE logo items. The ASHRAE Bookstore will be open during the following hours:

Friday, January 19 . . . . . 10:00 a.m. – 5:00 p.m.
Saturday, January 20 . . . . . 7:15 a.m. – 6:00 p.m.
Sunday, January 21 . . . . . 7:00 a.m. – 6:00 p.m.
Monday, January 22 . . . . . 7:00 a.m. – 5:00 p.m.
Tuesday, January 23 . . . . . 7:30 a.m. – 4:30 p.m.
Wednesday, January 24 . . . . . 7:30 a.m. – 1:00 p.m.

Sponsored by:

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ASHRAE's eLearning system, from the ASHRAE Learning Institute, will be demonstrated at the bookstore. Take a hands-on demonstration and learn more about new ways to earn PDHs/CEUs, on demand, online.

BROWSE WITH A BREW EVENT

Plan to meet your colleagues at our first Browse with a Brew event after the Technical Program concludes on Sunday from 5:00 – 6:00 p.m. in the Bookstore (Exhibit Hall, 4th Floor). Browse all that the ASHRAE Bookstore has to offer while sipping on a brew. ASHRAE will provide one glass of wine or beer per person. We hope to see you there! More information on page 18.

SPEAKER'S LOUNGE

Exhibit Hall, 4th Floor (Exhibit Level)

The Speaker's Lounge will be open during the following hours:

Saturday, January 20 ..... 1:00 p.m. – 3:00 p.m.
Sunday, January 21..... 7:00 a.m. – 5:00 p.m.
Monday, January 22 .....7:00 a.m. – 12:15 p.m. and
.....1:30 – 5:00 p.m.
Tuesday, January 23 ..... 7:00 a.m. – 5:00 p.m.
Wednesday, January 24..... 7:00 a.m. – 1:00 p.m.

MEMBERSHIP DESK

Exhibit Hall, 4th Floor (Exhibit Level)

The membership information desk is available for paying dues, applying for membership, updating membership information. This desk is open during the same hours as registration, so feel free to stop by if you have any questions concerning your ASHRAE membership.

HEADQUARTER OFFICE

Salon 3, 3rd Floor (Salon Level)

The ASHRAE Headquarter office offers members complimentary copying, services of a typist and access to printers for laptop computers.

Friday, January 19 ..... 12:00 p.m. – 5:00 p.m.
Saturday, January 20 ..... 8:00 a.m. – 5:00 p.m.
Sunday, January 21..... 8:00 a.m. – 5:00 p.m.
Monday, January 22 ..... 8:00 a.m. – 5:00 p.m.
Tuesday, January 23 ..... 8:00 a.m. – 5:00 p.m.
Wednesday, January 24..... 8:00 a.m. – 1:00 p.m.

YEA ACTIVITY

Young Engineers in ASHRAE (YEA) Hospitality Reception, Potter's Lounge, Lobby Level

Attention young professional members age 35 and younger! You are invited to visit the YEA Hospitality reception on Sunday, January 21, from 4:00 p.m. – 6:00 p.m. The reception offers social and networking opportunities and light refreshments will be served.

Sponsored by:

LEADERSHIP U

At each ASHRAE conference, the Leadership U program gives four future ASHRAE leaders the opportunity to shadow an ASHRAE Board member, providing a high level conference experience and unique networking opportunity. This program is operated by the Young Engineers in ASHRAE (YEA) Committee and more information can be found at www.ashrae.org/yea. The Leadership U participants for the 2018 ASHRAE Winter Conference are:

Christopher Albright, Johnstown Chapter, Region III
Matthew Clark, Central New York Chapter, Region I
Omar Rojas, Southern California Chapter, Region X
Marianna Vallejo, Oregon Chapter, Region XI

ASHRAE MEMBER LOUNGE

TWO Locations: Wrigley and Millenium, 6th Floor

The lounge will be open to all registered attendees during the following hours:

Saturday, January 20 ..... 7:30 a.m. – 3:00 p.m.
Sunday, January 21..... 7:30 a.m. – 4:00 p.m.
Monday, January 22 ..... 7:30 a.m. – 4:00 p.m.
Tuesday, January 23 ..... 7:30 a.m. – 4:00 p.m.
Wednesday, January 24..... 7:30 a.m. – 1:00 p.m.

More information about the ASHRAE Member Lounge can be found on page 16.

ASHRAE SPOUSE LOUNGE, Mezzanine

The lounge will be open to all registered spouses/guests during the following hours:

Saturday, January 20 ..... 7:30 a.m. – 3:00 p.m.
Sunday, January 21..... 7:30 a.m. – 4:00 p.m.
Monday, January 22 ..... 7:30 a.m. – 4:00 p.m.
Tuesday, January 23 ..... 7:30 a.m. – 4:00 p.m.
Wednesday, January 24..... 7:30 a.m. – 1:00 p.m.

More information about the ASHRAE Spouse Lounge can be found on page 16.

CHICAGO HOST DESK

Exhibit Hall, 4th Floor (Exhibit Level)

Stop by the Chicago Host Committee Concierge Desk to ask Alexa if you need your mittens to go grab lunch or hear what sessions, tours, and parties are on the calendar for the day. You can also find recommendations for Liz and Dave's favorite lunch, dinner, and most importantly, drink spots in the loop and near ASHARE events. Human staff also available.

HOUSTON ANNUAL CONFERENCE INFORMATION

Exhibit Hall, 4th Floor (Exhibit Level)

Information on the upcoming Annual Conference scheduled for June 23-27, 2018 at the Hilton Americas and the George R. Brown Convention Center in Houston, TX, will be available in the registration area.

LOCATION OF MEETINGS

Please refer to the Palmer House floor plans located in this program on pages 2–6 for more information locations of meeting rooms and how to access the main elevator bank and the State Street elevators.

MEETING SCHEDULE

FRIDAY, JANUARY 19

8:00 am–5:00 pm **Committee Meetings**
See listing on pages 92–124

10:00 am–5:00 pm **Registration** and **ASHRAE Bookstore**
Exhibit Hall, 4th Floor (Exhibit Level)

SATURDAY, JANUARY 20

7:30 am–3:00 pm **ASHRAE Member Lounge**,
Wrigley and Millenium, 6th floor
and **Spouse Lounge**, Mezzanine.
See description on page 16

7:15 am–6:00 pm **Registration and ASHRAE Bookstore**,
Exhibit Hall, 4th Floor (Exhibit Level)

8:00 am–5:00 pm **Committee Meetings**
See listing on pages 92–124

9:00 am–12:30 pm **Certification Exams**
Kimball, 3rd floor
More information on page 47

1:00 pm–3:00 pm **Speakers' Lounge**
Exhibit Hall, 4th Floor (Exhibit Level)

1:30 pm–3:00 pm **Student Welcome**
Red Lacquer, 4th Floor

Special Event

3:15 pm–5:00 pm **Meeting of the Members**
Plenary Session, Grand Ballroom,
4th Floor

Opening and Welcoming Remarks
by ASHRAE President Bjarne Olesen

Welcome by Director and Chair,
Region VI, Benjamin Skelton

Secretary's Report by Executive Vice
President Jeff H. Littleton

Awards Presentation
See description on pages 22–24

Keynote Address: Debbie Sterling
See description on page 17
Plenary Session is open, no badge nor registration is required to attend.

5:00 pm–6:30 pm **YEA/Student Mixer**
Red Lacquer, 4th Floor

Special Event

6:30 pm–8:30 pm **Welcome Party**
Chicago Cultural Center,
78 E Washington St.

Ticket required.

Limited shuttle service will be provided starting at 6:20 p.m. Shuttles leave from the Wabash Entrance of the Palmer House accessible via the State Street Level every 20 minutes. The Cultural Center is an approximate three block walk from the Palmer House. Exit the Wabash Entrance on the State Street level of the Palmer House and turn left onto Wabash. Walk two blocks to E. Washington Street and turn right. The Cultural Center will be on the right side of the street. Chicago Host Committee members will be scattered along the path to help direct attendees.

See description on page 17

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SUNDAY, JANUARY 21

7:00 am–5:00 pm **Speakers' Lounge**
Exhibit Hall, 4th Floor (Exhibit Level)

7:00 am–5:00 pm **Registration** and **ASHRAE Bookstore**
Exhibit Hall, 4th Floor (Exhibit Level)

7:30 am–4:00 pm **ASHRAE Member Lounge**
Wrigley and Millenium, 6th floor
and **Spouse Lounge**, Mezzanine.

8:00 am–4:45 pm **Technical Sessions**
See Technical Program on pages 50–59

8:00 am–5:00 pm **Committee Meetings**
See listing on pages 92–124

9:00 am–9:30 am **Networking Coffee Break**
4th Floor Foyer outside of State Ballroom and 6th Floor Foyer outside of Monroe and Adams

Sponsored by:

ComEd
Energy Efficiency Program

9:00 am–11:00 am **General Tour: Chicago Neighborhoods**
See description on page 33

9:00 am–3:00 pm **Student Program**
Red Lacquer, 4th floor

1:00 pm–3:00 pm **General Tour: Chicago Highlights 101**
See description on page 33

1:30 pm–5:00 pm **Tour: University of Chicago**
William Eckhardt Research Center
See description on page 36

4:00 pm-6:00 pm **Young Engineers in ASHRAE (YEA)**
Hospitality Reception, Potter's Lounge, Lobby

Attention members age 35 and younger: you are invited to visit the YEA Hospitality Reception, offering social and networking opportunities Light refreshments will be available.
See description on page 26

Sponsored by:

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5:00 pm–6:00 pm **Browse with a Brew Event**
ASHRAE Bookstore,
Exhibit Hall, 4th Floor
See description on page 18

MONDAY, JANUARY 22

7:00 am–8:30 am **Women in ASHRAE Breakfast**
Crystal, 3rd Floor
See description on page 18

7:00 am–12:15 pm **Speakers' Lounge**
Exhibit Hall, 4th Floor (Exhibit Level)

7:00 am–5:00 pm **Registration** and **ASHRAE Bookstore**
Exhibit Hall, 4th Floor (Exhibit Level)

7:30 am–4:00 pm **ASHRAE Member Lounge**
Wrigley and Millenium, 6th floor
and **Spouse Lounge**, Mezzanine.

8:00 am–12:00 pm **Technical Sessions**
See Technical Program on pages 59–70

9:30 am–11:00 am **ASHRAE Meet and Greet**
Crystal, 3rd Floor
See description on page 16

8:00 am–5:00 pm **Committee Meetings**
See listing on pages 92–124

10:00 am–11:45 am **Student Congress**
Salon 10, 3rd Floor (Salon Level)

10:00 am–6:00 pm **AHR Expo®**
McCormick Place, 2301 S King Dr.
Free shuttle buses between McCormick Place at the Palmer House are available and will run on 20 minute intervals from 7:00 a.m. – 7:00 p.m. on Monday.
See description on page 12

11:00 am–5:00 pm **Technical Sessions at McCormick Place,** S101A and S101B, 1st Floor, McCormick Place. A refrigerant mini-track and a Residential mini-track will be presented at the AHR Expo.
See description on pages 64–67

Special Event

12:15 pm–2:00 pm **President's Luncheon**
Grand Ballroom, 4th Floor
Doors open at 12:00 p.m.
Ticket required.
See description on page 19

1:30 pm–4:30 pm **Speakers' Lounge**
Exhibit Hall, 4th Floor (Exhibit Level)

2:15 pm–3:45 pm **Technical Sessions**
See Technical Program on pages 69–70

2:30 pm–4:30 pm **General Tour: Chicago's Southside Hidden Highlights Tour**
Ticket Required

2:30 pm–5:30 pm **Technical Tour: Gas Technology Institute (GTI) Lab**
Ticket Required

Technical Tour: Method Home Soap Manufacturing Plant
Ticket Required
See descriptions on pages 33–36

After 5:00 pm **Regional Dinners**
Sign up in ASHRAE registration area.

TUESDAY, JANUARY 23

7:00 am–5:00 pm **Speakers' Lounge**
Exhibit Hall, 4th Floor (Exhibit Level)

7:30 am–4:00 pm **ASHRAE Member Lounge**
Wrigley and Millenium, 6th floor
and **Spouse Lounge**, Mezzanine.

7:30 am–4:30 pm **Registration** and **ASHRAE Bookstore**
Exhibit Hall, 4th Floor (Exhibit Level)

8:00 am–4:45 pm **Technical Sessions**
See Technical Program on pages 70–83

8:00 am–5:00 pm Committee Meetings
See listing on pages 92–124

10:00 am–6:00 pm **AHR Expo®**
McCormick Place, 2301 S King Dr.
See description on page 12

12:00 pm–1:30 pm **Life Members' Lunch**
Salon 6, 3rd floor (Salon Level).
Ticket required
See description on page 19

1:00 pm–3:30 pm **General Tour: Gold Coast Tour**
Ticket required

1:00 pm–4:00 pm **General Tour: Moody Tongue Brewery Tour**
Ticket required

1:00 pm–4:00 pm **Technical Tour: 340 On The Park**
Ticket required

1:00 pm–4:00 pm **Technical Tour: The Plant**
Ticket required
See descriptions on pages 33–36

Special Event

6:15 pm–7:15 pm **Reception,** 4th Floor Foyer

7:15 pm–10:30 pm **Members' Night Out**
Grand Ballroom and State Ballroom
Ticket required
See description on page 19

WEDNESDAY, JANUARY 24

7:00 am–1:00 pm **Speakers' Lounge**
Exhibit Hall, 4th Floor (Exhibit Level)

7:30 am–11:00 am **Registration**
Exhibit Hall, 4th Floor (Exhibit Level)

7:30 am–1:00 pm **ASHRAE Bookstore**
Exhibit Hall, 4th Floor (Exhibit Level)

7:30 am–1:00 pm **ASHRAE Member Lounge**
Wrigley and Millenium, 6th floor
and **Spouse Lounge**, Mezzanine.

8:00 am–11:30 pm **Certification Exams: S102D**
1st Floor, McCormick Place.
More information on page 47

8:00 am–12:30 pm **Technical Sessions**
See Technical Program on pages 83–91

8:00 am–5:00 pm **Committee Meetings**
See listing on pages 92–124

10:00 am–4:00 pm **AHR Expo®**
McCormick Place, 2301 S King Dr.
See description on page 12

TOURS

Stand-by tour tickets will be distributed at ASHRAE registration after a tour sells out. Stand-by tickets are provided to ensure that a tour is filled in the event of last minute cancellations. If you have a stand-by ticket, please be prepared to pay by credit card or exact cash at the bus. Tour tickets may be purchased at the ASHRAE registration desk located in the Exhibit Hall at the Palmer House on the 4th floor (Exhibit Level).

Longer descriptions of tours can be found at www.ashrae.org/chicago, or on the app.

All tours depart from the Wabash Entrance on the Street Level of the Palmer House. Please arrive at least 10 minutes before the tour is scheduled to depart.

GENERAL TOURS

Chicago Neighborhoods

Sunday, January 21
9:00 am – 11:00 am
$70

Traverse the Chicago neighborhoods of Bronzeville, Bridgeport, Chinatown, Pilsen, UIC/Little Italy and Greektown to grasp the rich social diversity of Chicago beyond downtown. Guests will experience different kinds of residential Chicago architecture. Overall, this Chicago neighborhoods tour is like a "People's History" of Chicago, as much of the city's history goes beyond the power centered in downtown.

Chicago Highlights 101

Sunday, January 21
1:00 pm – 3:00 pm
$70

On this "V.I.P. access" guided tour guests will discover Chicago's bold character through its beautiful landmarks and fascinating backstories on this thoughtfully designed tour of history, contemporary life, and our world-famous architecture. Skyline Views from Museum Campus, the historic Water Tower, Lakefront Beach and Park Design and State Street will be highlighted. Stories of the Great Chicago Fire, why Chicago's so famous for architecture and contemporary city life will be told.

Chicago's Southside Hidden Highlights Tour

Monday, January 22
2:30 pm – 4:30 pm
$70

Experience the area of the 1893 World's Columbian Exposition, the beautiful Chicago lakefront, and the University of Chicago campus in Hyde Park. Guests view the exterior of the famous Robie House, designed by Frank Lloyd Wright. Obama's house

is included as well as sites significant to jazz and blues history. Stories of Chicago blues history, the first nuclear reaction, Indiana Jones' connection to Chicago and why Frank Lloyd Wright is so famous will be told.

Moody Tongue Brewery Tour
Tuesday, January 23
1:00 pm – 4:00 pm
$100

The Tasting Room at Moody Tongue brings chef-driven beers, Michelin-minded service, and a focused food menu from the team that introduced culinary brewing. Guests can enjoy year-round selections as well as specialty and barrel aged beers. Tour includes a walk through the brewing facilities and barrel aging room, as well as a discussion on culinary brewing philosophy, ingredients, beers and processes. Tours include a complimentary beer for each guest as well as glassware to take home.

Gold Coast Tour
Tuesday, January 23
1:00 pm – 3:30 pm
$70

Chicago's Gold Coast, which hugs Lake Michigan from Oak Street to North Avenue, is the city's most up-scale and exclusive neighborhood. As you stroll through the neighborhood, it's hard to believe that this area consisted of undeveloped marshland and cemeteries up until the 1880s. Learn how this neighborhood became wealthy per the guidance of Potter Palmer, real estate tycoon. Due to weather, there will be limited walking on this tour but attendees should still dress warmly.

UPCOMING CONFERENCES

ASHRAE 2018 Building Performance Analysis Conference and SimBuild, co-organized by ASHRAE and IBPSA-USA
September 26–28, 2018 • Chicago, IL
www.ashrae.org/BuildPerform

The Third International Conference on Efficient Building Design
October 4–5 2018 • Beirut, Lebanon
www.ashrae.org/Beirut2018

TECHNICAL TOURS

Gas Technology Institute (GTI) Lab

Monday, January 22 | 2:30 – 5:30 p.m.
$35

GTI researches and develops new energy technologies, with an emphasis on the distribution and use of natural gas. GTI's work includes ongoing development of technologies to improve the efficiency of residential and commercial HVAC and water heating products. GTI also works on topics such as smart energy technology, CHP (combined heat and power) systems, and the "whole building approach" to reducing energy consumption. GTI was largely responsible for the modeling that led to the development of the vent tables published in the National Fuel Gas Code.

GTI's 18-acre headquarters in metro Chicago is home to a flexible combination of specialized labs with equipment for design, testing and analysis of advanced energy technologies.

For more information, please visit www.gastechnology.org.

Method Home Soap Manufacturing Plant

Monday, January 22
2:30 – 5:30 p.m.
$35

Method's new soap factory houses the company's manufacturing and bottling operations and serves as a distribution center for both method and Ecover brands. It uses clean energy, water and materials to create innovative household products. The new state-of-the-art facility showcases the company's dedication to sustainability with the first LEED® Platinum manufacturing facility in its industry.

For more information, please visit https://methodhome.com/beyond-the-bottle/soap-factory.

340 On The Park

Tuesday, January 23
1:00 – 4:00 p.m.
$35

340 On The Park is a 62-story, luxury multi-family high rise constructed in 2007 and managed by Lieberman Management Services, which recently transitioned from district cooling to its own standalone chiller plant. In May of 2015, The Association of 340 On The Park initiated a cost analysis to consider moving away from district cooling and toward a standalone plant. This included energy modeling to simulate different chiller types, cooling towers, pump flow configurations and control sequences. The analysis indicated that the building could reduce their annual operating costs by just under $500k. The chillers are anticipated to provide a return on investment in less than ten years and to increase property values.

Construction began in March 2016 and culminated in a dramatic helicopter pick to lift two 16 foot long, 500 ton chillers and place them on the 63rd floor through a temporary roof opening in June 2016. The project was commissioned in August and completed in September when the district cooling service was shut down.

The Plant

Tuesday January 23
1:00 – 4:00 p.m.
$35

Not long ago, The Plant was an abandoned 93,500 square foot industrial space and pork processing facility.

Now it's a larger-than-life experiment and working model for closing waste, resource and energy loops. The facility will eventually divert over 10,000 tons of food waste from landfills each year, while providing enough electricity to power over 250 homes.

During your tour, you'll see some of The Plant's closed-loop tech demonstration projects up close, like an aquaponics farm and algae bioreactor.

For more information, please visit http://plantchicago.org.

STUDENT TOUR

University of Chicago William Eckhardt Research Center

Sunday, January 21
1:30 – 5:00 p.m.
$25

The University of Chicago William Eckhardt Research Center (WERC), is a 265,000 square foot high-performance research building which brings together several research groups within the world-renowned Physical Sciences Division (PSD), as well as the Institute for Molecular Engineering (IME), the university's first ever engineering program.

The highly complex laboratories have each been designed to meet stringent temperature and humidity criteria of 72°F +/- 0.5°F and 37.5% +/- 1% relative humidity. In addition, two of the high-performance optics laboratories are classified as Class 10,000 clean spaces.

This project recently achieved LEED Silver Certification. Various energy conservation measures were provided as part of the design, including the use of active chilled beams, heat recovery chillers, and multiple heat/energy recovery systems and are expected to save an estimated $240,000 annually in energy costs.

FUTURE ASHRAE CONFERENCES

Winter	Date	Annual
Chicago, IL January 20–24	2018	Houston, TX June 23–27
Atlanta, GA January 12–16	2019	Kansas City, MO June 22–26
Orlando, FL February 1–5	2020	Austin, TX June 27–July 1

PAST ASHRAE MEETINGS

Los Angeles	1980	Denver
Chicago	1981	Cincinnati
Houston	1982	Toronto
Atlantic City	1983	Washington
Atlanta	1984	Kansas City
Chicago	1985	Honolulu
San Francisco	1986	Portland
New York	1987	Nashville
Dallas	1988	Ottawa
Chicago	1989	Vancouver
Atlanta	1990	St. Louis
New York	1991	Indianapolis
Anaheim	1992	Baltimore
Chicago	1993	Denver
New Orleans	1994	Orlando
Chicago	1995	San Diego
Atlanta	1996	San Antonio
Philadelphia	1997	Boston
San Francisco	1998	Toronto
Chicago	1999	Seattle
Dallas	2000	Minneapolis
Atlanta	2001	Cincinnati
Atlantic City	2002	Honolulu
Chicago	2003	Kansas City
Anaheim	2004	Nashville
Orlando	2005	Denver
Chicago	2006	Quebec City
Dallas	2007	Long Beach
New York	2008	Salt Lake City
Chicago	2009	Louisville
Orlando	2010	Albuquerque
Las Vegas	2011	Montreal
Chicago	2012	San Antonio
Dallas	2013	Denver
New York	2014	Seattle
Chicago	2015	Atlanta
Orlando	2016	St. Louis
Las Vegas	2017	Long Beach

2018 Chicago *Sustainability Project*

The sustainability footprint program was launched by the Salt Lake City Host Committee at the 2008 Annual Conference and encourages members to examine ways to get more involved in their local communities. The goals of the program are to leave a legacy representing ASHRAE's commitment to sustainability and to offset the environmental impact from holding the Conference. It is now customary for the Conference host city to select a project with some funding provided by ASHRAE as seed money.

The Illinois Chapter has had an ongoing partnership since 2014 with Rebuilding Together Metro Chicago (RTMC), with Chapter members donating their skills, time, and resources to the Chicagoland community.

The organization seeks to repair the homes and improve the neighborhoods of elderly, disabled and low-income residents so that they may continue to live in warmth, safety and independence. Each year, Rebuilding Together Metro Chicago hosts a build day in a specific Chicago neighborhood, and recruits and trains sponsor teams, identifies and screens homeowner applicants, and coordinates the logistics of a volunteer effort that encompasses over 3,000 people.

The project the Illinois Chapter has undertaken consists of a two-pronged approach to ensure that the project will have the farthest-reaching impact to the local community and a family in need.

PHASE ONE:
Energy Conservation Kits and Homeowner Education

- Each home within the City of Chicago program (approximately 30 homes) will receive a kit of materials that will help to improve energy consumption in the home. These kits will include items such as programmable thermostats, air sealing and weather stripping materials, low-flow showerheads, and other equipment as available via sponsors. The Illinois Chapter will be responsible for compiling and delivering these kits, via the House Captains (as described below).
- Presentations will be made at the House Captain meetings leading up to National Rebuilding Day on April 28, 2018 to educate the House Captains on the equipment provided, and allow for them to further educate their homeowners as to energy savings measures.
- It is the intent that these Energy Conservation Kits be replicable for future years' use, as well.
- An established donor network will assist in ensuring that this can be continued for future iterations of the project.

PHASE TWO:
Efficiency-focused Upgrades to an Individual Home

- The homeowner is an elderly woman who is the sole caretaker and provider for her adult daughter, who has cerebral palsy. She has been unable to physically make necessary repairs to her home since becoming the sole caretaker four years prior, and is lacking in resources necessary to hire tradepersons to do so.
- The home, which is currently without central heat, is being heated by the homeowner via the gas stove at the center of the house. Replacement of the 25-year non-functional heating system with a new, high-efficiency system was the first order of priority.
- The Sustainability Project team completed an energy audit of the home, to identify other potential areas for energy conservation. The team has collected utility data from the homeowner and will utilize this as a baseline for future improvements. Other improvements to the home will be evaluated and implemented between December 2017 and February 2018, depending upon scope. These items will include, but are not limited to: insulation of the floor between the unconditioned basement and occupied areas, replacement of leaking fenestration, and cleaning and sealing of existing ductwork.
- Additionally, a renewable project is being investigated to further offset utility costs to the homeowner. At this time, the renewable project has not been fully defined, but may include solar PV or thermal, wind applications, or others. Monitoring and reporting of systems will be included in the project scope.
- Any larger-scale retrofits and renovations will be completed within the months leading up to National Rebuilding Day on April 28, 2018, by volunteers and tradespeople as required.
- All other renovations and repairs will be completed by a volunteer team from the Illinois Chapter and surrounding local Chapters on National Rebuilding Day.

A project overview and summary will be given by the Chicago Host Committee at the President's Luncheon on Monday in the Grand Ballroom on the 4th floor.

Rebuilding Together. Metro Chicago

WHAT IS A TECHNICAL COMMITTEE?

The technical expertise of ASHRAE is concentrated in its Technical Committees (TCs), Task Groups (TGs), Technical Resource Groups (TRGs) and Multidisciplinary Task Groups (MTGs). These groups are responsible in various degrees for:

- Preparing the text of ASHRAE Handbook chapters
- Originating, coordinating and supervising Society-sponsored research projects
- Presenting programs at ASHRAE conferences
- Reviewing papers for conferences
- Developing ASHRAE publications
- Evaluating the need for standards, and
- Advising the Society on all aspects of the technology it embraces

ASHRAE TCs and these other groups are comprised of volunteers who have a recognized proficiency in a specific field of interest. There are some active 100 TCs addressing all aspects of the HVAC&R and buildings industries.

Applying for Membership on a Technical Committee

ASHRAE welcomes new members to its technical committees. You can join a technical committee by accessing our website at www.ashrae.org/joinatc. You will immediately be assigned as a Provisional Corresponding Member for a two-year term, and be able to participate in committee activities. At the end of the term, you may be considered for a position that has voting membership.

Please note:

If you do not have an ASHRAE ID, please go to www.ashrae.org and click on the Log In tab at the top of the page. Next, click on "Need a Login?" to request an ID and PIN. You may also use that link if you already have an ASHRAE ID as a non-member.

Attending Technical Committee Meetings

TC meetings take place at the Society's Winter and Annual Conferences, and they are open. Attend any meetings in which you have a technical interest. TC chairs welcome new attendees—a TC can never have too many willing and able volunteers.

See the listing of Technical Committee meetings in the Final Program, online or in the app.

HOW AND WHY TO JOIN AN ASHRAE PROJECT COMMITTEE

What Is a Project Committee?

ASHRAE Project Committees (PCs) develop ASHRAE standards and guidelines. ASHRAE PCs consist of people who have a recognized expertise in a specific field of interest. Standards produced by ASHRAE are used as authoritative documents throughout our industry.

Applying for Membership on a Project Committee

ASHRAE welcomes new members to its project committees. With the exception of PC Chairs and Vice Chairs, it is not necessary to be a member of ASHRAE to participate on any of ASHRAE's Standards Project Committee (SPC), Guideline Project Committee (GPC), or Standing Standard/Guideline Project Committees (SSPC, SGPC).

To be considered for project committee membership, you must:

- Submit a PC Application for Membership to ASHRAE staff at Standards.Section@ashrae.org
- Submit a Bias/Conflict of Interest Statement to ASHRAE staff
- Update or complete an ASHRAE Bio online

After you correctly submit all necessary paperwork:

- ASHRAE staff processes the application and provides the membership package to the PC chair
- The PC Chair reviews the membership package and accepts or declines each applicant
- ASHRAE's Standards Project Liaison Subcommittee approves new members

More details on applying for PC membership are available at www.ashrae.org/standards.

Attending Project Committee Meetings

A PC member is expected to attend meetings and pay attention to correspondence. The PC Chair may recommend removal of a PC member for lack of participation such as failing to attend at least half of the scheduled PC meetings in a year.

ASHRAE Project Committees meet at each Society Winter and Annual Conference. Attendance at these meetings is open to everyone. You are encouraged to attend any of these meetings in which you have a technical interest. PC Chairs welcome visitors to PC meetings – a PC can never have too many willing and able volunteers.

See the listing of Standards and Guidelines Committees meetings in the Final Program, online or in the app.

FULL-DAY PROFESSIONAL DEVELOPMENT SEMINARS

Registration fees: $540 (ASHRAE Member $445)

SATURDAY, JANUARY 20, 2018

The Commissioning Process in New and Existing Buildings (Code 60)

8:00 a.m.–3:00 p.m., Palmer House Hilton, Rm: Empire

The fundamentals of the commissioning process through each step of a new construction project from pre-design to occupancy and operations are presented in this seminar. The seminar discusses commissioning documentation, including an overview of commissioning specifications for new construction.
Instructor: Rick Casault, P.E., Member ASHRAE

Complying with the Requirements of ASHRAE Standard 62.1-2016 (Code 61)

8:00 a.m.–3:00 p.m., Palmer House Hilton, Rm: Adams

This seminar provides an overview of the requirements of the new standard with emphasis on changes from the previous version and practical application of the standard to modern VAV systems. New requirements to the indoor air quality procedure for determining minimum ventilation rates are discussed. In the 2016 version, changes were made in determining air class for laboratory exhaust systems and the use of sensors for demand control ventilation. The course presents sample calculations for code review and for physical operation using the latest ASHRAE spreadsheet.
Instructors: Hoy Bohanon, P.E., Member ASHRAE, BEAP, LEED® AP and Chandra Sekhar, Ph.D., Fellow ASHRAE

TUESDAY, JANUARY 23, 2018

Humidity Control I and II: Tips for HVAC Design and Practical Solutions to Existing Problems (Code 72)

UPDATED!

9:00 a.m.–4:00 p.m., McCormick Place, Rm: S105A

This seminar consists of two, three-hour modules. Humidity Control I explains how humidity problems can be easily avoided in new designs by simple and effective humidity specifications and use of dedicated outdoor air systems that keep ventilation air dry. Humidity Control II describes classic problems and solutions for existing buildings when there may be little or no budget for different equipment or controls.
Instructors: Lew Harriman, Fellow ASHRAE and Mark Nunnelly, P.E., Member ASHRAE, BEMP, LEED® AP

Optimizing Indoor Environment: Increasing Building Value (Code 73)

NEW!

9:00 a.m.–4:00 p.m., McCormick Place, Rm: S105BC

This seminar describes what the optimal HVAC operations in existing buildings are, which ASHRAE publications are applicable, and then how to achieve energy and water

savings. If the fundamental building operations are not corrected first, then any efforts solely focused on improving energy and water efficiency will likely result in even poorer building performance.
Instructor: Hoy Bohanon, P.E., Member ASHRAE, BEAP, LEED® AP

HALF-DAY SHORT COURSES

Registration fees: $214 (ASHRAE Member $169)

SUNDAY, JANUARY 21, 2018

Air-to-Air Energy Recovery Applications: Best Practices (Code 62)
3:30 p.m.–6:30 p.m., McCormick Place, Rm: S105A
This course reviews real-world examples of where and how air-to-air energy recovery technologies are integrated into some common, commercially available systems. Particular configurations often used in high-performance buildings and how they can meet strict goals for IEQ, energy efficiency, and thermal comfort will be examined with respect to established performance metrics, peak performance results, and annual energy savings.
Instructor: Paul Pieper, P.Eng., Member ASHRAE

Laboratory Design: The Basics and Beyond (Code 63)
3:30 p.m.–6:30 p.m., McCormick Place, Rm: S105BC
The course focuses on the essential elements of the design process that are unique to laboratory HVAC systems. Topics include planning steps, determining exhaust/supply requirements, load calculation, pressure mapping, evaluating system options, layout of ducts and rooms, sizing primary air systems, designing exhaust stacks, sustainability in laboratories, and control strategies.
Instructor: John Varley, P.E., Member ASHRAE, HBDP, LEED® AP

New ASHRAE-Classified Refrigerants to Meet Society's Changing Needs (Code 64)


3:30 p.m.–6:30 p.m., McCormick Place, Rm: S105D
ASHRAE Standard 34 maintains a list of refrigerants with a standardized system of assigned refrigerant numbers and well-defined safety classifications, including toxicity and flammability ratings. This ever-growing list of refrigerants currently includes 161 chemicals and chemical blends that have been proposed for use as refrigerants. This course explains how the changing needs of society are creating requirements for new refrigerants to be developed and used. The course also explains the new safety classifications that are being proposed and some of the ramifications of these new classifications.
Instructor: Thomas Leck, Ph.D., P.E., Member ASHRAE

NEW! Understanding and Designing Chilled-Beam Systems (Code 65)

3:30 p.m.–6:30 p.m., McCormick Place, Rm: S106AB

This course is primarily designed for mechanical engineers with at least three years of experience in the design of commercial HVAC systems. The course enables attendees to discuss the system benefits, identify suitable applications, and design chilled-beam systems to optimize the energy and operational benefits. Properly identifying and controlling equipment and components that optimize design are also major components of this course.

Instructor: Ken Loudermilk, P.E., Member ASHRAE

MONDAY, JANUARY 22, 2018

Designing High-Performance Healthcare HVAC Systems (Code 66)

8:30 a.m.–11:30 a.m., McCormick Place, Rm: S105A

This advanced course discusses the nuances of HVAC system design for healthcare facilities. The course details the relationship of infection control and HVAC design, including application of ANSI/ASHRAE/ASHE Standard 170-2013, Ventilation of Health Care Facilities. The course discusses in detail the interactions of the key elements of high performance in healthcare, infection control, comfort, reliability, safety, maintenance, energy, and sustainability. Numerous energy conservation strategies are discussed in the context of achieving all the goals of a high-performing hospital.

Instructor: Daniel Koenigshofer, P.E., Member ASHRAE, HFDP

Energy Management Best Practices (Code 67)

8:30 a.m.–11:30 a.m., McCormick Place, Rm: S105BC

This course discusses the principles of energy management and also includes example problems, which are solved collaboratively by the class. Students will learn emissions factors in different geographic regions and how to develop the carbon footprint of a building. At the completion of the course, students are prepared to evaluate a reduced emissions program and the cost-effectiveness produced by key energy management practices.

Instructor: Richard Pearson, P.E., Fellow/Life Member ASHRAE

High-Performance Building Design: Applications and Future Trends (Code 68)

8:30 a.m.–11:30 a.m., McCormick Place, Rm: S105D

This course presents the applications of new technologies and design concepts to achieve the goal of high-performance buildings, including net zero or nearly net zero energy buildings. High performance is more than just energy efficiency, and this course addresses issues and methods for providing high performance in areas beyond energy efficiency, such as indoor environmental quality. The course describes

future trends toward high-performance buildings across the globe, and quickly summarizes how ASHRAE standards (existing and those in development) address these topics.
Instructor: Tom Lawrence, Ph.D., Member ASHRAE, LEED® AP

ASHRAE Guideline 0: The Commissioning Process (Code 69)

2:45 p.m.–5:45 p.m., McCormick Place, Rm: S105A
This course is ideal for building owners, facility managers, design engineers, building designers, architects, equipment manufacturers, and others interested in the commissioning process as defined by ASHRAE Guideline 0. This is an entry-level course that will provide an understanding of the ASHRAE commissioning process for new construction.
Instructor: Walter Grondzik, P.E., Fellow/Life ASHRAE, LEED® AP

Design of Affordable and Efficient Ground-Source Heat Pump Systems (Code 70)

2:45 p.m.–5:45 p.m., McCormick Place, Rm: S105BC
The course examines the economic analysis of ground-source versus more traditional systems and what is necessary to design an effective and efficient ground-source system. The course covers energy analysis, equipment selection, drilling technologies, testing requirements, hydronic system design, and system controls. Participants will learn all that is necessary for the design and installation of a successful ground-source heat pump system.
Instructor: Steve Kavanaugh, Ph.D., Fellow ASHRAE

Successfully Managing the Risk of Legionellosis Using ASHRAE Standard 188-2015 (Code 71) (Co-sponsored by NSF)

2:45 p.m.–5:45 p.m., McCormick Place, Rm: S105D
This course describes the environmental conditions that promote the growth of Legionella in water systems, and the locations where Legionella control measures can be applied in new and existing buildings. A comprehensive management strategy for the prevention of legionellosis is also discussed. The course focuses on the compliance with ASHRAE Standard 188-2015 to provide a safer and healthier building environment.
Instructors: Michael Patton, Member ASHRAE and William Pearson, P.E., Member ASHRAE

TUESDAY, JANUARY 23, 2018

Variable Refrigerant Flow System: Design and Applications (Code 74)

9:00 a.m.–12:00 p.m., McCormick Place, Rm: S105D
This course provides non-manufacturer-specific concepts of how to apply variable refrigerant flow (VRF) systems to buildings. The course supplements the fundamental technology presented in the 2012 ASHRAE Handbook–HVAC

Systems and Equipment, offering consulting engineers who already have a basic knowledge of VRF technology comprehensive system design and application guidance using building specific scenarios.
Instructors: Paul Doppel, Member ASHRAE and Jocelyn Léger, P.Eng., CEM, Member ASHRAE, LEED® AP

Fundamentals and Application of ASHRAE Standard 55 (Code 75)

9:00 a.m.–12:00 p.m., McCormick Place, Rm: S104B
This course is intended to bridge the gap between the design practitioner's knowledge of the built environment and its thermal relationship to the occupant's physiology and psychology. Based on ANSI/ASHRAE Standard 55, Thermal Environmental Conditions for Human Occupancy, this course covers the theory and principles of the standard using examples to illustrate how to achieve compliance with the standard to satisfy the requirements of building performance programs such as LEED®.
Instructors: Peter Alspach, P.E., Member ASHRAE, LEED® AP; Robert Bean, R.E.T., P.Eng., Member ASHRAE and Lawrence Schoen, P.E., Fellow ASHRAE

Complying with ASHRAE Standard 90.1-2016: HVAC/Mechanical (Code 76)

NEW!

9:00 a.m.–12:00 p.m., McCormick Place, Rm: S106AB
ASHRAE's Standard 90.1-2016 on energy for buildings has been established as the commercial building reference standard for state building energy codes in a ruling by the U.S. Department of Energy. Design professionals, code officials, and building owners must now keep up with the new, more stringent requirements to comply with this quickly evolving standard. This course describes the new and updated mandatory and prescriptive requirements for HVAC and service water heating systems, along with insights on how to comply during building design and construction.
Instructor: McHenry Wallace, P.E., Member ASHRAE, LEED® AP

Complying with ASHRAE Standard 90.1-2016: Appendix G (Code 77)

1:00 p.m.–4:00 p.m., McCormick Place, Rm: S106AB
ASHRAE Standard 90.1-2016 Appendix G: Performance Rating Method is an excerpt from ASHRAE Standard 90.1, Energy Standard for Buildings except Low-Rise Residential Buildings. This course discuss the compliance of Appendix G with the 2016 version of the standard. The course provides the compliance path and gives credit for integrated design resulting in energy savings such as efficient use of building mass, optimized building orientation, efficient HVAC&R system selection and right sizing of HVAC&R equipment.
Instructors: McHenry Wallace, P.E., Member ASHRAE, LEED® AP and Joseph Deringer, AIA, Member ASHRAE, LEED® AP

Designing toward Net Zero Energy Commercial Buildings (Code 78)

UPDATED!

1:00 p.m.–4:00 p.m., McCormick Place, Rm: S105D

The course provides application knowledge of the design and operating principles for energy-efficient buildings and available technologies and systems to achieve NZEBs design. Building design strategies; review of current policy and regulation, energy, environmental and economic assessment of building's performance; energy efficiency in HVAC, lighting and appliances; and on-site renewable energy sources are reviewed.

Instructor: Frank Mills, C. Eng., Member ASHRAE

IT Equipment Design Evolution and Data Center Operation Optimization (Code 79)

1:00 p.m.–4:00 p.m., McCormick Place, Rm: S104B

This course examines the best practices for data center energy efficiency. It focuses on the highlights from ASHRAE's Datacom Series of publications and whitepapers. The course provides a detailed discussion of the many variables, drivers, methods, and processes that facilitate energy-efficient data center design and operations, as well as how to plan for future data center needs.

Instructors: Jack Glass, Member ASHRAE and Roger Schmidt, Ph.D., P.E., Member ASHRAE

ASHRAE CERTIFICATION EXAMS

Saturday, January 20
9:00 a.m. – 12:30 p.m.
Kimball, 3rd Floor, Palmer House

Wednesday, January 24
8:00 – 11:30 a.m.
S102D, 1st Floor, McCormick Place

ASHRAE® Certified

Recognized by over 30 national, state and local government bodies – and with over 2,700 certifications earned – ASHRAE certifications increasingly have become the must-have credential for built-environment professionals. ASHRAE certification exams will be administered to candidates in these key, built-environment fields: Commissioning, Energy Assessment, Energy Modeling, Healthcare Facility Design, High-Performance Building Design and Building Operations.

Pre-application required.

ASHRAE 2018 WINTER CONFERENCE TECHNICAL PROGRAM

Earn Professional Development Hour (PDH) credits by attending sessions listed in the Technical Program. Each hour attended in a session equals one PDH. For forums and other one-hour sessions, you must be present for the entire 50-minute program to earn a PDH. Sign in sheets will be available in all session rooms for attendees to complete. State PDHs, AIA LUs and LEED AP credits are awarded for select sessions.

Types of sessions presented:

Conference Paper Sessions. These sessions present papers on current applications or procedures, as well as papers reporting on research in process. These papers differ from technical papers in that they are shorter in length and undergo a much less stringent peer review. PowerPoint presentations with audio descriptions of the presentations are posted online in the Virtual Conference. Preprints of conference papers and an online papers collection are available for purchase in the ASHRAE Bookstore.

Debates. Debates highlight hot-button issues. Experts, either on teams or as individuals, present different sides of an issue in debate format. Each participant presents evidence for or against a specific statement or question such as 'Is Sustainability Really Sustainable?".

Forums. Forums are "off-the-record" discussions held to promote a free exchange of ideas. Reporting of forums is limited to allow individuals to speak confidentially without concern of criticism. There are no papers attached to these forums.

Panels. Panel discussions can feature a broad range of subjects and explore different perspectives on issues in the industry. A panel may feature discussions about integrated project delivery among designers, builders and facility management professionals.

Seminars. Seminars feature presentations on subjects of current interest. Papers are not available from the Society; however, seminar PowerPoint presentations with audio descriptions of the presentations are posted online in the Virtual Conference. Access is free for attendees who purchase a conference registration. A permanent record of the seminar presentations will be available online. Orders can be taken in the ASHRAE Bookstore.

Technical Paper Sessions. These sessions present papers on current applications or procedures, as well as papers resulting from research on fundamental concepts and basic theory. Papers presented in these sessions have successfully completed a rigorous peer review. You are invited to comment

on these papers. Forms for written comment are available at each session. Power point presentations with audio descriptions of the presentations are posted online in the Virtual Conference. Preprints of papers and an online papers collection are available for purchase in the ASHRAE bookstore.

Workshops. Workshops enable technical committees and other ASHRAE committees to provide a series of short presentations on a topic requiring specific expertise. These short presentations are provided with an increased emphasis on audience participation and training in a specific set of skills. PowerPoint presentations with audio descriptions are posted online in the Virtual Conference.

2018 ASHRAE Winter Conference Papers (subscription) – $65

Conference Seminars (subscription) – $105

Conference Preprints (individual papers, in print) – $6 each

ASHRAE Transactions (print volume) – $65

Approved for New York State Professional Development Hours (PDHs) and American Institute of Architects Learning Units (LUs)

Approved for GBCI LEED AP CE Credits

Packages: *Purchase in the Conference Bookstore*

1. **2018 ASHRAE Winter Conference**
   Papers (subscription) and Conference Seminars (subscription); $149
2. **2018 ASHRAE Winter Conference**
   Papers (subscription) and *ASHRAE Transactions*; $124
3. **Complete Winter Conference Content Package**
   (2018 ASHRAE Winter Conference – Papers (subscription), Conference Seminars (subscription), and *ASHRAE Transactions*); $174

All prices are special conference-only prices.

Sunday, January 21

8:00 AM - 9:00 AM

Debate 1 (Intermediate)

BAS Graphics: Integrating Multiple Masters, Who Is the Boss?
Room: Adams
Sponsor: 1.4 Control Theory and Application, 7.3 Operation and Maintenance Management
Moderator: Marcelo Acosta, P.E., Member, Armstrong Fluid Technology, Toronto, ON, Canada
1. *Frank Shadpour, P.E., Fellow ASHRAE**, SC Engineers, Inc., San Diego, CA*
2. *Larry Scholl Jr., Member**, Automated Logic, Kennesaw, GA*

8:00 AM - 9:00 AM

Seminar 1 (Intermediate)

Campus Operators Reflect on Using Guideline 22 and Standard 90.1 for Chiller Plant Monitoring
Room: State
Sponsor: 8.2 Centrifugal Machines, 9.1 Large Building Air-Conditioning Systems
Chair: Dwayne Johnson, Trane, La Crosse, WI
1. University Campus Chiller Plants: ASHRAE Guideline 22 and Standard 184P in Operation
John Vucci, Member*, University of Maryland, College Park, MD*
2. Healthcare Chiller Plants: ASHRAE 90.1 Chiller Plant Monitoring and Beyond
Tim Peglow, P.E., Associate Member*, MD Anderson, Houston, TX*

8:00 AM - 9:00 AM

Seminar 2 (Advanced)

Stack Effect: Friend or Foe in Tall Buildings
Room: Empire
Sponsor: 9.12 Tall Buildings
Chair: Dennis Wessel, P.E., Fellow Life Member, Retired, Cleveland, OH
1. Methods to Mitigate Stack Effect in Supertall and Megatall Buildings
Mehdi Jalayerian, P.E., Member*, ESD, Chicago, IL*
2. Measurements of Stack Effect in Existing Tall and Supertall Buildings
Duncan Phillips, Ph.D., P.E., Associate Member*, RWDI, Guelph, ON, Canada*

8:00 AM - 9:00 AM

Forum 1

Ventilation Effectiveness: What Is It?
Room: Monroe
Sponsor: MTG.ACR, 9.10 Laboratory Systems, TC 9.11 Clean Spaces, TC 9.6 Healthcare Facilities
Moderator: Kishor Khankari, Ph.D., Fellow ASHRAE, AnSight LLC, Ann Arbor, MI

8:00 AM - 9:00 AM

Workshop 1 (Intermediate)

District Chilled Water and Building Systems Heat Exchange Equipment and Impact on Operations

Room: Honore

Sponsor: 7.3 Operation and Maintenance Management

Moderator: John Constantinide, Member, Alpha MRC Architects Engineers, Merritt Island, FL

1. District Energy and Facility Management Operations
***Terrence Rollins, Member**, RHC Global Energy Solutions, Corpus Christi, TX*

8:00 AM - 9:00 AM

Workshop 2 (Intermediate)

Taking the (Fuel) Blinders off Energy Codes: Pathways for Moving to Carbon-Based Codes

Room: Chicago

Moderator: Jim Edelson, Associate Member, New Buildings Institute, Portland, OR

1. The Carbon Emission Requirements in ASHRAE Standard 189.1
***Charles Eley, P.E., BEMP, Member**, Eley Consulting, San Francisco, CA*

2. Beneficial Electrification: What, Why, How and What It Means at the Building Level
***Kenneth A Colburn**, Regulatory Assistance Project, Montpelier, VT*

9:45 AM - 10:45 AM

Conference Paper Session 1 (Intermediate)

Operation and Design for Resilient and Responsive Buildings

Track: Earth, Wind & Fire

Room: Honore

Chair: Alamelu Brooks, Member, ICF International, Columbia, MD

1. Building Automation System Alarm Management for Operation and Maintenance Decision Making (CH-18-C001)
***Han Li**, Azizan Aziz, Erica Cochran, Ph.D. and Bertrand Lasternas, Center for Building Performance and Diagnostics, School of Architecture, Carnegie Mellon University, Pittsburgh, PA*

2. Resilient Building System Design (CH-18-C002)
***Sean Lawler, P.E., Member**[1], Joseph Hurford, CEng[2] and Willa Kuh[3], (1)Affiliated Engineers Inc., Seattle, WA, (2)Affiliated Engineers Inc., Madison, WI, (3)Affiliated Engineers, Inc., Boston, MA*

3. Resilient Design, Commissioning and Operation of the Canadian High Arctic Research Station (CH-18-C003)
***Jean-Francois Pelletier, P.Eng., CPMP, Member**[1], Michael D. Brown, Student Member[2], Guillaume Castonguay, P.Eng.[1] and Cynthia Cruickshank, Ph.D.[2], (1)Ædifica Consultants, Montreal, Canada, (2) Carleton University, Ottawa, ON, Canada*

9:45 AM – 10:45 AM

Seminar 3 (Basic) G

ASHRAE Conference Crash Course

Track: Fundamentals and Applications

Room: Empire

Sponsor: Young Engineers in ASHRAE

Chair: Jake Kopocis, Member, Control Services, Inc, Omaha, NE

1. The Ins and Outs of ASHRAE

***Rachel Romero, P.E., Member**, NREL, Golden, CO*

2. Make the Most of Your Conference Experience

***Vanessa Freidberg, Member**, Siemens Building Technologies, Austin, TX*

9:45 AM - 10:45 AM

Seminar 4 (Intermediate) NY PDH G

Modeling and Testing: Do Air Change Rates Have Lab Safety Covered?

Track: Modeling Throughout the Building Life Cycle

Room: Adams

Sponsor: 9.10 Laboratory Systems, SSPC 62.1

Chair: Kelley Cramm, P.E., Member, Henderson Engineers, Overland Park, KS

1. Case Study of a Model to Evaluate Ventilation Effectiveness in Labs

***Kishor Khankari, Ph.D., Fellow ASHRAE**, AnSight LLC, Ann Arbor, MI*

2. Case Study of an Empirical Test to Evaluate Ventilation Effectiveness in Labs

***Thomas Smith, Member**, Exposure Control Technologies, Inc., Cary, NC*

9:45 AM - 10:45 AM

Seminar 5 (Advanced) NY PDH G

Optimization Tools for Heat Exchanger Design

Track: Heat Exchange Equipment

Room: Monroe

Sponsor: 1.13 Optimization

Chair: David Yashar, Ph.D., P.E., Member, National Institute of Standards and Technology, Gaithersburg, MD

1. GenOpt and Heat Pump Design Model to Optimize Heat Exchangers for Low-GWP Alternative Refrigerants

***Bo Shen, Ph.D., Member**, Oak Ridge National Laboratory, Oak Ridge, TN*

2. Multi-Scale Novel Heat Exchanger Design Using Approximation Assisted Optimization

***Zhiwei Huang, Student Member**, University of Maryland, College Park, MD*

9:45 AM - 10:45 AM

Seminar 6 (Intermediate) NY PDH G

Cutting-Edge Japanese Technologies SHASE Annual Award for System and Equipment in 2017: Zero-Energy Building

Track: Systems and Equipment

Room: State

Chair: Shin-ichi Tanabe, Ph.D., Fellow ASHRAE, Department of Architecture, Waseda University, Tokyo, Japan

1. Targeting Urban ZEB in Japan
***Takuya Tanaka**, Taisei Corporation, Tokyo, Japan*

2. An Air-Conditioning Plan Pursuing Energy Conservation within Urban Medium-Sized Office with an Individual Air-Conditioning System
***Hideki Morita**, Shimizu Corporation, Tokyo, Japan*

11:00 AM - 12:30 PM

Conference Paper Session 2 (Intermediate)

Advancements in Energy Savings

Track: Fundamentals and Applications
Room: Empire
Chair: Michael Pate, Ph.D., Life Member, Texas A&M University, College Station, TX

1. Energy Saving Performance of Buoyancy-Driven Natural and Hybrid Ventilation (CH-18-C004)
***Yoshihide Yamamoto, Ph.D., Member**[1], Shuzo Murakami, Ph.D., Fellow ASHRAE[2], Hisaya Ishino, Ph.D., Member[3] and Kimiko Kohri, Ph.D., Member[4], (1)Nihon Sekkei Co., Ltd, Tokyo, Japan, (2)Institute for Building Environment and Energy Conservation, Tokyo, Japan, (3)Tokyo Metropolitan University, Tokyo, Japan, (4)Utsunomiya University, Utsunomiya, Japan*

2. Nationwide Savings Analysis of a Variety of Energy Conservation Measures (CH-18-C005)
***Defeng Qian, Student Member**, Yanfei Li, Student Member, Fuxin Niu, Student Member and Zheng O'Neill, Ph.D., P.E., Member, University of Alabama, Tuscaloosa, AL*

3. Heat Energy Recovery Potential from Urban Underground Infrastructures (CH-18-C006)
***Graeme Maidment, Ph.D., P.E.**[1], Gareth Davies[1], Nicholas Boot-Handford[2], Joseph Grice[3], William Dennis[2], Abayomi Ajileye[2] and Akos Revesz, Student Member[1], (1)London South Bank University, London, United Kingdom, (2)Transport for London, London, United Kingdom, (3)Islington Council, London, United Kingdom*

4. Identifying Peak and Base Energy Consumption Hour Ranges for Commercial Buildings Using a Non-Parametric Method (CH-18-C007)
***Hongxiang Fu, Student Member**, Juan-Carlos Baltazar, Ph.D., P.E., BEMP, Member and David Claridge, Ph.D., P.E., Fellow ASHRAE, Texas A&M University, College Station, TX*

11:00 AM - 12:30 PM

Conference Paper Session 3 (Intermediate)

Improvements in Heat Transfer Equipment

Track: Heat Exchange Equipment
Room: Chicago
Sponsor: 1.3 Heat Transfer and Fluid Flow
Chair: Lorenzo Cremaschi, Ph.D., Member, Auburn University, Auburn, AL

1. Liquid Removal through Vibrations on a Flexible Film for Condensing/Dehumidification (CH-18-C009)
***Ryan Huber, Student Member**, Giselle Guanes and Melanie Derby, Ph.D., Member, Kansas State University, Manhattan, KS*

2. A New Model for Frost Growth Incorporating Droplet Condensation and Crystal Growth Phases (CH-18-C010)
***Ellyn Harges, Student Member** and Lorenzo Cremaschi, Ph.D., Member, Auburn University, Auburn, AL*

3. Thermal-Hydraulic Performance of Wavy-Fin Heat Exchanger Under Dehumidifying Conditions (CH-18-C011)
Kashif Nawaz, Associate Member[1] *and Dr. Mohammad Sultan Khan, Member*[2]*, (1)Oak Ridge National Labratory, Oak Ridge, TN, (2) Mohammad Ali Jinnah University, Islamabad, Pakistan*

4. Frost Growth on Hydrophilic and Hydrophobic Substrates: The Role of Surface Wettability (CH-18-C012)
Andrew D. Sommers, Ph.D., Associate Member[1]*, Colton W. Gebhart*[1] *and Christian J.L. Hermes*[2]*, (1)Miami University, Oxford, OH, (2) Federal University of Santa Catarina, Florianópolis, Brazil*

5. Round-Tube-Plate-Fin Heat Exchanger Joining Process: Determining Interference Fit Between Tubes and Fin Collars Resulting from the Expansion Process (CH-18-C013)
Rocky Smith*, Burr Oak Tool Inc., Sturgis, MI*

11:00 AM - 12:30 PM

Seminar 7 (Intermediate) NY PDH G

ASHRAE Standard 189.1: NEW Acoustic Control Section
Track: Standards, Guidelines and Codes
Room: Monroe
Sponsor: 2.6 Sound and Vibration
Chair: Jeff Boldt, P.E., Fellow ASHRAE, KJWW Engineering Consultants, Madison, WI

1. Summary of Acoustic Section of ASHRAE Standard 189.1
Erik Miller-Klein, P.E., Member*, A3 Acoustics, LLP, Seattle, WA*

2. Understanding the Referenced Standards and Guidelines in the Acoustics Section of ASHRAE Standard 189.1
Joseph Bridger, Member*, Stewart Acoustical Consultants, Raleigh, NC*

3. The ASHRAE Standard 189.1 User's Manual and Acoustics
Michael Schmeida, Associate Member*, Gypsum Association, Hyattsville, MD*

11:00 AM - 12:30 PM

Seminar 8 (Intermediate) NY PDH G

Impact of Regulatory and Market Trends on Compressor and System Design
Track: Systems and Equipment
Room: Adams
Sponsor: 8.1 Positive Displacement Compressors
Chair: Greg Chilcote, P.E., Member, Trane – Ingersoll Rand, La Crosse, WI

1. HVAC Regulatory and Market Trends
Brian Smith*, Johnson Controls Advanced Development and Engineering Development Center, York, PA*

2. Compressor and System Design Integration
William Dietrich, Member*, Daikin Applied, Staunton, VA*

3. Compressor Modulation
Alberto Scala*, Trane - Ingersoll Rand, La Crosse, WI*

4. Impact of Refrigerants on Compressor Design
Hung Pham*, Emerson Commercial & Residential Solutions, Sidney, OH*

11:00 AM - 12:30 PM

Seminar 9 (Intermediate)

Pressurization Systems for Protecting Exit Stairwells during a Fire

Track: Earth, Wind & Fire

Room: Honore

Sponsor: 5.6 Control of Fire and Smoke

Chair: Paul Turnbull, Member, Siemens Building Technologies, Inc., Buffalo Grove, IL

1. Basic Concepts of Stairwell Pressurization
***John Klote, P.E., Fellow Life Member**, John Klote Fire and Smoke Consulting, Leesburg, VA*

2. Life Safety Dampers
***Larry Felker, Life Member**, Belimo Americas, Sparks, NV, USA*

3. Applications of Stairway and Elevator Pressurization Systems: Is It Really That Easy?
***Peter W McDonnell, P.E., Member**, McClure Engineering, St Louis, MO*

Sunday, January 21, 1:30 PM - 3:00 PM

Conference Paper Session 4 (Intermediate)

HVAC: Tales of the Tape

Track: Fundamentals and Applications

Room: Empire

Chair: David Yashar, Member, NIST, Gaithersburg, MD

1. Design Optimization of Active Chilled Beam for an Office Space Using Large Eddy Simulation (CH-18-C014)
***Abdullah Karimi, Associate Member**, Southland Industries, Dulles, VA*

2. An Optimal Integrated Approach to Design and Operate Ice Thermal Storage for Typical HVAC Systems (CH-18-C015)
***Nabil Nassif, Ph.D., P.E., Member**[1], Fouad AlRifaie, Student Member[2] and Nihal Al Raees, Student Member[1], (1)North Carolina A&T State University, Greensboro, NC, (2)North Carolina A&T University, Greensboro, NC*

3. The BAS/HVAC Office: Organizing People to Use BAS to Optimize Building Performance (CH-18-C016)
***Orvil Dillenbeck, P.Eng., Member** and Don Sheppard, Canadian Nuclear Laboratories, Chalk River, ON, Canada*

4. How Focusing on the Acoustics in the Human Environment Improves Standards and Guidelines and Creates Better Buildings (CH-18-C017)
***Erik Miller-Klein, P.E., Member**, A3 Acoustics, LLP, Seattle, WA*

5. Commercial HVAC Load Sizing Calculations Gone Wrong (CH-18-C018)
***Liam Buckley, CEng, BEMP, Member**, IES Ltd., Oakland, CA*

1:30 PM - 3:00 PM

Seminar 10 (Intermediate)

Building Energy Modeling for Power Grids and Energy Code Compliance

Track: Modeling Throughout the Building Life Cycle

Room: Honore

Sponsor: 4.7 Energy Calculations

Chair: Ralph Muehleisen, Ph.D., P.E., Member, Midwest Energy Efficiency Alliance, Chicago, IL

1. Additional Electric Power Capacity without on-Site Generation Using Power Factor Correction
***Bass Abushakra, Ph.D., Member**, United States Military Academy, West Point, NY*

2. Development of a Data Visualization Tool Set for Use in Investment Decision Making and Utility Program Development
***William Copeland**, Electric Power Board, Chattanooga, TN*

3. Using Building Modeling to Determining Statewide Residential Energy Code Compliance: A Kentucky Case Study
***Chris Burgess, AIA**, Midwest Energy Efficiency Alliance, Chicago, IL*

4. Development of a Web-Based, Code Compliant 2015 Iecc Residential Simulator for Texas
***Jeff S. Haberl, Ph.D., BEMP, Fellow ASHRAE**, Texas A&M University, College Station, TX*

1:30 PM - 3:00 PM

Seminar 11 (Intermediate)

Next Generation Tall Buildings HVAC Design

Track: Tall Buildings

Room: Monroe

Sponsor: 9.12 Tall Buildings

Chair: John Carter, Member, CPP, Fort Collins, CO

1. The Current Tallest Building Design Update
***Mehdi Jalayerian, P.E., Member**, ESD, Chicago, IL*

2. Low Energy Tall Building Design and Modular Tall Buildings
***Robert Tazlaar, Member**, ARUP, Chicago, IL*

3. Low Carbon and Healthy Tall Buildings
***Luke Leung, P.E.**, Skidmore Owings & Merrill, Chicago, IL*

1:30 PM - 3:00 PM

Seminar 12 (Intermediate)

Residential Ventilation Experiences in Europe and North America towards NZEB Design and Operation

Track: Fundamentals and Applications

Room: Chicago

Sponsor: TC 2.1 Physiology and Human Environment, REHVA

Chair: Jaap Hogeling, Dr.Ing., Fellow ASHRAE, REHVA, Brussels, Belgium

1. Mechanical Ventilation in NZEB Cortau House in Italy: Theoretical Performance, Real Effects and Occupants' Expectations
***Stefano Corgnati, Ph.D., P.E., Associate Member**, REHVA, Brussels, Belgium*

2. Cen Standard Methodology for Energy Requirements in Residential Ventilation
***Livio Mazzarella, Ph.D., P.E.**, Politecnico di Milano, Milano, Italy*

3. Residential Ventilation Standards and NZEB Homes in North America
***Max Sherman, Ph.D., Fellow ASHRAE**, LBL, Berkeley, CA*

4. New REHVA Guidebook on Residential Heat Recovery Ventilation: System Layouts, Sizing and Typical Solutions
***Jarek Kurnitski**, Tallinn University of Technology, Tallinn, Estonia*

5. Implementing New and Classical CO2 Tracer Gas Methods for the Assessment of Ventilation Indicators in Residential Buildings
***Manuel Gameiro da Silva, Ph.D., Member**, University of Coimbra, Coimbra, Portugal*

1:30 PM - 3:00 PM

Seminar 13 (Intermediate)

Sound Humidification Supports Health and Comfort

Track: Fundamentals and Applications

Room: Adams

Sponsor: TC 5.11 Humidifying Equipment, TC 5.7 Evaporative Cooling

Chair: Raul Simonetti, Member, Carel Industries SpA, Brugine, Italy

1. 40 Is the New 20: Balanced Indoor Air-Hydration for Health!
***Stephanie Taylor, M.D., Member**, Healthcare Acquired Infections Organization, Boston, MA*

2. Getting Humidity Control Right
***Nicholas Lea, P.Eng., Associate Member**, Nortec Humidity Ltd., A Member of the Condair Group, Ottawa, ON, Canada*

3. VAV with IAQ and a Cure for the Spread of the Airborne Flu Virus
***Thomas Weaver, P.E., Member**, CMSI Headquarters, Hercules, CA*

4. Steam Humidification: Main Systems and Characteristics
***Raul Simonetti, Member**, Carel Industries SpA, Brugine, Italy*

3:15 PM - 4:45 PM

Technical Paper Session 1 (Intermediate)

New Advancements for Energy Efficient Heat Transfer

Track: Fundamentals and Applications

Room: Honore

Chair: Jaya Mukhopadhyay, Ph.D., Member, Montana State University, Bozeman, MT

1. Strategies to Increase Deployment of Renewables Using Cool Thermal Energy Storage (RP-1607) (CH-18-001)
***Amy Van Asselt, Student Member**, University of Wisconsin-Madison, Madison, WI*

2. Analysis of Magnetic Refrigeration Designs with Different Magnet Array Geometries (CH-18-002)
***Serdar Celik, Member**, Southern Illinois University, Edwardsville, IL*

3:15 PM - 4:45 PM

Seminar 14 (Intermediate)

Controlling Pollutant Sources in Residential Buildings

Track: Fundamentals and Applications

Room: Empire

Sponsor: TC 4.3 Ventilation Requirements and Infiltration, SSPC62.2

Chair: Steven J. Emmerich, Fellow ASHRAE, National Institute of Standards and Technology, Gaithersburg, MD

1. Keeping the Car out of the Living Room: What Works (RP-1450)
***Paul W. Francisco, Member**, University of Illinois at Urbana-Champaign, Champaign, IL*

2. The Limitations and Opportunities for Filtration and Air Cleaning in Residences
***Jeffrey Siegel, Ph.D., Fellow ASHRAE**, University of Toronto, Toronto, ON, Canada*

3. Is a Two Hundred Dollar Indoor Air Quality Monitor Good Enough to Keep You Safe?
***Brett Singer, Ph.D., Member**, Lawrence Berkeley National Laboratory , Berkeley, CA*

4. Development of a Smart Range Hood
***Mike Moore, P.E., Associate Member**, Newport Partners LLC, Loveland, CO*

3:15 PM - 4:45 PM

Seminar 15 (Intermediate) NY PDH G

Model Predictive Control Case Studies in Commercial and Institutional Buildings
Track: Modeling Throughout the Building Life Cycle
Room: Monroe
Sponsor: 7.5 Smart Building Systems
Chair: Andreas Athienitis, Ph.D., P.E., Fellow ASHRAE, Concordia University, Montreal, QC, Canada

1. Model Predictive Control of Multiple Rooftop Air Conditioners in Small Commercial Buildings
***Jim Braun, Ph.D., P.E., Fellow ASHRAE**, Purdue University, West Lafayette, IN*

2. Model Predictive Control of a Radiant Floor Cooling System in an Office Space
***Panagiota Karava, Ph.D., Associate Member**, Purdue University, West Lafayette, IN*

3. Model Predictive Control of a Net-Zero Energy Institutional Building and a Hybrid Ventilation System
***Andreas Athienitis, Ph.D., P.E., Fellow ASHRAE**, Concordia University, Montreal, QC, Canada*

3:15 PM - 4:45 PM

Seminar 16 (Intermediate)

New Developments in Ice Rink Refrigeration Systems
Track: Systems and Equipment
Room: Chicago
Sponsor: TC 10.2 Automatic Icemaking Plants and Skating Rinks
Chair: Greg Scrivener, Member, Cold Dynamics, Meadow Lake, SK, Canada

1. Ammonia/Carbon Dioxide Secondary Systems
***Arthur Sutherland, Member**, Accent Refrigeration Systems, Victoria, BC, Canada*

2. Ice Arena Refrigeration Energy Comparison of Low-GWP and Natural Refrigerants
***Kyle Larson, P.E., Associate Member**, Vacom Technologies, LaVene, CA*

3. Heat Recovery in Curling Facilities: Keep It Simple
***Daniel Dettmers, P.E., Member**, University of Wisconsin, Madison, WI*

4. Heat Pumps in Ice Arena Refrigeration Systems
***Wayne Borrowman, P.Eng., Member**, Cimco Refrigeration, Toronto, ON, Canada*

3:15 PM - 4:45 PM

Seminar 17 (Intermediate) NY PDH G

Designing VRF Systems for Code Compliance
Track: Standards, Guidelines and Codes
Room: Adams
Sponsor: TC 8.7 Variable Refrigerant Flow (VRF)
Chair: Madison Schultz, P.E., Member, Guernsey Engineers/ Architects/Consultants, Oklahoma City, OK

1. Designing VRF Systems for Compliance with IECC-2015 and ASHRAE Standard 90.1-2016
***Nick Manusos, Affiliate**, Lennox International, Chicago, IL*

2. Designing VRF Systems for Compliance with ASHRAE Standard 15 and ASHRAE Standard 34-2016
***Keith Hammelman, P.E., Member**, Cannon Design, Chicago, IL*

3. Ventilation Options When Designing VRF Systems
***Bill Artis, Member**, Daikin, New York, NY*

4. Designing VRF Systems for Compliance with City of Chicago Codes
***Andy Hubner**, Premier Mechanical, Addison, IL*

Monday, January 22

8:00 AM - 9:30 AM

Conference Paper Session 5 (Intermediate)

Designing Building Systems for Thermal Comfort

Track: Fundamentals and Applications

Room: Honore

Chair: Christopher Laughman, Member, Waltham, MA

1. Dynamic HVAC Operations with Real-Time Vision-Based Occupant Recognition System (CH-18-C019)
***Siliang Lu, Ph.D., Student Member**, Erica Cochran Hameen, Ph.D. and Azizan Aziz, Center for Building Performance and Diagnostics, School of Architecture, Carnegie Mellon University, Pittsburgh, PA*

2. Case Study: How to Handle a 50 Percent Increase in Occupancy While Maintaining Indoor Air Quality (CH-18-C020)
***Mike McFarland**, enVerid Systems, Inc., Needham, MA*

3. Inference of Thermal Preference Profiles for Personalized Thermal Environments (CH-18-C021)
***Seungjae Lee, Student Member**, Panagiota Karava, Ph.D., Associate Member, Athanasios (Thanos) Tzempelikos, Ph.D., Member and Ilias Bilionis, Purdue University, West Lafayette, IN*

4. Field Studies of the Impact of Demand Response on Occupant's Thermal Comfort and Their Adaptive Behavior in a University Campus (CH-18-C022)
***Sama Aghniaey, Ph.D., Student Member**[1] and Thomas M. Lawrence, Ph.D., P.E., Fellow ASHRAE[2], (1)UGA, Athens, GA, (2)University of Georgia, Atlanta, GA*

8:00 AM - 9:30 AM

Seminar 18 (Intermediate)

Building-Integrated Photovoltaic Systems: Enabling Net-Zero Energy Performance and Beyond

Track: Fundamentals and Applications

Room: State

Sponsor: TC 6.7 Solar Energy Utilization, TC 4.4, TC 4.5, TC 7.1, TC 7.6

Chair: Thanos Tzempelikos, Ph.D., Member, Purdue University, West Lafayette, IN

1. How to Accelerate Architectural Solar in the US Market: From Building-Integrated Photovoltaic to Building Component
***Chris Klinga, P.Eng.**, Architectural Solar Association, Boulder, CO*

2. Building-Integrated Photovoltaic Windows and Envelope Solutions for New and Retrofit Buildings
***Costa Kapsis, Ph.D.**, Natural Resources Canada, Varennes, QC, Canada*

3. Challenges and Opportunities in the Design of Building-Integrated Photovoltaic/Thermal Systems
***Andreas Athienitis, Ph.D., P.E., Fellow ASHRAE**, Concordia University, Montreal, QC, Canada*

4. Building Integrated Photovoltaic Systems: Value, Aesthetics and Standards
***Anthony Pereira**, altPOWER, New York, NY*

8:00 AM - 9:30 AM

Seminar 19 (Intermediate)

Navigating the Changing Landscape of Regulations, Codes and "Best Practices" Around Legionella and Building Water Safety

Track: Standards, Guidelines and Codes

Room: Chicago

Sponsor: TC 3.6 Water Treatment, Environmental Health Committee, SSPC188

Chair: Joshua Ince, P.Eng., Member, Eldon Water Inc, West Chester, OH

1. Where Legionella Lurks in Building Water Systems: How Codes and Regulations Seek to Control Amplification
***Janet Stout, Ph.D., Associate Member**, Special Pathogens Laboratory, Pittsburgh, PA*

2. Water Safety Plans, Who Does What?: The Role of Water Treatment, Engineering and Facility Management
***William Pearson, Member**, Special Pathogens Laboratory, Pittsburgh, PA*

3. Legionella: The Drive for More Effective Codes
***Tim Keane, Member**, Legionella Risk Management Inc., Chalfont, PA*

8:00 AM - 9:30 AM

Seminar 20 (Intermediate)

Performance-Based Procurement: A Focus on Real Performance from Beginning to End

Track: Modeling Throughout the Building Life Cycle

Room: Red Lacquer

Sponsor: TC 7.6 Building Energy Performance, TC 7.5 Smart Building Systems

Chair: Scott Hackel, P.E., Member, Seventhwave, Madison, WI

1. Introduction to Performance-Based Procurement
***Scott Hackel, P.E., Member**, Seventhwave, Madison, WI*

2. Using Performance Targets to Procure a Bed Tower Expansion at Mayo Clinic
***Ken Potts R.A.**, Mayo Clinic, Rochester, MN*

3. Best Practices for Performance-Based Procurement
***Ben Heymer, P.E., Member**, Seventhwave, Chicago, IL*

4. Modeling and Designing Buildings to a Target EUI
***Joseph Clair, P.E.**, dbHMS, Chicago, IL*

8:00 AM - 9:30 AM

Seminar 21 (Intermediate)

Air, Water and Wind: Controlling the Indoor Environment with Excellent Design Strategies

Track: Systems and Equipment

Room: Monroe

Sponsor: TC 6.1 Hydronic and Steam Equipment and Systems, TC 5.1 Fans

Chair: Carrie Anne Crawford, Associate Member, Austin, TX

1. Fan Laws Are Broken at Your Peril: Strategies for Comfort with Careful Fan Selection
***Ginger Scoggins, P.E., Member**, Engineering Designs, Cary, NC*

2. Designing for System Efficiency: Are You Making the Grade?
***Jennifer E. Leach, P.E., Member**, Cummins-Wagner Co, Inc., Annapolis Junction, MD*

3. Keeping out the Bad Stuff, Keeping in the Good Stuff: Envelope Systems That Work with Mechanical Systems
***Theresa A. Weston, Ph.D., Member**, DuPont Building Innovations, Richmond, VA*

8:00 AM - 9:30 AM

Seminar 22 (Intermediate)

How to Thrive During Your Next Natural Disaster: Three Operational Combined Heat and Power Case Studies

Track: Earth, Wind & Fire

Room: Adams

Sponsor: TC 1.10 Cogeneration Systems

Chair: Timothy Wagner, Ph.D., Member, United Technologies Research Center, East Hartford, CT

1. Hurricane Katrina and Jackson Memorial Hospital's 3.5 MW CHP System
***Gearoid Foley, Member**, Integrated CHP Systems Corp., Princeton Junction, NJ*

2. Superstorm Sandy and Princeton University's 15 MW CHP System
***Richard Sweetser, Life Member**, Exergy Partners Corp., Herndon, VA*

3. Winter Storm Nemo and Frito- Lay's 4.2 MW CHP System
***Bruce Hedman, Dr.Ing.**, Entropy LLC, Alexandria, VA*

8:00 AM - 9:30 AM

Seminar 23 (Intermediate)

New Code Requirements for Protecting HVAC&R Components from Extreme Events

Track: Standards, Guidelines and Codes

Room: Empire

Sponsor: TC 2.7 Seismic and Wind Resistant Design

Chair: Harold Dubensky, Member, Johnson Controls, Inc., York, PA

1. Overview (FEMA) of Best Practices and Industry Recommendations
***Scott Campbell, Ph.D., Member**, Structural Analysis Consulting Group, Milwaukee, WI*

2. Updates of Seismic Load Design Requirements for HVACR Components
***Karl Peterman, Member**, Vibro-Acoustics, Markham, ON, Canada*

3. Significant Changes to the Wind Load Design Requirements for HVACR Components
***Panos Papavizas, Member**, Baltimore Aircoil Company, Jessup, MD*

9:45 AM - 10:45 AM

Technical Paper Session 2 (Intermediate)

Airflow Modeling and the Effect on Energy Conservation

Track: Systems and Equipment
Room: Chicago
Chair: Yunho Hwang, Ph.D., Member, University of Maryland, College Park, MD

1. Modeling Variable Airflow Series Fan-Powered Terminal Units in a Mass and Energy Balance Approach (CH-18-003)
***Peng Yin, Ph.D., Associate Member**, University of Louisiana at Lafayette, Lafayette, LA*

2. Modeling Variable Airflow Parallel Fan-Powered Terminal Units in a Mass and Energy Balance Approach (CH-18-004)
***Peng Yin, Ph.D., Associate Member**, University of Louisiana at Lafayette, Lafayette, LA*

3. Modeling and Testing of Single-Speed DX Air Conditioning System (CH-18-005)
***Nabil Nassif**, North Carolina A&T University, Greensboro, NC*

9:45 AM - 10:45 AM

Conference Paper Session 6 (Intermediate)

Fire Safety Effects on IAQ

Track: Earth, Wind & Fire
Room: Honore
Chair: Samir Traboulsi, Dr.Ing., P.Eng., Fellow Life Member, Thermotrade/Ranec, Beirut, Lebanon

1. Numerical Investigation of Smoke Control in Switchgear Room (CH-18-C023)
***Essam E. Khalil, Fellow ASHRAE**, Esmail ElBialy, Ph.D., P.E., Mohamed . Ibrahim, Dr.Ing. and Mohamed A. Fares, P.Eng., Cairo University, Cairo, Egypt*

2. Use CFD Modeling Tool to Study Impact of Energy-Saving HVLS Fans on Fire Safety in Large Space (CH-18-C024)
***Xiaolei Chen, Ph.D.**[1] and Frank Wang, P.E.[2], (1)California State University, Los Angeles, CA, (2)Jensen Hughes, Anaheim, CA*

3. Atrium Smoke Management in Commercial Buildings (CH-18-C025)
***Essam E. Khalil, Fellow ASHRAE**, Mohamed M.A. Hassan, Ph.D., Hatem O. Haridi, Ph.D. and Mohamed M. Ahmed, P.Eng., Cairo University, Cairo, Egypt*

9:45 AM - 10:45 AM

Conference Paper Session 7 (Intermediate)

Increasing System Performance

Track: Fundamentals and Applications
Room: State
Chair: Roger Lautz, P.E., Member, Affiliated Engineers, Inc., Madison, WI

1. Pump Systems Optimization for Commercial Buildings (CH-18-C026)
***Greg Pimento, P.Eng.**[1] and Mark Sullivan[2], (1)Armstrong Fluid Technology, Toronto, ON, Canada, (2)Hydraulic Institute, Parsippany, NJ*

2. Zone Specific Airflow Rate Optimization By Incorporating PI Controller in a General Purpose Commercial CFD Code (CH-18-C027)
Andrew N. Page, Affiliate *and Deepak Kandra, P.E., Arup, New York, NY*

3. Case Study: Prestigious Event Center Achieves Sustainability Goals Using the Indoor Air Quality Procedure of ASHRAE Standard 62.1 (CH-18-C028)
Marwa Zaatari, Associate Member*, enVerid Systems, Needham, MA*

9:45 AM - 10:45 AM

Seminar 24 (Intermediate) NY PDH G

Building Automation Solutions to Code Compliance Challenges in Hospitals
Track: Standards, Guidelines and Codes
Room: Red Lacquer
Sponsor: TC 1.4 Control Theory and Application, TC 9.6 Healthcare Facilities, TC 7.5 Smart Building Systems
Chair: Frank Shadpour, P.E., Fellow ASHRAE, SC Engineers, Inc., San Diego, CA

1. Harvesting Data in Smart Hospitals for Code Compliance Reporting
Daniel Farrow*, Palomar Health, San Diego, CA*

2. Retrocommissioning Strategies to Save Energy in Existing Hospitals
Joseph Kilcoyne, P.E., Member*, SC Engineers, Inc., San Diego, CA*

9:45 AM - 10:45 AM

Seminar 25 (Intermediate) NY PDH G

Modeling and Metrics for Data Center Performance
Track: Modeling Throughout the Building Life Cycle
Room: Empire
Sponsor: TC 9.9 Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment
Chair: Nick Gangemi, Life Member, Northern Air Systems, Rochester, NY

1. The Performance Indicator: A Data Center Cooling Performance View
Mark Seymour, CEng, Member*, Future Facilities Ltd, London, United Kingdom*

2. Using Modeling and Metrics to Improve the Citigroup Flextech Upgrade
Christian Pastrana, P.E., Associate Member*, Citigroup, New York, NY*

3. Quantifying Data Center Cooling Performance
Kourosh Nemati, Ph.D.*, Future Facilities Incorporated, New York, NY*

9:45 AM - 10:45 AM

Seminar 26 (Basic) NY PDH G

Steam System Fundamentals and Applications
Track: Fundamentals and Applications
Room: Monroe
Sponsor: TC 6.1 Hydronic and Steam Equipment and Systems, Student Activities Committee
Chair: Rex Scare, P.E., Member, Armstrong International Inc, Three Rivers, MI

1. Steam System Fundamentals
Robert Feeman*, Armstrong International Inc, Three Rivers, MI*

2. Steam System Applications
***Justin Westmoreland, P.E., Member**, Alternative Energy Systems Consulting, Fresno, CA*

9:45 AM - 10:45 AM
Seminar 27 (Basic)

Urban-Scale Energy Modeling, Part 7
Track: Tall Buildings
Room: Adams
Sponsor: TC 1.5 Computer Applications, TC 9.12 Tall Buildings, TC 4.7 Energy Calculations
Chair: Joshua New, Ph.D., Member, Oak Ridge National Lab, Oak Ridge, TN

1. Micro Environemnt in City of Chicago and Impacts to UBEM
***Luke Leung, P.E., Member**, Skidmore, Owings, & Merrill LPP, Chicago, IL*

2. Sources of Errors in the Physical and Computational Modeling of Wind in the Urban Realm
***Duncan Phillips, Ph.D., P.E., Associate Member**, RWDI, Guelph, ON, Canada*

The following eight sessions will be held Monday at the McCormick Place South Building in conjunction with the AHR Expo. Badges are not required and PDHs will be earned.

11:00 AM - 12:00 PM
AHR Expo Session 1 (Intermediate)

Senses and Cents: Reducing Sound, Improving Comfort and Enabling Energy Efficiency in Residential Buildings
*Track: Residential Mini Track @ Expo**
Room: S101A
Sponsor: 6.1 Hydronic and Steam Equipment and Systems, 5.2 Duct Design, Residential Building Committee
Chair: Lew Harriman, Fellow ASHRAE, Mason-Grant Consulting, Portsmouth, NH

1. Goldie Locks Was a Wethead: Fluid Flow, Not Too Fast and Not Too Slow…Just Right for Quiet, Comfortable and Efficient Systems
***Robert Bean,P.L.(Eng.), Member**, Indoor Climate Consultants Inc., Calgary, AB, Canada*

2. The Big Bad Wolf Was an Airhead: Huffing and Puffing and Blowing the House Down Is Not a Prerequisite for Duct Design
***Allison Bailes, Ph.D., Member**, Energy Vanguard LLC, Decatur, GA*

11:00 AM - 12:00 PM
AHR Expo Session 2 (Intermediate)

Lubricant Changes for Low GWP Next Generation Equipment
*Track: Refrigerant Mini Track @ Expo**
Room: S101B
Sponsor: 3.4 Lubrication, MTG.LowGWP Lower Global Warming Potential Alternative Refrigerants
Chair: Edward Hessell, Ph.D., Associate Member, Chemtura Corporation, Middlebury, CT

1. Lubrication Considerations for Lower GWP R-410A Alternatives
***Julie Majurin, Associate Member**, CPI Fluid Engineering, Midland, MI*

2. Understanding Lubricant Requirements for Next Generation Low Global Warming Potential Refrigerants
***Roberto Urrego, Associate Member**, Chemtura Corporation, Middlebury, CT*

3. Lubricant Changes for Low GWP Next Generation Equipment
***Joe Karnaz, DSc, Member**, Shrieve Chemical, Houston, TX*

1:00 PM - 2:30 PM

AHR Expo Session 3 (Intermediate)

Real-World Experience Providing Residential Energy Excellence

*Track: Residential Mini Track @ Expo**
Room: S101A

Sponsor: 2.8 Building Environmental Impacts and Sustainability, Residential Buildings Committee
Chair: Carrie Anne Crawford, Associate Member, Austin, TX

1. Five New Multifamily Residential Buildings: Measured vs. Modeled Energy Consumption
***Katrin Klingenberg**, Passive House Institute US | PHIUS, Urbana, IL*

2. Prescriptive Doesn't Work for Buildings so Why Would It Work for a Project Team?
***Kimberly LLewellyn**, Mitsubishi Electric Cooling & Heating, Suwanee, GA*

3. The U.S. Army Experience: Reducing Energy When Occupants Don't Pay for Utilities
***Katherine Hammack, Fellow Member**, Ernst & Young, McLean, VA*

1:00 PM - 2:30 PM

AHR Expo Session 4 (Intermediate)

Some Low GWP Next Generation Refrigerant will be Flammable: What Does It Mean to be Flammable?

*Track: Refrigerant Mini Track @ Expo**
Room: S101B

Sponsor: 3.1 Refrigerants and Secondary Coolants
Chair: Steven Eckels, Ph.D., Member, Kansas State University Institute for Environmental Research, Manhattan, KS

1. Flammable Refrigerant Basics
***Stephen Kujak, Member**, Trane, Ingersoll Rand, La Crosse, WI*

2. Flammability: A Continuum vs. Discrete Boundary
***Gregory Linteris, Ph.D., Associate Member**, National Institute of Standards and Technology, Gaithersburg, MD*

3. AHRI Flammable Refrigerant Research
***Xudong Wang, Ph.D., Member**, Air-Conditioning, Heating and Refrigeration Technology Institute, Arlington, VA*

4. Developing Guidelines for Flammable Refrigerant Use
***William Goetzler, Associate Member**, Navigant, Burlington, MA*

2:45 PM - 3:45 PM

AHR Expo Session 5 (Intermediate)

Keeping Occupants Happy and Healthy Through Affordable and Flexible Air and Water Control Strategies

*Track: Residential Mini Track @ Expo**

Room: S101A

Sponsor: TC.6 Service Water Heating Systems, Residential Building Committee

Chair: Kevin Brown, P.E., Member, ABM Technical Solutions, Atlanta, GA

1. Airborne Particulate Matter in Residences: Challenges and Opportunities for Control
***Brent Stephens, Associate Member**, Illinois Institute of Technology, Chicago, IL*

2. Best Practices in Residential Hot Water System Design
***Gary Klein, Associate Member**, Gary Klein and Associates, Inc., Rancho Cordova, CA*

2:45 PM - 3:45 PM

AHR Expo Session 6 (Basic)

Next Generation of Lower or Low GWP Next Generation HVAC&R Equipment

*Track: Refrigerant Mini Track @ Expo**

Room: S101B

Sponsor: 3.1 Refrigerants and Secondary Coolants, 8.2 Centrifugal Machines

Chair: Christopher Seeton, Ph.D., Member, Shrieve, The Woodlands, TX

1. Low GWP Refrigerant Alternatives for Chillers
***Barbara Minor, Member**, Chemours Fluorochemicals, Wilmington, DE*

2. Low GWP Systems for Commercial Refrigeration
***K.C. Kolstad**, Target, Minneapolis, MN*

3. Key Learnings from Conversions of Commercial Refrigeration Systems to Low GWP Alternatives
***Charles Allgood, Ph.D.**, Chemours, Wilmington, DE*

4:00 PM - 5:00 PM

AHR Expo Session 7 (Basic)

ASHRAE's Duct Size Calculator Tool for Easy, Reliable Residential Duct Sizing

*Track: Residential Mini Track @ Expo**

Room: S101A

Sponsor: Residential Building Committee

Chair: Neil P. Leslie, P.E., Member, Gas Technology Institute, Des Plaines, IL

1. What's Inside ASHRAE's Duct Calculator Tool: How It Works, and Why It Helps
***Charles Culp, Ph.D., Fellow Life Member**, Texas A&M University, College Station, TX*

2. How You Can Use ASHRAE's Duct Design Tool for Your Job
***Chris Van Rite, Associate Member**, M&M Manufacturing Co, Fort Worth, TX*

4:00 PM - 5:00 PM

AHR Expo Session 8 (Intermediate)

Contaminant Control: What Is the Same and What is New When Using Low GWP Refrigerants?

*Track: Refrigerant Mini Track @ Expo**

Room: S101B

Sponsor: TC 3.3 Refrigerant Contaminant Control, MTG.Low-GWP Lower Global Warming Potential Alternative Refrigerants

Chair: William Bradford Boggess, Associate Member, Emerson, Syndey, OH

1. Chemistry Considerations and Contaminant Control for Low GWP Refrigerants

***Joe Karnaz, DSc, Member**, Shrieve Chemical, Houston, TX*

2. Impact of Contamination on the Stability of Low GWP Refrigerants

***Sarah Kim, Ph.D., Associate Member**, Arkema, Inc., King of Prussia, PA*

3. Effect of Contaminants on the Stability of HFO Refrigerant Systems

***Ngoc Dung (Rosine) Rohatgi, Ph.D., Member**, Spauschus Associates Inc., Sylva, NC*

11:00 AM - 12:00 PM

Conference Paper Session 8 (Intermediate)

HVAC in Critical Environments

Track: Fundamentals and Applications

Room: Honore

Chair: John Dunlap, Fellow Life Member, Dunlap & Partners, Richmond, VA

1. Constructing Operating Room HVAC with Performance Assurances; An Alternate Approach (CH-18-C029)

***Travis English, P.E., Member**, Jessica Grey and Nabil Mikhail, P.E., Member, Kaiser Permanente, Anaheim, CA*

2. Modeling a Healthcare Facility in South Louisiana for Evaluating Potential Energy Savings (CH-18-C030)

***Zahra Sardoueinasab**[1], Sally Anne McInerny, Ph.D., P.E., Member[1], Peng Yin, Ph.D., Associate Member[1] and Chris Morgan[2], (1)University of Louisiana at Lafayette, Lafayette, LA, (2)CD Morgan and Associates, Lafayette, LA*

3. Dynamics of Semi Unidirectional Air Flow (CH-18-C031)

***Kishor Khankari, Ph.D., Fellow ASHRAE**, AnSight LLC, Ann Arbor, MI*

11:00 AM - 12:00 PM

Conference Paper Session 9 (Intermediate)

Optimizing Heat Exchanger Performance

Track: Heat Exchange Equipment

Room: Chicago

Chair: Michael Sherber, P.Eng., Member, The Firma Group, Inc., Rocky Hill, CT

1. Airside Thermal and Hydraulic Performance of a Bare Tube Heat Exchanger with Diameter of 0.8 Mm Under Dehumidifying Conditions (CH-18-C032)

***Zhiwei Huang, Student Member**, Jiazhen Ling, Ph.D., Member, Yunho Hwang, Ph.D., Member and Reinhard Radermacher, Ph.D., Fellow ASHRAE, University of Maryland, College Park, MD*

2. Development of a Method for Testing Air-Side Fouling Effects on Outdoor Heat Exchangers (RP-1705) (CH-18-C033)

***Mehdi Mehrabi, Student Member,** David P. Yuill, Ph.D., P.E., Member, University of Nebraska, Omaha, NE*

3. Field Evaluation of Condensing Heating Rooftop Units (RTUs) in 100% Outside Air Applications (CH-18-C034)
Patricia Rowley, Associate Member[1]*, Douglas Kosar, Member, Paul Glanville, P.E., Associate Member[1], Shawn Scott[1], Sam Halasa[2] and Wayne Fang[3], (1)Gas Technology Institute, Des Plaines, IL, (2)Beckett Gas Inc., North Ridgeville, OH, (3)Munters Corporation, Selma, TX*

11:00 AM - 12:00 PM
Seminar 28 (Advanced) NY PDH G

Development of a Unified Tool for Analysis of Room Loads and Conditions
Track: Fundamentals and Applications
Room: Monroe
Sponsor: 6.5 Radiant Heating and Cooling
Chair: Peter Simmonds, Ph.D., Fellow ASHRAE, Buildings and Systems Analytics, Marina Del Rey, CA

1. The Theory and Background behind Radiant Performance Explorer/Heat Balance
Chip Barnaby, BEMP, Fellow ASHRAE*, Retired, Lexington, MA*

2. Practical Applications of a Radiant Performance Explorer/Heat Balance Module
Peter Simmonds, Ph.D., Fellow ASHRAE*, Buildings and Systems Analytics, Marina Del Rey, CA*

11:00 AM - 12:00 PM
Seminar 29 (Intermediate) NY PDH G

Fan Energy Savings and System Efficiency Increase by Using the Fan Energy Index
Track: Systems and Equipment
Room: Empire
Sponsor: 5.1 Fans, 5.9 Enclosed Vehicular Facilities
Chair: Joe Brooks, P.E., Member, AMCA International, Arlington Heights, IL

1. Fan Energy Index Defined
Tim Mathson, Member*, Greenheck Fan Corporation, Schofield, WI*

2. Fan Selection Using FEI
Armin Hauer, Member*, ebm-papst, Farmington, CT*

11:00 AM - 12:00 PM
Seminar 30 (Intermediate) NY PDH G

From Concept to Commissioning: How to Get a 1,000 Ton Chiller Plant in a +60 Story Condominium Building
Track: Tall Buildings
Room: Red Lacquer
Sponsor: 7.9 Building Commissioning, TC 9.12, Tall Buildings
Chair: Francis Kohout, P.E., Member, Cyclone Energy Group, Chicago, IL

1. Proposing, Managing and Commissioning the New Chiller Plant
Francis Kohout, P.E., CPMP, Member*, Cyclone Energy Group, Chicago, IL*

2. The Owners Perspective on Installing a New Chiller Plant in an Existing Condominium Building
Amy Eickhoff*, Lieberman Property Management, Chicago, IL*

3. Designing and Installing a New Chiller Plant on Top of an Existing Tall Building
Owen Putman, P.E.*, Hill Mechanical Corp, Chicago, IL*

11:00 AM - 12:00 PM

Workshop 3 (Intermediate) NY PDH G

ASHRAE Building Energy Quotient: A Building Rating System and More

Track: Fundamentals and Applications

Room: Adams

Sponsor: 1.5 Computer Applications, Building EQ Committee

Chair: Bill Klock, P.E., Member, EEA Consulting Engineers, Austin, TX

1. The Methodology of Building EQ

***Charles Eley, P.E., BEMP, Member**, Eley Consulting, San Francisco, CA*

2. A Discussion of the New Building EQ Web Portal

***Stephen Roth, P.E., Member**, Carmel Software Corp., San Rafael, CA*

11:00 AM - 12:00 PM

Workshop 4 (Intermediate) NY PDH G

Code Red: Is your Facility Prepared?

Track: Earth, Wind & Fire

Room: State

Sponsor: 9.6 Healthcare Facilities

Chair: Robert Cox, P.E., Member, Jacobs Carter Burgess, Cary, NC and Mark Tome, Member, CESI

1. What, Why and How to Defend-in-Place in Hospitals

***Michael Meteyer, P.E., Member**, Erdman Companies, Madison, WI*

2. Code Red: Is Your Facility Prepared?

***Ronald Westbrook, P.E., Member**, State University of New York Upstate Medical University, Syracuse, NY*

2:15 PM - 3:45 PM

Seminar 31 (Intermediate)

Disrupting the Status Quo with Natural Refrigerants

Track: Systems and Equipment

Room: Chicago

Sponsor: 10.7 Commercial Food and Beverage Refrigeration Equipment, 10.3 Refrigerant Piping, Controls and Accessories

Chair: Shitong Zha, Member, Heatcraft, Stone Mountain, GA

1. Micro-Distributed: A Simple Solution to Our Refrigerant Challenges

***Tom Wolgamot, P.E., CPMP, Member**, DC Engineering, Missoula, MT*

2. Low Charge Ammonia Chillers for Broad Applications

***Caleb Nelson, P.E., Associate Member**, Azane, Inc., Missoula, MT*

3. Piping Solutions for Natural Refrigerants

***Chris Mueller, Associate Member**, Mueller Industries, Memphis, TN*

2:15 PM - 3:45 PM

Seminar 32 (Intermediate)

The Art and Science of Delivering Healthy, Productive and Effective Buildings

Track: Fundamentals and Applications

Room: Adams

Sponsor: 2.8 Building Environmental Impacts and Sustainability, CIBSE ASHRAE Liaison Committee (co-sponsored by TC2.8, TC7.1 and TC7.6)

Chair: Tim Dwyer, CEng, Fellow ASHRAE, UCL Institute for Environmental Design and Engineering (IEDE), London, United Kingdom

1. The Art of High Performance Buildings
***Peter Wong, CEng, Member**, Yook Tong Electric Co Ltd, Hong Kong, Hong Kong*

2. Creating Healthy Emergency Rooms for Staff and Patients
***David Clark, CEng, Member**, Stantec, Toronto, ON, Canada*

3. Retrofitting to Net Zero Energy
***Kevin Hydes, P.E.**, Integral Group, Oakland, CA*

4. High Performance Buildings Require High Performance Commissioning
***David Green, CEng, CPMP, Member**, CDML, Edmonton, AB, Canada*

2:15 PM - 3:45 PM

Forum 2

The Future of Standards

Track: Standards, Guidelines and Codes

Room: Monroe

Sponsor: ASHRAE BOD ExCom

Chair: Ginger Scoggins, P.E., Member, Engineering Designs, Cary, NC

Tuesday, January 23

Tuesday, January 23, 8:00 AM - 9:30 AM

Conference Paper Session 10 (Intermediate)

Building Envelope Effect on Other Systems

Track: Fundamentals and Applications

Room: Chicago

Chair: William Murphy, Ph.D., P.E., Fellow Member, University of Kentucky, Paducah, KY

1. Learning from the Vernacular: The Impacts of Massive Perforated Screen Shades on Building Energy Savings and Thermal Comfort in Three Different Hot Climate Zones (CH-18-C035)
***Ihab Elzeyadi, Ph.D., BEMP and HBDP** and Ayesha Batool, University of Oregon, Eugene, OR*

2. The Influence of Lighting Conditions, Shading Patterns and Weather on Occupant Visual Preferences in Perimeter Building Zones (CH-18-C036)
***Jie Xiong**, Seungjae Lee, Student Member, Panagiota Karava, Ph.D., Associate Member and Athanasios (Thanos) Tzempelikos, Ph.D., Member, Purdue University, West Lafayette, IN*

3. Economic Feasibility of Hybrid Solar-Combined Cooling, Heating and Power (CCHP) Systems for a Large Office in California (CH-18-C037)
Hyeunguk Ahn, Student Member[1], *Donghyun Rim, Ph.D., Associate Member*[2] *and James Freihaut, Ph.D., Member*[2], *(1)Pennsylvania State University, State College, PA, (2)Pennsylvania State University, University Park, PA*

4. Experimental Study on Heating Emitters in an Environmental Chamber (CH-18-C038)
Duan Wu, Ph.D., Member*, Mitsubishi Electric R&D Center Europe-UK, Livingston, United Kingdom*

5. Life-Cycle Assessment of Apartment Building Renovation in Latvia (CH-18-C039)
Anatolijs Borodinecs, Dr.Ing., Member*, Jurgis Zemitis, Ph.D. and Aleksandrs Geikins, Riga Technical University, Riga, Latvia*

8:00 AM - 9:30 AM

Conference Paper Session 11 (Intermediate)

System Optimization Using Controls and Heat Transfer
Track: Systems and Equipment
Room: Honore
Chair: Bass Abushakra, Ph.D., Member, United States Military Academy, West Point, NY

1. Data-Driven Framework to Find the Physical Association between AHU and VAV Terminal Unit: Pilot Study (CH-18-C040)
June Young Park, Student Member[1], *Bertrand Lasternas*[2] *and Azizan Aziz*[2], *(1)The University of Texas at Austin, Austin, TX, (2)Carnegie Mellon University, Pittsburgh, PA*

2. Cyber Security for Internet Connected HVAC/R Components (CH-18-C041)
Christian Ellwein, Ph.D., Member *and Heinrich Steinhart, Dr.Ing., KRIWAN Industrie-Elektronik GmbH, Forchtenberg, Germany*

3. Business Cases for Improved Control and Internet of Things in HVAC/R (CH-18-C042)
Christian Ellwein, Ph.D., Member*, KRIWAN Industrie-Elektronik GmbH, Forchtenberg, Germany*

4. Relationship Between Sensitivity and Calibration Accuracy on Virtual in-Situ Calibration in Building Systems (CH-18-C043)
Sungmin Yoon *and Yuebin Yu, Ph.D., Associate Member, University of Nebraska-Lincoln, Omaha, NE*

5. Optimization of Microchannel Condenser with Phase Separation in the Header (CH-18-C044)
Jun Li, Student Member[1] *and Pega Hrnjak, Ph.D., Fellow ASHRAE*[2], *(1)University of Illinois, ACRC, Urbana, IL, (2)University of Illinois, ACRC and CTS, Urbana, IL*

8:00 AM - 9:30 AM

Seminar 33 (Intermediate)

Advances in Understanding Corrosion in Heat Exchangers
Track: Heat Exchange Equipment
Room: Empire
Sponsor: TC 8.4 Air-to-Refrigerant Heat Transfer Equipment
Chair: Chad Bowers, Ph.D., Associate Member, Ingersoll Rand, Clarksville, TN

1. Cyclic Polarization of AA 3102 in Various Corrosive Electrolytes
Seifollah Nasrazadani, Member*, University of North Texas, Denton, TX*

2. Field Test Data and Comparison to Accelerated Corrosion Lab Tests for Different Mchx Solutions
***Claudi Martín Callizo, Ph.D., Associate Member**, Granges Aluminium (Shanghai) Co.,Ltd, Shanghai, China*

3. Aluminum Round Tube: Application Requirements and Corrosion Performance
***Vikas Somani**, Brazeway, Adrian, MI*

8:00 AM - 9:30 AM
Seminar 34 (Intermediate) NY PDH G

Net Zero Energy Buildings
Track: Fundamentals and Applications
Room: Red Lacquer
Sponsor: Publishing and Education Council
Chair: Van Baxter, Ph.D., Fellow Life Member, Oak Ridge National Laboratory, Oak Ridge, TN

1. Beyond NZEB: Experimental Investigation of the Thermal Indoor Environment and Energy Performance of a Single-Family House Designed for Plus-Energy Targets
***Ongun Kazanci, Ph.D., Associate Member** and Bjarne Olesen, Ph.D., ASHRAE President and Fellow, Danish Technical University, Lyngby, Denmark*

2. Analysis on a Net-Zero Energy Renovation of a 1920s Vintage Home
***Stephen Caskey, Student Member**[1], Eric Bowler[2] and Eckhard Groll, Dr.Ing., Fellow ASHRAE[1], (1)Purdue University, West Lafayette, IN, (2) Whirlpool Corporation, Benton Harbor, MI*

3. Daytime Space Cooling with Phase Change Material (PCM) Ceiling Panels Discharged Using Rooftop PV/T Panels and Night-Time Ventilation
***Eleftherios Bourdakis, Student Member**[1], Thibault Q. Péan[1], Luca Gennari[1] and Bjarne Olesen, Ph.D., Fellow ASHRAE[2], (1)Technical University of Denmark, Kongens Lyngby, Denmark, (2)Danish Technical University, Lyngby, Denmark*

8:00 AM - 9:30 AM
Seminar 35 (Intermediate) NY PDH G

Low GWP Refrigerants in Heat Exchange Equipment: Part 1, Introduction and Case Studies
Track: Heat Exchange Equipment
Room: Monroe
Sponsor: MTG.LowGWP Lower Global Warming Potential Alternative Refrigerants, TC 1.3 Heat Transfer and Fluid Flow, TCs 1.3, 3.1, 8.4, 8.5, 8.11, The American Society of Thermal and Fluids Engineers (ASTFE), and the U.S. National Committee of the International Institute of Refrigeration (IIR)
Chair: Lorenzo Cremaschi, Ph.D., Member, Auburn University, Auburn, AL

1. Simulated Thermal Performance of Flooded Evaporators with R1234ze (and others) vs. R134a with Oil Effects
***John Thome, Ph.D.**, Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland*

2. Low Environmental Impact Refrigerants for Air-Conditioning, Chiller and Refrigeration Applications
***Ankit Sethi, Associate Member**, Honeywell International, Buffalo, NY*

3. Recent Developments in Low GWP Refrigerants for Refrigeration and Air Conditioning
***Joshua Hughes, Member**, Chemours, Wilmington, DE*

4. Comparative Analysis of Conventional Shell Side Ammonia Flooded Evaporator vs. New Concept Direct Expansion Evaporator
***Zahid Ayub, Ph.D., P.E., Fellow ASHRAE**, Isotherm, Inc., Arlington, TX*

5. Heat Exchanger Performance of Low GWP Refrigerants in Chillers
***Kenneth Schultz, Ph.D., Member**, Ingersoll Rand, La Crosse, WI*

8:00 AM - 9:30 AM

Seminar 36 (Basic)

Resiliency: Building a Safer Future
Track: Earth, Wind & Fire
Room: Adams
Sponsor: TC 2.5 Global Climate Change
Chair: Elizabeth Tomlinson, P.E., Member, TKDA, St. Paul, MN

1. Safeguarding Assets for a Robust Relevant Practice
***Ann Kosmal, F.A.I.A., LEED AP BD +C, CPHC, PDC**, U.S. General Services Administration, Washington, DC*

2. Making Buildings Resilient
***Daniel Nall, P.E., HBDP, CPMP and BEMP, Fellow Life Member**, Syska Hennessy, New York, NY*

3. State-Level Resiliency Planning
***Matthew Lieuallen, J.D.**, Ecology and Environment, Inc., Portland, OR*

8:00 AM - 9:30 AM

Seminar 37 (Intermediate)

Use of Energy Modeling Tools to Support Building Asset Ratings: Screening Analysis, Simplified Modeling and Retrofit Analysis
Track: Modeling Throughout the Building Life Cycle
Room: State
Sponsor: TC 4.7 Energy Calculations
Chair: Chris Balbach, P.E., Associate Member, Performance Systems Development, Ithaca, NY

1. Integration of Screening, Modeling, and Energy Audit
***Nora Wang, Dr.Eng**, PNNL, Richland, WA*

2. Driving Efficiency through Home Energy Ratings
***Joan Glickman**, United States Department of Energy, Washington, DC*

3. Energy Services Triage for Buildings
***Chris Balbach, P.E., BEMP, Associate Member**, Performance Systems Development, Ithaca, NY*

9:45 AM - 10:45 AM

Debate 2 (Basic)

Low GWP Refrigerants in Heat Exchange Equipment
Track: Heat Exchange Equipment
Room: Adams
Sponsor: MTG.LowGWP Lower Global Warming Potential Alternative Refrigerants, 1.3 Heat Transfer and Fluid Flow, TCs: 1.3, 3.1, 8.4, 8.5, 8.11, The American Society of Thermal and Fluids Engineers (ASTFE), and the U.S. National Committee of the International Institute of Refrigeration (IIR)
Moderator: Omar Abdelaziz, Ph.D., Member, OAK Ridge National Laboratory, Oak Ridge, TN,

1. John Thome, *Ph.D., Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland*

2. **Zahid Ayub**, *Ph.D., P.E., Fellow ASHRAE, Isotherm, Inc., Arlington, TX*

3. Kenneth Schultz, *Ph.D., Member, Ingersoll Rand, La Crosse, WI,*

4. Ankit Sethi, *Associate Member, Honeywell International, Buffalo, NY*

5. Joshua Hughes, *Member, Chemours, Wilmington, DE*

9:45 AM - 10:45 AM

Technical Paper Session 3 (Intermediate)

System Enhancement through Commissioning and Metering

Track: Systems and Equipment

Room: Chicago

Chair: Marija S. Todorovic, Fellow Member, University of Belgrade, Belgrade, Serbia

1. Commissioning an Existing Heat Recovery Chiller System at a Large District Plant (CH-18-006)

Lei Wang, Ph.D., P.E., Member[1]*, Yasuko Sakurai*[2]*, Steven Bowman*[2] *and David Claridge, Ph.D., P.E., Fellow ASHRAE*[1]*, (1)Texas A&M University, College Station, TX, (2)Utilities & Energy Services,Texas A&M University, college station, TX*

2. Valve Flow Meter Enhancement Through Computing Valve Dynamic Behaviors (CH-18-007)

Shima Shahahmadi, Student Member[1] *and Li Song, Ph.D., P.E., Member*[2]*, (1)University of Oklahoma, Norman, OK 2)University of Oklahoma, Norman, OK*

9:45 AM - 10:45 AM

Conference Paper Session 12 (Basic)

Residential and Urban Developments

Track: Fundamentals and Applications

Room: Honore

Chair: Hyojin Kim, Ph.D., Member, The Catholic University of America, Washington, DC

1. Indirect Evaporative Cooling with Thermally Reactivated Desiccant Dehumidification for a Net Zero Energy, Hybrid Residential Dwelling (CH-18-C045)

James Leidel, Member[1]*, Pouyan Pourmovahed, Student Member*[1] *and Valeriy Maisotsenko, Ph.D., Member*[2]*, (1)Oakland University, Rochester, MI, (2)IDALEX Technologies, Denver, CO*

2. Dynamic Thermal Analysis of Soil Temperature Distribution in an Urban Park Landscape Above an Enclosed Rail Yard for Optimizing in-Slab Cooling System Sizing, Design and Controls (CH-18-C046)

Kirsten Salmins, Associate Member*, Deepak Kandra, P.E and Raymond Quinn, P.E., Member, Arup, New York , NY*

3. Analysis and Performance of a Residential Indoor Vertical Plant Production Module (CH-18-C047)

Jonathan Maisonneuve, Ph.D., Associate Member[1]*, Pouyan Pourmovahed, Student Member*[1]*, Lianqing Zhu*[2] *and Mingli Dong*[2]*, (1) Oakland University, Rochester, MI, (2)Beijing Information Science and Technology University, Beijing, China*

9:45 AM - 10:45 AM

Seminar 38 (Advanced) NY PDH G

Climate Effects on Tall, Supertall and Megatall Buildings

Track: Tall Buildings

Room: State

Sponsor: 9.12 Tall Buildings

Chair: Peter Simmonds, Ph.D., Fellow ASHRAE, Buildings and Systems Analytics, Marina Del Rey, CA

1. An Engineer's Solution to the Problems

***Peter Simmonds, Ph.D., Fellow ASHRAE**, Buildings and Systems Analytics, Marina Del Rey, CA*

2. An Architect's Perspective of the Problem

***Russell Gilchrist, AIA**, Gensler, Chicago, IL*

9:45 AM - 10:45 AM

Seminar 39 (Intermediate) NY PDH G

Humidity Control in the Built Environment

Track: Fundamentals and Applications

Room: Red Lacquer

Sponsor: Publishing and Education Council

Chair: Fu Linda Xiao, Ph.D., Member, Hong Kong Polytechnic University, Hong Kong, Hong Kong

1. Experimental Study of the Flow Characteristics in a Falling Film Liquid Desiccant Dehumidifier

***Hong-xing Yang, Ph.D.**[1], Yimo Luo, Ph.D.[2], Yi Chen, Ph.D.[1], Tammy Zhong Dan, Ph.D.[2] and Yuanhao Wang, Ph.D.[2], (1)Hong Kong Polytechnic University, Hong Kong, Hong Kong, (2)Technological and Higher Education Institute of Hong Kong, Hong Kong, Hong Kong*

2. Heat and Mass Transfer Performance Comparison between a Direct-Contact Liquid Desiccant Packed Bed and a Liquid-to-Air Membrane Energy Exchanger for Air Dehumidification

***Carey Simonson, Ph.D., Fellow Member**, Gaoming M. Ge, Ph.D., Ahmed Abdel Salam, Ph.D. and Mohamed R.H. Abdel-Salam, Student Member, University of Saskatchewan, Saskatoon, SK, Canada*

9:45 AM - 10:45 AM

Seminar 40 (Intermediate) NY PDH G

Introduction to the New ASHRAE Dedicated Outdoor Air System Design Guide

Track: Systems and Equipment

Room: Empire

Sponsor: TC 8.10 Mechanical Dehumidification Equipment and Heat Pipes

Chair: Kevin Muldoon, KCC International, Louisville, KY

1. Overview of the New ASHRAE DOAS Design Guide

***Svein Morner, Ph.D., P.E., Member**, Sustainable Engineering Group, Madison, WI*

2. Common Pitfalls in the Design and Operation of DOAS

***John Murphy, Fellow ASHRAE**, Trane, La Crosse, WI*

9:45 AM - 10:45 AM

Workshop 5 (Advanced)

Status of Standards in Europe and the Relation to IEC, ISO in View of the Application of Low GWP Refrigerants

Track: Standards, Guidelines and Codes

Room: Monroe

Sponsor: Refrigeration Committee

Chair: Martin Dieryckx, Member, Daikin Europe NV, oostende, Belgium

1. Changes and Work in Progress in IEC 61D and IEC 61C Related to Implementation of Low GWP Substances
***Brian Rodgers**, Underwriters Laboratories, Northbrook, IL*

2. Changes and Work in Progress in European Standards for Low GWP Substances and Relation to ISO and IEC
***Els Baert, Member**, Daikin Europe NV, oostende, Belgium*

11:00 AM - 12:30 PM

Technical Paper Session 4 (Intermediate)

Energy Cost Analysis of HVAC Systems

Track: Fundamentals and Applications

Room: Chicago

Chair: Daniel Pettway, Life Member, Hobbs & Associates, Norfolk, VA

1. Analysis of Whole-Building HVAC System Energy Efficiency (CH-18-008)
***Jiajun Liao, Student Member**[1], Linyan Wang[2] and David E. Claridge, Ph.D., P.E., Fellow ASHRAE[1], (1)Texas A&M University, College Station, TX, (2)Bractlet, Inc., Austin, TX*

2. Cool Roof Use in Commercial Buildings in the United States: An Energy Cost Analysis (CH-18-009)
***Thomas Taylor** and Christian Hartwig, GAF, Parsippany, NJ*

Improving the Energy Efficiency of a Mid-Size Power Plant by Increased Recovery and Reuse of Waste Heat (CH-18-010)
***James Mathias, Member** and Jeffery Green, Southern Illinois University Carbondale, Carbondale, IL*

3. Comprehensive Analyses of Variable, Constant Speed Pumps and Heat Exchanger and Energy Cost Savings Potential in KU Power Plant (CH-18-011)
***Ronald L. Dougherty, Ph.D., P.E.**[2] and Raoof Alabdullah[1], (1)Republic of Iraq' Ministry of Oil, Basra, Iraq, (2)Department of Mechanical Engineering, University of Kansas, Lawrence, KS*

11:00 AM - 12:30 PM

Conference Paper Session 13 (Intermediate)

Application of Modern Modeling Techniques

Track: Modeling Throughout the Building Life Cycle

Room: Honore

Chair: Wade H. Conlan, P.E., Member, Hanson Professional Services, Orlando, FL

1. On the Modelling of Flow Regimes Around Cooling Towers (CH-18-C048)
***Essam E. Khalil, Fellow ASHRAE**, Waleed Abdelmaksoud, Ph.D. and Mohamed Omar, P.E., Cairo University, Cairo, Egypt*

2. CFD Analysis of Dispersion of Particles and Gases in Buildings for Optimal IAQ Sensor Positioning (CH-18-C049)
Gen Pei, Student Member[1], *Donghyun Rim, Ph.D., Associate Member*[1] *and Matthew Vannucci*[2], *(1)Pennsylvania State University, University Park, PA, (2)University of California, Berkeley, CA*

3. Characteristics and Causes of Outliers in Inverse Modeling of Residential Building Energy Use Data (CH-18-C050)
Huyen Do, Student Member*, Kristen Cetin, Ph.D., P.E., Associate Member and Trevor Andersen, Iowa State University, Ames, IA*

4. Control-Oriented Modeling of an Air-Based Electric Thermal Energy Storage Device (CH-18-C051)
Jennifer A. Date, Student Member[1], *José A. Candanedo, Ph.D.*[2], *Andreas Athienitis, Ph.D., P.E., Fellow ASHRAE*[1] *and Karine Lavigne*[3], *(1)Concordia University, Montreal, QC, Canada, (2)Natural Resources Canada, CanmetENERGY, Varennes, QC, Canada, (3)Laboratoire des technologies de l'énergie, Shawinigan, QC, Canada*

11:00 AM - 12:30 PM
Seminar 41 (Intermediate)

Going Large in Air-to-Air Energy Recovery
Track: Systems and Equipment
Room: State
Sponsor: TC 5.5 Air-to-Air Energy Recovery
Chair: Adam Fecteau, Member, Aldes, Saint-Léonard-d'Aston, QC, Canada

1. Going Big in Energy Recovery
Ronnie Moffitt, P.E., Member*, Trane, Lexington, KY*

2. Enthalpy Plate Exchangers for Large Airflow Application
Mo Afshin, P.Eng., Member*, dpoint technologies, Vancouver, BC, Canada*

3. Integrating Large Energy Recovery Units in Cold Climate Designs
Julien Allard, P.Eng., Member*, BPA, Montréal, QC, Canada*

11:00 AM - 12:30 PM
Seminar 42 (Intermediate)

Don't Blow Your Top! Designing Rooftop Systems for Wind and Seismic Compliance
Track: Earth, Wind & Fire
Room: Adams
Sponsor: TC 2.7 Seismic and Wind Resistant Design, TC 5.2 Duct Design
Chair: Patrick Marks, P.E., Fellow ASHRAE, Johnson Controls, New Freedom, PA

1. Designing Rooftop Systems for Wind and Seismic Compliance
Robert Simmons, P.E., Member*, Petra Seismic Design, Houston, TX*

2. Wind Loads on Architectural Screens and Impact on Wind Loads for Roof Mounted Equipment They Surround
Murray Morrison, Ph.D.*, Insurance Institute for Business and Home Safety, Richburg, SC*

3. Secure Roof Top Equipment
Matthew Hooti, P.E., Member*, ISOTECH Industries, Vaughan, ON, Canada*

11:00 AM - 12:30 PM

Seminar 43 (Advanced)

New Advances in Ground-Source Borehole Thermal Response Testing and Storage Applications

Track: Fundamentals and Applications

Room: Monroe

Sponsor: TC 6.8 Geothermal Heat Pump and Energy Recovery Applications

Chair: Cary Smith, Member, Sound Geothermal Corp., Sandy, UT

1. Dynamic Determination of Ground Thermal Conductivity and Minimum Thermal Response Test Duration Using the Line Source Model
***Xiaobing Liu, Ph.D., Member**, Oak Ridge National Laboratory, Oak Ridge, TN*

2. Simulation Correlation Analysis Method Capabilities and Continuous Line-Slope Method Findings
***Rick Clemenzi**, Geothermal Design Center Inc., Ashville, NC*

3. Advanced Thermal Response Applications
***Garen N. Ewbank, Member**, Ewbank Geo Testing, LLC, Fairview, OK*

4. Utilizing DTS for DTRS and Ghx/Btes Temperature Instrumentation
***Chuck Hammock, P.E., Associate Member**, Andrews, Hammock & Powel, Inc., Macon, GA*

11:00 AM - 12:30 PM

Seminar 44 (Intermediate)

The Best of "Engineer's Notebook" 2nd Edition

Track: Fundamentals and Applications

Room: Empire

Sponsor: TC 9.1 Large Building Air-Conditioning Systems, TC 9.10 Laboratory Systems

Chair: John Kuempel Jr., P.E., Member, DeBra-Kuempel, Cincinnati, OH

1. Building Automation System Control of Variable Air Volume Labs
***Steven T. Taylor, P.E., Fellow ASHRAE**, Taylor Engineering LLC, Alameda, CA*

2. Chillers and Boilers in the Same Room: A Cautionary Tale
***Stephen W. Duda, P.E., BEAP, HBDP and HFDP, Fellow ASHRAE**, Ross & Baruzzini, Saint Louis, MO*

3. Energy Efficient Ventilation Systems for Labs
***Daniel H. Nall, P.E., BEMP, CPMP and HBDP, Fellow Life Member**, Syska Hennessy Group, New York, NY*

4. Underground Piping Distribution Systems
***Kent W. Peterson, P.E., BEAP, Presidential Fellow ASHRAE**, P2S Engineering, Inc., Long Beach, CA*

11:00 AM - 12:30 PM

Seminar 45 (Basic)

What in the World? Global Refrigerant Regulations Explained By Experts from Around the Globe

Track: Standards, Guidelines and Codes

Room: Red Lacquer

Sponsor: MTG.LowGWP Lower Global Warming Potential Alternative Refrigerants, Refrigeration Committee, UN Environment

Chair: Jason Robbins, P.E., Member, McDonald's, Romeoville, IL

1. The Kigali Amendment: What Does It Actually Do and Why Should I Care?
***Andrea Voigt, Member**, The European Partnership for Energy and the Environment, Brussels, Belgium*

2. U.S. Refrigerant Regulatory Updates, ASHRAE Standard 15 and UL Safety Standards
***Bill Hansen, P.E., Member**[1] and Jason Robbins, P.E., Member[2], (1) Ingersoll Rand, La Crosse, WI, (2)McDonald's, Romeoville, IL*

3. Refrigerant Regulations in Asia
***Tetsuji Okada**, Japanese Refrigeration and Air Conditioning Industry Association (JRAIA), Tokyo, Japan*

4. Refrigerant Regulations in Developing Countries
***Ayman Eltalouny, Member**, OzonAction Programme at UN Environment, Manama, Bahrain*

5. Refrigerant Regulatory Updates in Europe
***Martin Dieryckx, Member**, Daikin Europe NV, oostende, Belgium*

1:00 PM - 1:30 PM

Seminar TC

Building Automation, Social Media and Millennials! What Do They Have in Common?
Track: Fundamentals and Applications
Room: Salon 4/5
Sponsor: TC 1.4 Control Theory and Application
Chair: Marcelo Acosta, P.Eng., Member, Armstrong Fluid Technologies, Toronto, ON, Canada

Building Automation, Social Media and Millennials! What Do They Have in Common?
***Michelle Shadpour, Student Member**, SC Engineers, Inc., San Diego, CA*

1:30 PM - 3:00 PM

Debate 3 (Intermediate)

Environmental Health Is of Little Concern to the Designer
Track: Fundamentals and Applications
Room: Adams
Sponsor: College of Fellows, Environmental Health Committee
Moderator: Larry Spielvogel, P.E., Fellow Life Member, Consulting Engineer, Bala Cynwyd, PA,

1. Katherine Hammack, *Fellow Member, Ernst & Young, McLean, VA,*

2. Lawrence Schoen, *P.E., Fellow ASHRAE, Schoen Engineering Inc, Columbia, MD,*

3. William Bahnfleth, *Ph.D., P.E., Presidential Fellow ASHRAE, Pennsylvania State University, University Park, PA,*

4. Don Beaty, *P.E., Fellow Life ASHRAE, DLB Associates, Eatontown, NJ,*

5. Peter Wong, *CEng, Member, Yook Tong Electric Co Ltd, Hong Kong, Hong Kong*

6. E. Mitchell Swann, *P.E., Member, MDCSystems, Paoli, PA*

1:30 PM - 3:00 PM

Technical Paper Session 5 (Intermediate)

Investigations of Energy Efficient Airflow Design

Track: Systems and Equipment

Room: Honore

Chair: Ratnesh Tiwari, Ph.D., Member, University of Maryland, College Park, MD

1. A Comparison of Fixed and Variable Airflow Series Fan Powered Terminal Units (CH-18-012)

***Dennis O'Neal, Ph.D., P.E., Fellow ASHRAE**, Baylor University, Waco, TX*

2. Energy and Control Performance Investigation of Dual-Branch Air Handling Units with Return Air Bypass (CH-18-013)

***Koosha Kiamehr, Student Member**, University of Miami, Coral Gables, FL*

3. Annual Energy Performance Evaluation of Series and Parallel Fixed Airflow Fan Powered Terminal Units (CH-18-014)

***Peng Yin, Ph.D., Associate Member**[1], Dennis O'Neal, Ph.D., P.E., Fellow ASHRAE[2] and Di Lu[2], (1)University of Louisiana at Lafayette, Lafayette, LA, (2)Baylor University, Waco, TX*

1:30 PM - 3:00 PM

Conference Paper Session 14 (Intermediate)

Cooling Mission Critical Facilities

Track: Fundamentals and Applications

Room: Chicago

Chair: Nick Gangemi, Life Member, Northern Air Systems, Rochester, NY

1. Effective Cooling of Server Boards in Data Centers By Liquid Immersion Based on Natural Convection Demonstrating PUE below 1.04 (CH-18-C052)

***M. Matsuoka, Ph.D., BEAP, Member**[1], Kazuhiro Matsuda, M.D., BEAP, Member[1] and Hideo Kubo[2], (1)Osaka University, Osaka, Japan, (2) Fujitsu Limited, Tokyo, Japan*

2. Proposal of Cooling System for High Performance Computing by Drip-Feeding Cooling (CH-18-C053)

***Kazuhiro Matsuda, M.D., BEAP, Member**[1], Morito Matsuoka, Member[1] and Yuichiro Miyake[2], (1)Osaka University, Osaka, Japan, (2)NTT Group, Tokyo, Japan*

3. Cooling System with Nearly Zero Cooling Power for Server Rooms (CH-18-C054)

***Naoki Aizawa, BEAP**, Takasago Thermal Engineering Co.,Ltd., Kanagawa, Japan*

4. Data Center Sustainability Index (CH-18-C055)

***Sophia Flucker, CEng**[1], Robert Tozer, Ph.D., Life Member[1], Beth Whitehead, Ph.D.[1], Deborah Andrews, Ph.D.[2] and Jon Summers[3], (1) Operational Intelligence Ltd., Kingston upon Thames, United Kingdom, (2)London South Bank University, London, United Kingdom, (3) University of LEEDS, Leeds, United Kingdom*

5. Efficient Cooling and Heat Recovery with VRF Systems in Embedded Data Centers (CH-18-C056)

***Micah Sweeney**[1], Mukesh Khattar, Ph.D., Fellow ASHRAE[2] and Ron Domitrovic, Ph.D., Member[3], (1)EPRI (Electric Power Research Institute), Knoxville, TN, (2)EPRI (Electric Power Research Institute), Palo Alto, CA, (3)Electric Power Research Institute, Knoxville, TN*

1:30 PM - 3:00 PM

Seminar 46 (Intermediate) 

CFD Modeling throughout the Building Lifecycle

Track: Modeling Throughout the Building Life Cycle

Room: Monroe

Sponsor: TC 4.10 Indoor Environmental Modeling

Chair: Jinchao Yuan, Ph.D., P.E., Member, University of Idaho, Boise, ID

1. Is a Reactive Approach to Data Center Overheating Sufficient?
***Mark Seymour, CEng, Member**, Future Facilities Ltd, London, United Kingdom*

2. Design Considerations for Occupational Health When Large Maintenance Facilities Are Repurposed for Aircraft Painting
***James Bennett, Ph.D., Member**, CDC/NIOSH, Cincinnati, OH*

3. CFD Modeling to Support City Building Re-Development
***Duncan Phyfe, Associate Member**, ARL, Alden, MA*

1:30 PM - 3:00 PM

Seminar 47 (Intermediate) 

Requirements for Extreme Weather Operation of HVAC Systems

Track: Earth, Wind & Fire

Room: State

Sponsor: TC 7.3 Operation and Maintenance Management

Chair: Robyn Ellis, Associate Member, City of Hamilton - Public Works, Hamilton, ON, Canada

1. Extreme Cold Weather HVAC System Configuration and Operation
***Orvil Dillenbeck, P.Eng., Member**, Canadian Nuclear Laboratories, Chalk River, ON, Canada*

1:30 PM - 3:00 PM

Seminar 48 (Basic) 

Cost Effective Measurement and Verification for Large Systems

Track: Systems and Equipment

Room: Empire

Sponsor: TC 7.6 Building Energy Performance

Chair: Annie Smith, P.E., Associate Member, Ross & Baruzzini, St. Louis, MO

1. Measurement and Verification of Efficiency Upgrades in Chilled Water Systems
***Abdul Qayyum "Q" Mohammed, Associate Member**, Go Sustainable Energy, Columbus, OH*

2. Adventures in Industrial Process Improvements
***Dennis Landsberg, Ph.D., P.E., BEAP, Fellow Life Member**, L&S Energy Services, Inc., Clifton Park, NY*

3. Measurement and Verification: Added Expense or Cheapest Energy Savings Available?
***Chris Smith, P.E., Member**, Energy 350, Portland, OR*

1:30 PM - 3:00 PM

Seminar 49 (Intermediate) NY PDH G

The Process for Zero Energy K-12 Schools: The Next Series of ASHRAE Advanced Energy Design Guides

Track: Fundamentals and Applications

Room: Red Lacquer

Sponsor: TC 2.8 Building Environmental Impacts and Sustainability

Chair: Charles Eley, P.E., Member, Eley Consulting, San Francisco, CA

1. The Process of Creating Zero Energy Design Guidance: The Next in the Series
***Paul Torcellini, Ph.D., P.E., Member**, National Renewable Energy Laboratory, Golden, CO*

2. The Owners Perspective: Making Zero Energy Happen
***John Chadwick, AIA**, Arlington Public Schools, Arlington, VA*

3. Lighting Design Parameters for Successful Zero Energy Schools
***Shanna Olson**, IMEG Corp., Chicago, IL*

4. Making It All Work: Important Aspects of HVAC Zero Energy Design
***Daniel Nall, P.E., HBDP, CPMP and BEMP, Fellow Life Member**, Syska Hennessy, New York, NY*

2:00 PM - 3:00 PM

Seminar TC

CFD Study of Hydraulic Shock in Two-Phase Anhydrous Ammonia

Track: Systems and Equipment

Room: Clark 3

Sponsor: TC 10.3 Refrigerant Piping, Controls and Accessories

Chair: Chidambaram Narayanan, ASCOMP USA Inc., Surich, Switzerland

3:15 PM - 4:45 PM

Seminar 50 (Basic) NY PDH G

Low Energy Design Impacts on Peak Heating and Cooling Load Calculations

Track: Fundamentals and Applications

Room: Monroe

Sponsor: TC 4.1 Load Calculation Data and Procedures

Chair: Glenn Friedman, P.E., Fellow ASHRAE, Taylor Engineering, Alameda, CA

1. Heating and Cooling Load Trends: Down, Down, Down
***Steven Bruning, P.E., Fellow ASHRAE**, Newcomb & Boyd, Atlanta, GA*

2. Decreasing Internal Loads: Could This Lead to Problems?
***Christopher K. Wilkins, P.E., Member**, CBR USA, Cambridge, MA*

3. Low Loads: Reap the Benefits but Read the Fine Print
***Manalee Nabar, P.E., Associate Member**, Bright Power Inc., New York, NY*

3:15 PM - 4:45 PM

Seminar 51 (Intermediate)

Control System Best Practices: How to Make the Control System a Success, Part 2

Track: Systems and Equipment

Room: Adams

Sponsor: TC 1.4 Control Theory and Application

Chair: Israa Ajam, Associate Member, Ecosystem, New York, NY

1. Control System Best Practices: How to Make the Control System a Success Part 2A

***Barry Bridges, P.E., CPMP, Life Member**, NV5, Saint Paul, MN*

2. Control System Best Practices: How to Make the Control System a Success Part 2B

***George Gemberling III**, County of Riverside, Riverside, CA*

3. Control System Best Practices: How to Make the Control System a Success Part 2C

***Israa Ajam, Associate Member**, Ecosystem, New York, NY*

3:30 PM - 4:30 PM

Seminar TC (Basic)

TC Seminar How Accurate is Your Air Flow Capture Hood Measurement?

Track: Systems and Equipment

Room: Honore

Sponsor: TC 1.2 Instruments and Measurements

Chair: Stephen Idem, Ph.D., Member, Tennessee Technological University, Cookeville, TN

1. Accuracy of Residential Capture Hoods

***Steve Rogers**, The Energy Conservatory, Minneapolis, MN*

2. Capture Hood Errors Associated with Commercial Diffuser Types

***Robert Moss**, Dwyer, Michigan City, IN*

Wednesday, January 24

8:00 AM - 9:30 AM

Technical Paper Session 6 (Intermediate)

Unique Methods of Improving Building Operation

Track: Fundamentals and Applications

Room: Chicago

Chair: Luke Leung, P.E., Member, Skidmore, Owings, & Merrill LPP, Chicago, IL

1. Software-Based Fault Detection for Multi-Circuit Building Lighting Systems (CH-18-015)

***Jayson Bursill, Student Member**, William O'Brien, Ph.D., Member and Ian Beausoleil-Morrison, Carleton University, Ottawa, ON, Canada*

2. A Preliminary Study on Text-Mining Operator Logbooks to Develop a Fault-Frequency Model (CH-18-016)

***H. Burak Gunay**[1], Weiming Shen[2], Brent Huchuk[3] and Zixiao Shi[2], (1) Usable Buildings, Ottawa, ON, Canada, (2)Carleton University, Ottawa, ON, Canada, (3)ecobee, Toronto, ON, Canada*

3. Energy Modelling Methodology for Community Masterplanning (CH-18-017)

***Scott Bucking, Ph.D., Associate Member**, Carleton University, Ottawa, ON, Canada*

4. Simulation of Radiant Cooling Systems in Clean Room Applications Using Computational Fluid Dynamics (CH-18-018)
Mohamed Al Beltagy[1], *Ahmed El Baz*[2], *Mohamed Elmorsi*[3] *and Ahmed El Assy*[2], *(1)Howeedy Consultant, Cairo, Egypt, (2)Ain Shams University, Cairo, Egypt, (3)American University, Cairo, Egypt*

8:00 AM - 9:30 AM

Conference Paper Session 15 (Intermediate)

Contemporary Heat Pump Methods

Track: Heat Exchange Equipment

Room: Honore

Chair: Philip Agee, Student Member, Virginia Polytechnic Institute and State University, Blacksburg, VA

1. Performance Enhancement of Urban Ground Source Heat Pumps through Interactions with Underground Railway Tunnels (CH-18-C057)
Akos Revesz, Student Member*, Mari Mavroulidou, Issa Chaer, Ph.D., Mike Gunn, Jolyn Thompson and Graeme Maidment, Ph.D., P.E., London South Bank University, London, United Kingdom*

2. Preliminary Analysis of the Impact of Gas-Fired Heat Pump on Heating and Cooling Energy Consumption of a Library Building (CH-18-C058)
Altamash Baig, Student Member *and Alan Fung, Ryerson University, Toronto, ON, Canada*

3. Longitudinal Evidence of Inverter-Driven Heat Pump Performance in Low-Load Residential Buildings (CH-18-C059)
Philip Agee, Student Member*, Georg Reichard, Ph.D., Member and Andrew McCoy, Ph.D., Virginia Polytechnic Institute and State University, Blacksburg, VA*

4. Laboratory and Field Evaluation of a Gas Heat Pump-Driven Residential Combination Space and Water Heating System (CH-18-C060)
Paul Glanville, P.E., Associate Member[1], *Daniel Suchorabski*[1], *Chris Keinath, Ph.D.*[2] *and Michael Garrabrant*[2], *(1)Gas Technology Institute, Des Plaines, IL, (2)Stone Mountain Technologies, Inc., Erwin, TN*

8:00 AM - 9:30 AM

Seminar 52 (Intermediate)

Are You Ready for the Next Disaster?

Track: Earth, Wind & Fire

Room: Monroe

Sponsor: TG2 Heating Ventilation and Air-Conditioning Security (HVAC)

Chair: Carol Lomonaco, Member, Johnson Controls, Inc., Milwaukee, WI

1. Past Disasters: What Can We Learn?
Anthony York, P.E., Member*, Syska Hennessy Group, New York, NY*

2. Current State: How Do We Assess Security?
Jason DeGraw, Ph.D., Member*, National Renewable Energy Laboratory, Golden, CO*

3. Moving Forward: What Guidance on Security and Risk Assessment Is Available?
Scott Campbell, Ph.D., Member*, Portland Cement Association, Milwaukee, WI*

8:00 AM - 9:30 AM

Seminar 53 (Intermediate)

Biomass Hydronic Heating: Achieving High Performance Systems in Residential and Commercial Applications

Track: Systems and Equipment

Room: Empire

Sponsor: TC 6.10 Fuels and Combustion, TC 6.1 Hydronic and Steam Equipment and Systems

Chair: Paul Sohler, Crown Boiler Company, Philadelphia, PA

1. Efficiency and Emissions of Modern Hydronic Biomass-Fired Heating Systems
***Thomas Butcher, Ph.D., Fellow ASHRAE**, Brookhaven National Laboratory, Upton, NY*

2. Staging Biomass and Conventional Boilers for Optimal Energy Management
***John Siegenthaler, P.E., Member**, Appropriate Designs, Holland Patent, NY*

3. Numerous Lessons Learned from Biomass Heating System Commercial Installations in New York State
***Khaled Yousef, P.E., Member**, Pyramid Energy Engineering Services, Albany, NY*

8:00 AM - 9:30 AM

Seminar 54 (Intermediate)

Ventilation Equipment and Systems for Underground Railway Facilities

Track: Systems and Equipment

Room: Adams

Sponsor: TC 5.9 Enclosed Vehicular Facilities, TC 5.1 Fans, TC 5.6 Control of Fire and Smoke

Chair: Igor Maevski, Ph.D., P.E., Member, Jacobs Engineering, New York, NY

1. Chicago Union Station: Ventilation System Design Innovations
***Jonathan Ko, P.E., Member**, Jacobs Engineering, New York, NY*

2. Emergency Tunnel Ventilation Fans: A Guide to Selections and the Ramifications of the Choices
***Michael Feuser, Member**, Twin City Clarage, Inc., Pulaski, TN*

3. Tunnel Ventilation Dampers: A Guide to Selections for Underground Passenger Rail Facilities
***Bill Lampkin, Member**, Greenheck, Schofield, WI*

4. Subway Fires
***Yoon Ko, Ph.D., Member**, National Research Council Canada, Ottawa, ON, Canada*

8:00 AM - 9:30 AM

Seminar 55 (Intermediate)

Unique Refrigeration Applications

Track: Systems and Equipment

Room: Red Lacquer

Sponsor: TC 10.1 Custom Engineered Refrigeration Systems

Chair: Tom Wolgamot, P.E., Member, DC Engineering, Missoula, MT

1. Refrigeration Aboard the ISS
***Douglas Reindl, Ph.D., P.E., Fellow ASHRAE**, University of Wisconsin-Madison, Madison, WI*

2. Design of Micro-Breweries
***Daniel Dettmers, Member**, Industrial Refrigeration Consortium, University of Wisconsin- Madison, Madison, WI*

3. Use of Transcritical CO2 in a Pumped Direct Floor Ice Rink
***James Blahey, P.Eng., Member**, Cimco, Winnipeg, MB, Canada*

8:00 AM - 9:30 AM

Seminar 56 (Intermediate)

Using Optimization for Airflow Management in Data Centers and Operating Rooms

Track: Modeling Throughout the Building Life Cycle

Room: State

Sponsor: TC 4.10 Indoor Environmental Modeling, TC 9.9 Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment

Chair: James W. VanGilder, P.E., Member, Schneider Electric, Andover, MA

1. Optimization Study of Stanchion Layout and Flow Partitioning to Achieve Uniform Airflow through Perforated Tiles in Data Centers
***Cheng-Xian (Charlie) Lin, Ph.D., Member**, Florida International University, Miami, FL*

2. Optimizing Supply Airflow Location in Data Centers Using CFD
***Ramin Rezaei, Associate Member**, Southland Industries, Dulles, VA*

3. Improving Data Center Efficiency with Active Airflow Control
***James W. VanGilder, P.E., Member,** Schneider-Electric, Andover, MA*

4. Optimizing Air Change Rates in an Operating Room Using CFD
***Mehran Salehi, Ph.D., Associate Member**, Southland Industries, Dulles, VA*

9:45 AM - 10:45 AM

Conference Paper Session 16 (Intermediate)

Low GWP Refrigerants

Track: Fundamentals and Applications

Room: Honore

Chair: Edward A. Vineyard, Fellow ASHRAE, Oak Ridge National Laboratory, Oak Ridge, TN

1. Comparing Atmospheric Stability versus HVACR Equipment Chemical Stability of New Low GWP Olefin Based Refrigerants (CH-18-C061)
***Stephen Kujak, Member** and Elyse Sorenson, Associate Member, Trane, Ingersoll Rand, La Crosse, WI*

2. Investigation of Low GWP Flammable Refrigerant Leak from Rooftop Units (CH-18-C062)
***Ahmed Elatar, Ph.D.**[1], Ahmad Abu-Heiba, Member[2], Viral Patel, Ph.D., Member[2], Omar Abdelaziz, Ph.D., Member[1], K Dean Edwards[2], Mingkan Zhang[2] and Van Baxter, Ph.D., Fellow Life Member[2], (1)ORNL, Oak Ridge, TN, (2)Oak Ridge National Laboratory, Oak Ridge, TN*

3. Performance of Low GWP Refrigerant R-516A in an Air-Cooled Chiller (CH-18-C063)
***Kenneth Schultz, Ph.D., Member** and Marcos Perez-Blanco, Ph.D., Ingersoll Rand, La Crosse, WI*

9:45 AM - 10:45 AM

Seminar 57 (Advanced)

Air Barriers and HVAC Systems: A Better Marriage

Track: Tall Buildings

Room: Monroe

Sponsor: TC 4.4 Building Materials and Building Envelope Performance

Chair: Chris Schumacher, Member, RDH Building Science Laboratories, Waterloo, ON, Canada

1. Air Barrier in the Building Envelope: Basics
***Laverne Dalgleish, Associate Member**, Air Barrier Association of America, Boston, MA*

2. Airflow Breakdown: Mapping Ventilation Airflow in a 13 Story Residential Tower
***Lorne Ricketts, P.Eng., Associate Member**, RDH Building Science Inc., Vancouver, BC, Canada*

9:45 AM - 10:45 AM

Seminar 58 (Intermediate)

ASHRAE Standard 100-2015, Energy Efficiency in Existing Buildings: Applications, Updates and Plans

Track: Standards, Guidelines and Codes

Room: Empire

Sponsor: TC 7.6 Building Energy Performance, SSPC 100 Energy Efficiency in Existing Buildings

Chair: Joseph Firrantello, Ph.D., P.E., Member, Envinity, Inc., State College, PA

1. Targets and Climates for International Application of Standard 100
***Glenn Friedman, P.E., Fellow ASHRAE**, Taylor Engineering, Alameda, CA*

2. New Compliance Options for Individual Users of ASHRAE Standard 100
***Neil P. Leslie, P.E., Member**, Gas Technology Institute, Des Plaines, IL*

3. Alternative Expressions of Performance for ASHRAE Standard 100: Is EUI Enough or Does It Need Help?
***Dennis Landsberg, Ph.D., P.E., BEAP, Fellow Life Member**, L&S Energy Services, Inc., Clifton Park, NY*

9:45 AM - 10:45 AM

Seminar 59 (Intermediate)

Dehumidification Designs for Surgical Suites

Track: Fundamentals and Applications

Room: State

Sponsor: TC 8.12 Desiccant Dehumidification Equipment and Components, TC 5.5 Air-to-Air Energy Recovery, TC 9.6 Healthcare Facilities

Chair: Mark Piegay, Associate Member, Alfa Laval - Kathabar, Tonawanda, NY

1. Applying Dry Rotor Desiccant Systems in Temperature and Humidity Control for Hospital Operating Rooms
***James Piscopo, P.E., Member**, Jacobs Engineering, Philadelphia, PA*

2. Applying Liquid Desiccant Systems in Temperature and Humidity Control for Hospital Operating Rooms
***Michael Harvey, Member**, Niagara Blower Company, Buffalo, NY*

9:45 AM - 10:45 AM
Seminar 60 (Intermediate)

Energy Optimization and Loads for Indoor Plant and Animal Growth
Track: Fundamentals and Applications
Room: Adams
Sponsor: TC 2.2 Plant and Animal Environment, TC 8.10 Mechanical Dehumidification Equipment and Heat Pipes, TC 9.8 Large Building Air Conditioning Systems
Chair: Carol Donovan, Member, Alares LLC, Quincy, MA

1. Latent and Sensible Calculations for Indoor Plant Growth
***Craig Burg, Member**, Desert Aire Corp, Germantown, WI*

2. Calculation Methodology for Preconditioning Inlet Air for Livestock Facilities
***Joe Zulovich, Ph.D., P.E., Affiliate**, University of Missouri, Columbia, MO*

9:45 AM - 10:45 AM
Seminar 61 (Intermediate)

Cutting-Edge Japanese Technologies SHASE Annual Award for Systems and Equipment in 2017: Retrofit Project
Track: Systems and Equipment
Room: Red Lacquer
Sponsor: SHASE
Chair: Ryozo Ooka, Ph.D., Member, University of Tokyo Institute of Industrial Science, Tokyo, Japan

1. Energy-Saving Retrofit of Facilities in the Museum, Slashing Energy Consumption By 40%
***Taro Nomura**, Japan Facility Solutions, Inc., Tokyo, Japan*

2. Energy-Saving Retrofitting of Heat Source in DHC
***Satoshi Yamakawa**, TEPCO Energy Partner, Incorporated, Tokyo, Japan*

9:45 AM - 10:45 AM
Seminar 62 (Intermediate)

Thermodynamic Limits for Buildings
Track: Fundamentals and Applications
Room: Chicago
Sponsor: TC 7.4 Exergy Analysis for Sustainable Buildings (EXER)
Chair: David Vernon, Associate Member, UC Berkeley Center for the Built Environment, Berkeley, CA

1. Thermodynamic Limits for Air-Conditioned Buildings
***William Kopko, Member**, Johnson Controls, Chiller Solutions, Technology and Innovation Group, New Freedom, PA*

2. Exergy in Air Conditioning
***Mike Trantham, Member**, IMI Flow Design, Dallas, TX*

3. Holistic Analysis of HVAC Systems Using Exergy
***Ongun Berk Kazanci, Ph.D., Associate Member**, Technical University of Denmark, Kgs. Lyngby, Denmark*

11:00 AM - 12:30 PM
Panel 1 (Intermediate)

Integrated Design and Delivery: Spirit of a New World or a Fantasy?
Track: Modeling Throughout the Building Life Cycle
Room: Adams

Sponsor: TC 7.1 Integrated Building Design, TC 1.7 Business, Management & General Legal Education, TC 7.2 HVAC Design-Build Contractors

Moderator: E. Mitchell Swann, P.E., Member, MDCSystems, Paoli, PA

1. The Contractor's Perspective
***Charles Gulledge, P.E., HBDP, Member**, AC Corporation, Greensboro,, NC*

2. The Owner's Perspective
***Martin Weiland, P.E., Member**, US General Services Administration, Washington, DC*

3. The Engineer\Modeler Perspective
***Elyse Malherek, Associate Member**, The Weidt Group, Minnetonka, MN*

11:00 AM - 12:30 PM

Conference Paper Session 17 (Intermediate)

Radiant Panels and Phase Change Materials

Track: Systems and Equipment

Room: Honore

Chair: Paul Torcellini, Ph.D., P.E., Member, National Renewable Energy Laboratory, Golden, CO

1. A Simulation Study on the Performance of Radiant Ceilings Combined with Free-Hanging Horizontal Sound Absorbers (CH-18-C064)
***Ongun Berk Kazanci, Ph.D., Associate Member**, L. Marcos Dominguez, Student Member, Nils Rage and Bjarne W. Olesen, Ph.D., ASHRAE President and Fellow, Technical University of Denmark, Kgs. Lyngby, Denmark*

2. Simulation Study of Active Ceilings with Phase Change Material in Office Buildings for Different National Building Regulations (CH-18-C065)
***Hajan Farhan, Student Member**[1], Casper Stefansen, Student Member[2], Eleftherios Bourdakis, Student Member[3], Ongun Berk Kazanci, Ph.D., Associate Member[4] and Bjarne W. Olesen, Ph.D., ASHRAE President and Fellow[1], (1)Technical University of Denmark, Lyngby, Denmark, (2) Technical University of Denmark, Copenhagen, Denmark, (3)Technical University of Denmark, Kongens Lyngby, Denmark, (4)Technical University of Denmark, Kgs. Lyngby, Denmark*

3. Simulation Study of Performance of Active Ceilings with Phase Change Material in Office Buildings under Extreme Climate Conditions (CH-18-C066)
***Casper Stefansen, Student Member**[1], Hajan Farhan, Student Member[2], Eleftherios Bourdakis, Student Member[3], Ongun Berk Kazanci, Ph.D., Associate Member[4] and Bjarne W. Olesen, Ph.D., ASHRAE President and Fellow[2], (1)Technical University of Denmark, Copenhagen, Denmark, (2)Technical University of Denmark, Lyngby, Denmark, (3) Technical University of Denmark, Kongens Lyngby, Denmark, (4) Technical University of Denmark, Kgs. Lyngby, Denmark*

4. The Influence of a Radiant Panel System with Integrated Phase Change Material on Energy Use and Thermal Indoor Environment (CH-18-C067)
***Lin Flemming Nielsen, Student Member**[1], Eleftherios Bourdakis, Student Member[2], Ongun Berk Kazanci, Ph.D., Associate Member[3] and Bjarne W. Olesen, Ph.D., ASHRAE President and Fellow[1], (1)Technical University of Denmark, Lyngby, Denmark, (2)Technical University of Denmark, Kongens Lyngby, Denmark, (3)Technical University of Denmark, Kgs. Lyngby, Denmark*

11:00 AM - 12:30 PM

Seminar 63 (Advanced) 

Challenges in Heat and Mass Exchange for Absorption Systems

Track: Heat Exchange Equipment

Room: Red Lacquer

Sponsor: TC 8.3 Absorption and Heat Operated Machines, TC 1.10 Cogeneration Systems

Chair: William Ryan, Ph.D., P.E., Member, Univ. of Illinois at Chicago, Chicago, IL

1. Enhancing Heat and Mass Transfer in Absorbers Using Membrane-Constrained Flow and Laminar Mixers
***Saeed Moghaddam, Member**, University of Florida, Gainesville, FL*

2. Absorbers for Industrial Ammonia Absorption Units
***G Anand, Member**, Energy Concepts Co, Annapolis, MD*

3. Titanium Tubes the "New Normal of Modern Absorption Units"
***Doug Davis, Member**, Broad USA, Hackensack, NJ*

11:00 AM - 12:30 PM

Seminar 64 (Intermediate) 

Combo Filters for IAQ and Energy Savings

Track: Systems and Equipment

Room: State

Sponsor: TC 2.3 Gaseous Air Contaminants and Gas Contaminant Removal Equipment, TC 5.4 Industrial Process Air Cleaning (Air Pollution Control), TC 2.4 Particulate Air Contamination and Particulate Contaminant Removal Equipment

Chair: Kyung-Ju Choi, Ph.D., Member, Clean & Science, Louisville, KY

1. Developments in the Application and Use of Combination Particulate/Chemical Filters for IAQ and Energy Savings
***Christopher Muller, Member**, Purafil, Filtration Group, Doraville, GA*

2. Development of a Combinatorial Filter for Removing Both Particle and Organic Vapor in Residential Homes: Approach and Challenges
***Jianshun Zhang, Ph.D., Fellow ASHRAE**, Syracuse University, Syracuse, NY*

3. A Combination-Filter for Residential HVAC Filtration
***John Zhang, Ph.D., Member**, 3M Personal Care Division, St. Paul, MN*

4. A Combination Filter Used in Pollution Control Device: Kitchen Ventilation
***Derek Schrock,** Halton Company, Scottsville, KY*

5. Particulate and Gas-Phase Residential Filtration
***Thad Ptak, Ph.D., Member**, A. O. Smith Corporation, Milwaukee, WI*

11:00 AM - 12:30 PM

Seminar 65 (Intermediate) 

It's Not Just the Water Heater Anymore

Track: Fundamentals and Applications

Room: Chicago

Sponsor: TC 6.6 Service Water Heating Systems, TC 6.1 Hydronic and Steam Equipment and Systems

Chair: James D. Lutz, P.E., Member, Hot Water Research, Oakland, CA

1. Title 24 Draw Profiles: What They Are and How You Can Use Them
***Peter Grant**, Frontier Energy, Davis, CA*

2. Modeling Drainwater Heat Recovery
***Peter Grant**, Frontier Energy, Davis, CA*

3. How Low Can You Go? How Close Can You Get?
***Gary Klein, Associate Member**, Gary Klein and Associates, Inc., Rancho Cordova, CA*

4. Service Hot Water Systems: A Balancing Act between Legionella Prevention and Scald Prevention
***Ronald L. George, CPD, Associate Member**, Plumb-Tech Design & Consulting Services, LLC, Newport, MI*

11:00 AM - 12:30 PM

Seminar 66 (Intermediate)

High Performance Envelopes: From Cold to Net Zero
Track: Fundamentals and Applications
Room: Monroe
Sponsor: TC 4.4 Building Materials and Building Envelope Performance, Residential Building Committee
Chair: Marcus Bianchi, Ph.D., P.E., Member, Owens Corning, Granville, OH

1. The Perfect Wall
***Joseph Lstiburek, P.Eng., Fellow ASHRAE**, Building Science Corp, Westford, MA*

2. Why Is the Building Envelope so Complicated?
***Simon Pallin, Ph.D., Associate Member**, Oak Ridge National Laboratory, Oak Ridge, TN*

3. DOE Perspective of the Perfect Envelope: Building Science Advisor
***Eric Werling, Member**, U.S. Department of Energy, Washington, DC*

11:00 AM - 12:30 PM

Seminar 67 (Intermediate)

Why ASHRAE Standard 160 Is Critical to Designing High Performance Buildings?
Track: Standards, Guidelines and Codes
Room: Empire
Sponsor: TC 4.4 Building Materials and Building Envelope Performance, TC 1.12 Moisture Management in Buildings, SPC 160 and Residential Building Committee
Chair: Diana Fisler, Ph.D., Associate Member, Johns Manville, Littleton, CO

1. Introduction to ASHRAE Standard 160
***Stanley Gatland II, Member**, Certainteed, Philadelphia, PA*

2. Update on ASHRAE Standard 160-2016: Changes Since 160-2009
***Samuel Glass, Ph.D., Member**, USDA Forest Products Laboratory, Madison, WI*

3. Applications of ASHRAE Standard 160 to Various Climate Zones
***Manfred Kehrer, P.Eng., Member**, WJE, Chicago, IL*

4. Applications of ASHRAE Standard 160 to Commercial Buildings in Both Hot and Humid and Cold Climates
***Achilles Karagiozis, Ph.D., Member**, Owens Corning, Granville, OH*

SOCIETY COMMITTEE MEETINGS

All Society committee meetings are located at the Palmer House Hilton on the lobby level as well as the 3rd – 7th floors. Please see pages 2–6 for meeting space floor plans and descriptions on how to access the meeting room floors. The floor levels are indicated in parenthesis in the listing below. Subcommittees are indented in the listing below. Rooms will be set as best as possible as indicated in the parentheses beside the committee, i.e., (20/20) will accommodate at least 20 people at the conference table and at least 20 chairs for the audience. Any audiovisual or electrical ordered will be listed. If AV is not ordered in advance there is no guarantee it will be available onsite.

AEDG Steering Committee (10/10) Electric
Monday (1/22) 2:15 pm – 5:00 pm Clark 9 (7)

Airborne Infectious Diseases PD Committee (20/20) Screen/Electric
Monday (1/22) 6:30 pm – 8:30 pm Price (5)

Appointments Roadmap (22/0) Screen/Electric
Sunday (1/21) 7:00 am – 8:00 am Handcock (6)

ASHRAE Foundation (27/10) Screen/Electric
Monday (1/22) 7:30 am – 9:30 am Grant Park (6)

ASHRAE Foundation Executive Committee (10/5) Electric
Saturday (1/20) 1:30 pm – 3:00 pm Burnham 1 (7)

ASHRAE/AHRI Joint Exposition Policy Committee (25/10) Electric
Sunday (1/21) 9:00 am – 11:00 am Wilson (3)

Assessment Process for Sustainable Operation and Maintenance of RAC Plants Ad Hoc Committee for 2017–18 (15/10) Screen
Tuesday (1/23) 3:30 pm – 5:00 pm Salon 2 (3)

Associate Society Alliance (65/70) Screen
Monday (1/22) 4:15 pm – 6:00 pm Wabash (3)

Associate Society Alliance Subcommittee (40/15) Screen
Sunday (1/21) 1:30 pm – 4:30 pm Crystal (3)

Board of Directors (32/75) Screen/Electric
Sunday (1/21) 1:30 pm – 5:30 pm Grand Ballroom (4)
Wednesday (1/24) 2:00 pm – 6:00 pm Grand Ballroom (4)

Building Energy Quotient Committee (15/15) Screen/Electric
Sunday (1/21) 8:30 am – 11:30 am LaSalle 2 (7)

bEQ Methodology (10/5) Screen/Electric
Saturday (1/20) 11:00 am – 1:00 pm Ashland (3)

bEQ Business Development (10/5) Screen/Electric
Saturday (1/20) 1:00 pm – 3:00 pm Ashland (3)

Building Envelope Committee (30/0)
Monday (1/22) 9:00 am – 12:00 pm Spire (6)

Certification (12/12) Screen/Electric
Saturday (1/20) 8:00 am – 12:00 pm Montrose 3 (7)

Chapter Technology Transfer Committee (30/15) Screen/Electric
Friday (1/19) 8:00 am – 12:00 pm Salon 10 (3)
Saturday (1/20) 9:00 am – 12:00 pm Salon 10 (3)

Chapter Technology Transfer Member Services (15/15) Screen
Friday (1/19) 1:00 pm – 5:00 pm Salon 4 (3)
Chapter Technology Transfer Operations (10/15) Screen
Friday (1/19) 1:00 pm – 5:00 pm Salon 10 (3)
Chapter Technology Transfer Mixer (37/15) Screen
Friday (1/19) 5:15 pm – 6:30 pm Salon 10 (3)
Chapter Technology Transfer Executive Subcommittee (5/0) Screen
Saturday (1/20) 8:00 am – 9:00 am Salon 10 (3)

CIBSE/ASHRAE Liaison (25/10) Electric
Wednesday (1/24) 10:00 am – 12:30 pm Salon 1 (3)

CLIMA 2019 (12/0) Screen
Saturday (1/20) 12:15 pm – 1:30 pm Madison (3)

College of Fellows (25/5)
Sunday (1/21) 10:00 am – 12:00 pm Price (5)
College of Fellows: Advisory Committee (15/5)
Sunday (1/21) 9:00 am – 10:00 am Price (5)

Conferences and Expositions Committee (30/10) Screen/Electric
Saturday (1/20) 8:00 am – 3:00 pm Clark 5 (7)
Conferences and Expositions Executive (30/5)
Friday (1/19) 1:00 pm – 3:30 pm Salon 7 (3)
Conferences and Expositions Annual and Winter Meetings (30/5)
Friday (1/19) 3:30 pm – 6:00 pm Salon 7 (3)

Development Committee (24/15) Screen/Electric
Monday (1/22) 9:45 am – 11:45 am Handcock (6)

Directors-At-Large Meeting (10/0)
Wednesday (1/24) 12:00 pm – 2:00 pm Salon 9 (3)

DRCs/RMCRs (25/20)
Friday (1/19) 11:00 am – 1:00 pm Salon 1 (3)
Wednesday (1/24) 12:00 pm – 2:00 pm Salon 10 (3)

Electronic Communications Committee (14/10) Screen/Electric
Saturday (1/20) 11:00 am – 3:00 pm Clark 1 (7)
Electronic Communications Committee Subcommittees (14/10) Screen/Electric
Saturday (1/20) 8:00 am – 11:00 am Clark 1 (7)

Energy Efficiency in Buildings Position Document Committee (10/0) Screen
Tuesday (1/23) 3:00 pm – 4:30 pm Harvard (3)

Environmental Health Committee (20/20) Screen
Monday (1/22) 2:15 pm – 6:15 pm Price (5)
Environmental Health Executive (20/20) Screen
Monday (1/22) 7:00 am – 8:00 am Price (5)
Environmental Health Handbook/Policy (20/20) Screen
Monday (1/22) 8:00 am – 10:00 am Price (5)
Environmental Health Program/Research (20/20) Screen
Monday (1/22) 10:00 am – 12:00 pm Price (5)
RP-1663 PMS (10/0)
Tuesday (1/23) 12:00 pm – 1:00 pm Harvard (3)

Ethics Performance Review Task Group Ad Hoc Committee (7/0) Screen/Electric
Saturday (1/20) 11:30 am – 1:00 pm Congress (3)

Executive Committee (12/22) Screen/Electric
Saturday (1/20) 8:30 am – 1:00 pm Cresthill (3)
Wednesday (1/24) 7:30 am – 9:00 am Cresthill (3)
Thursday (1/25) 7:30 am – 11:00 am Cresthill (3)

Finance Committee (12/20) Electric
Friday (1/19) 8:00 am – 12:00 pm Marshfield (3)
Finance Investment Subcommittee (4/0)
Thursday (1/18) 5:00 pm – 7:00 pm Kimball (3)
Finance Planning Subcommittee (8/8) Electric
Thursday (1/18) 5:00 pm – 7:00 pm Logan (3)

Grassroots Government Advocacy Committee (35/30) Screen/Electric
Saturday (1/20) 8:00 am – 12:30 pm Crystal (3)
GGAC: Member Training (30/15) Screen/Electric
Friday (1/19) 8:00 am – 10:00 am Burnham 1 (7)
GGAC: Executive Subcommittee (20/10) Screen/Electric
Friday (1/19) 10:15 am – 12:00 pm Burnham 1 (7)
GGAC: Member Mobilization Subcommittee (15/10) Screen/Electric
Friday (1/19) 1:00 pm – 2:30 pm Burnham 2 (7)
GGAC: Policy and Programs Subcommittee (15/10) Screen/Electric
Friday (1/19) 1:00 pm – 2:30 pm Burnham 1 (7)
MBO # 5 – Global Issues Report Subcommittee (15/10) Screen/Electric
Friday (1/19) 2:45 pm – 3:15 pm Burnham 1 (7)
MBO # 12 – GGAC Governing Documents Subcommittee (15/10) Screen/Electric
Friday (1/19) 2:45 pm – 3:15 pm Burnham 2 (7)
MBO # 3 – Residential Issues (10/10) Screen/Electric
Friday (1/19) 3:30 pm – 4:00 pm Burnham 1 (7)
MBO # 9 – Publications Lists (10/10) Screen/Electric
Friday (1/19) 3:30 pm – 4:00 pm Burnham 2 (7)
MBO # 10 – Maps Project (15/10) Screen/Electric
Friday (1/19) 4:15 pm – 4:45 pm Burnham 1 (7)
MBO # 11– International Engagement Subcommittee (15/10) Screen/Electric
Friday (1/19) 4:15 pm – 4:45 pm Burnham 2 (7)
MBO # 13 – Ad Hoc Committee on GGAC Structure (15/10) Screen/Electric
Friday (1/19) 5:00 pm – 5:30 pm Burnham 1 (7)

Handbook Committee (30/15) Screen/Electric
Sunday (1/21) 10:30 am – 1:00 pm Salon 1 (3)
Handbook Excom (5/5)
Saturday (1/20) 1:00 pm – 2:00 pm Clark 2 (7)
Handbook Strategic Planning (5/5)
Saturday (1/20) 2:00 pm – 3:00 pm Clark 2 (7)
Handbook Electronic Media (5/0)
Sunday (1/21) 8:00 am – 9:00 am Indiana (3)
Handbook Functional (5/0)
Sunday (1/21) 8:00 am – 9:00 am Logan (3)
Handbook International (5/0)
Sunday (1/21) 8:00 am – 9:00 am Kimball (3)
Handbook Training Workshop (50/0) Screen
Sunday (1/21) 8:00 am – 9:00 am Marshfield (3)
Handbook 2019 HVAC Applications TCs/Volume Subcommittee (15/0)
Sunday (1/21) 9:00 am – 10:00 am Indiana (3)
Handbook 2020 HVAC Systems and Equipment TCs/Volume Subcommittee (15/0)
Sunday (1/21) 9:00 am – 10:00 am Kimball (3)
Handbook 2021 Fundamentals TCs/Volume Subcommittee (15/0)
Sunday (1/21) 9:00 am – 10:00 am Logan (3)
Handbook Volume Subcommittees (25/0) Screen/Electric
Sunday (1/21) 10:00 am – 10:30 am Salon 1 (3)

Historical Committee (20/0) Screen/Electric
Sunday (1/21) 8:30 am – 12:00 pm Salon 10 (3)

Honors & Awards (15/5) Screen/Electric
Sunday (1/21) 1:00 pm – 5:00 pm Kimball (3)
Monday (1/22) 2:15 pm – 5:30 pm Kimball (3)

IEQ-GA (20/0) Screen/Electric
Tuesday (1/23) 4:00 pm – 5:30 pm Madison (3)

Indoor Air Quality PD (10/0) Screen/Electric
Tuesday (1/23) 9:00 am – 10:00 am Harvard (3)

Life Member Executive Board Meeting (10/0)
Tuesday (1/23) 9:00 am – 11:00 am Ashland (3)

Members Council (32/40) Electric
Tuesday (1/23) 8:15 am – 12:00 pm Crystal (3)
Members Council Region Operations Subcommittee (12/10) Electric
Saturday (1/20) 8:00 am – 12:00 pm Madison (3)
Members Council Planning Subcommittee (12/10) Electric
Sunday (1/21) 8:00 am – 12:00 pm Madison (3)

Membership Promotion (24/15) Screen/Electric
Saturday (1/20) 8:00 am – 4:00 pm Salon 7 (3)
Membership Promotion Subcommittees (20/10) Screen/Electric
Friday (1/19) 1:00 pm – 6:00 pm Salon 1 (3)

Nominating (48/0) Electric
Sunday (1/21) 7:30 am – 12:00 pm Salon 7/8 (3)

PEAC (12/15) Screen/Electric
Tuesday (1/23) 12:00 pm – 2:00 pm Dearborn 2 (7)

Planning (21/40) Screen/Electric
Friday (1/19) 1:00 pm – 6:00 pm Crystal (3)

Professional Development (16/20) Screen/Electric
Monday (1/22) 8:00 am – 12:00 pm Salon 2 (3)

Publications Committee (12/10) Screen/Electric
Sunday (1/21) 8:00 am – 12:00 pm Salon 9 (3)
Publications Planning Subcommittee (5/5)
Saturday (1/20) 10:00 am – 12:00 pm Indiana (3)

Publishing and Education Council (35/30) Screen/Electric
Tuesday (1/23) 8:00 am – 12:00 pm Water Tower (6)
Publishing and Education Council Fiscal (17/8) Screen
Monday (1/22) 2:00 pm – 3:30 pm Salon 9 (3)
Publishing and Education Council Functional (17/8) Screen
Monday (1/22) 3:30 pm – 5:00 pm Salon 9 (3)

Refrigeration Committee (20/20) Screen
Sunday (1/21) 8:00 am – 12:00 pm Clark 5 (7)
Refrigeration Excom (20/20) Screen
Sunday (1/21) 7:00 am – 8:00 am Clark 5 (7)

Region-at-Large (40/0) Screen
Monday (1/22) 2:15 pm – 4:15 pm Crystal (3)

REHVA ASHRAE Liaison Meeting (12/0)
Sunday (1/21) 11:00 am – 12:00 pm Indiana (3)

Research Administration Committee (25/20) Screen/Electric
Friday (1/19) 3:00 pm – 7:00 pm Grant Park (6)
Saturday (1/20) 8:00 am – 3:00 pm Handcock (6)
Wednesday (1/24) 7:00 am – 11:00 am Grant Park (6)
RAC Excom (6/0) Screen
Friday (1/19) 1:00 pm – 2:30 pm Grant Park (6)

Research Promotion (25/5) Electric
Saturday (1/20) 7:30 am – 1:00 pm Burnham 1 (7)
Research Promotion Executive (10/0) Electric
Friday (1/19) 2:00 pm – 6:00 pm Sandburg 3 (7)
Research Promotion Subcommittee (10/0) Electric
Saturday (1/20) 2:00 pm – 3:00 pm Burnham 3 (7)

Residential Building Committee (20/10) Screen/Electric
Monday (1/22) 9:00 am – 12:00 pm Clark 7 (7)
Residential Building Committee: Conferences Subcommittee (8/5)
Sunday (1/21) 8:30 am – 9:30 am Clark 1 (7)
Residential Building Committee: Programs Subcommittee (8/5)
Sunday (1/21) 9:30 am – 10:30 am Clark 1 (7)
Residential Building Committee: Technical Subcommittee (8/5)
Sunday (1/21) 10:30 am – 11:30 am Clark 1 (7)
Residential Building Committee: Publications Subcommittee (8/5)
Sunday (1/21) 1:00 pm – 2:00 pm Clark 1 (7)
Residential Building Committee: Stakeholders Subcommittee (8/5)
Sunday (1/21) 2:00 pm – 3:00 pm Clark 1 (7)

Resiliency Position Document (15/0)
Sunday (1/21) 3:00 pm – 4:30 pm Logan (3)

Scholarship Trustees (10/3) Screen/Electric
Tuesday (1/23) 8:00 am – 12:00 pm Burnham 5 (7)

Society Rules (10/20) Screen/Electric
Tuesday (1/23) 2:00 pm – 6:00 pm Kimball (3)

Standards Committee (30/20) Screen/Electric
Saturday (1/20) 8:00 am – 1:00 pm Dearborn 1 (7)
Wednesday (1/24) 8:00 am – 10:00 am Grand Ballroom (4)
Standards: Executive Committee (10/10) Screen/Electric
Friday (1/19) 8:00 am – 12:00 pm Burnham 3 (7)
StdC Training Adhoc (10/10) Screen/Electric
Friday (1/19) 12:00 pm – 1:00 pm Burnham 3 (7)
Standards: ILS/ISAS (10/3) Screen/Electric
Friday (1/19) 1:00 pm – 4:00 pm Burnham 5 (7)
Standards: PPIS (6/10) Screen/Electric
Friday (1/19) 2:00 pm – 6:00 pm Burnham 3 (7)
Standards: SPLS (20/20) Screen/Electric
Friday (1/19) 2:00 pm – 6:00 pm Burnham 4 (7)
Standards PPIS (6/10) Screen/Electric
Tuesday (1/23) 11:00 am – 2:00 pm Wilson (3)
Standards SPLS (20/10) Screen/Electric
Tuesday (1/23) 2:00 pm – 4:00 pm Wilson (3)
Standards SRS (8/4) Screen/Electric
Tuesday (1/23) 5:00 pm – 6:00 pm Wilson (3)

Student Activities Committee (25/10) Screen/Electric
Saturday (1/20) 8:00 am – 3:00 pm Salon 1 (3)
Student Activities Centralized Training (10/5) Screen/Electric
Friday (1/19) 8:30 am – 9:30 am Madison (3)
Student Activities Executive (10/5) Screen/Electric
Friday (1/19) 9:30 am – 11:30 am Madison (3)
Student Activities K-12/STEM (20/5) Screen/Electric
Friday (1/19) 12:00 pm – 2:00 pm Madison (3)
Student Activities Post High (20/5) Screen/Electric
Friday (1/19) 2:00 pm – 4:00 pm Madison (3)
Student Activities ABET (15/5) Screen/Electric
Friday (1/19) 2:00 pm – 4:00 pm Logan (3)
Student Activities Design Competition (15/5) Screen/Electric
Friday (1/19) 4:00 pm – 6:00 pm Madison (3)
Student Activities Grants (15/5) Screen/Electric
Friday (1/19) 4:00 pm – 6:00 pm Logan (3)

Student Branch Advisor Congress (30/0) Screen
Monday (1/22) 10:00 am – 11:45 am Salon 12 (3)

Student Congress (30/0) Screen
Monday (1/22) 10:00 am – 11:45 am Salon 10 (3)

Student Welcome (300/0) Screen
Saturday (1/20) 1:00 pm – 3:00 pm Red Lacquer (4)

Student/YEA Mixer (300/0)
Saturday (1/20) 5:00 pm – 6:30 pm Red Lacquer (4)

Student Program (400/0) Screen
Sunday (1/21) 9:00 am – 3:00 pm Red Lacquer (4)

TC/TG Chair's Training Workshop Screen
Sunday (1/21) 9:45 am – 10:45 am Chicago (5)

Technical Activities Committee (25/20) Screen /Electric
Saturday (1/20) 8:00 am – 3:00 pm Grant Park (6)
Wednesday (1/24) 7:00 am – 10:00 am Water Tower (6)

TAC/Standing Committee Executive Interface (25/20) Screen/Electric
Saturday (1/20) 7:00 am – 8:00 am Grant Park (6)

TAC/TC/SSPC 90.1 Interface/Liaison Session (50/0) Screen/Electric
Monday (1/22) 2:15 pm – 4:15 pm State Ballroom (4)

Technology Council (37/20) Screen/Electric
Wednesday (1/24) 9:00 am – 12:00 pm Crystal (3)

Technology Council Special Projects (10/5) Screen/Electric
Tuesday (1/23) 8:00 am – 9:00 am Salon 1 (3)

Technology Council: Operations Subcommittee (25/15) Screen/Electric
Tuesday (1/23) 9:00 am – 10:30 am Salon 1 (3)

Technology Council: Document Review Subcommittee (10/10) Screen/Electric
Tuesday (1/23) 10:30 am – 11:30 am Salon 1 (3)

UNEP ASHRAE Coordinating Committee (12/6) Screen
Saturday (1/20) 5:30 pm – 6:30 pm Salon 1 (3)

Young Engineers in ASHRAE Committee (25/15) Electric
Saturday (1/20) 8:00 am – 3:00 pm Price (5)

YEA Hospitality (125/0)
Sunday (1/21) 4:00 pm – 6:00 pm Potter's Lounge (Lobby)

TC/TG/SPC MEETINGS

The ASHRAE Technical Committees, Project Committees, Task Groups and Technical Resource Groups listed below usually meet at each Society Winter and Annual Conference. Attendance at these meetings is open to all society members, to all registered guests at scheduled Society Conferences, and to those invited by the chairman at the request of a member. You are encouraged to attend any of these meetings in which you have a technical interest.

Abbreviations:
GPC = Guideline Project Committee
MTG = Multidisciplinary Task Group
RP = Research Project
SPC = Standard Project Committee
SSPC = Standing Standard Project Committee
TC = Technical Committee
TG = Task Group
TRG = Technical Research Group

Finding your Meeting Location:

All Society committee meetings are located at the Palmer House Hilton on the lobby level as well as the 3rd – 7th floors. Please see pages 2–6 for meeting space floor plans and descriptions on how to access the meeting room floors. The floor levels are indicated in parenthesis in the listing below. Subcommittees are indented in the listing below.

Rooms will be set as best as possible as indicated in the parentheses beside the committee, i.e., (20/20) will accommodate at least 20 people at the conference table and at least 20 chairs for the audience. Any audiovisual or electrical ordered will be listed. If AV is not ordered in advance there is no guarantee it will be available onsite.

Color Codes: If the meeting has not been listed in color it was NOT confirmed prior to the meeting.

TECHNICAL COMMITTEES (TCS)

TC/TG Chair's Breakfast Section 1 (27/4)
Sunday (1/21) 6:30 am – 8:00 am Salon 1 (3)

TC/TG Chair's Breakfast Section 2 (21/4)
Sunday (1/21) 6:30 am – 8:00 am Salon 5 (3)

TC/TG Chair's Breakfast Section 3 (13/4)
Sunday (1/21) 6:30 am – 8:00 am Salon 4 (3)

TC/TG Chair's Breakfast Section 4 (17/4)
Sunday (1/21) 6:30 am – 8:00 am Salon 9 (3)

TC/TG Chair's Breakfast Section 5 (21/4)
Sunday (1/21) 6:30 am – 8:00 am Salon 6 (3)

TC/TG Chair's Breakfast Section 6 (19/4)
Sunday (1/21) 6:30 am – 8:00 am Salon 2 (3)

TC/TG Chair's Breakfast Section 7 (19/4)
Sunday (1/21) 6:30 am – 8:00 am Wilson (3)

TC/TG Chair's Breakfast Section 8 (25/4)
Sunday (1/21) 6:30 am – 8:00 am Salon 10 (3)

TC/TG Chair's Breakfast Section 9 (25/4)
Sunday (1/21) 6:30 am – 8:00 am Salon 12 (3)

TC/TG Chair's Breakfast Section 10 (15/4)
Sunday (1/21) 6:30 am – 8:00 am Kimball (3)

MTG Chair's Breakfast Section MTG (19/4)
Sunday (1/21) 6:30 am – 8:00 am Madison (3)

TC/TG Chair's Training Workshop Screen

Sunday (1/21) 9:45 am – 10:45 am Chicago (5)

TC Program Subcommittee Training (30/0) Screen

Tuesday (1/23) 11:15 am – 12:00 pm Salon 10 (3)

Research Subcommittee Chairs (121/0) Screen

Monday (1/22) 6:30 am – 9:00 am Grand Ballroom (4)

TC 1.1 Thermodynamics and Psychrometrics (12/15)

Monday (1/22) 2:15 pm – 4:15 pm LaSalle 2 (7)

TC 1.2 Instruments and Measurements (12/0)

Tuesday (1/23) 1:00 pm – 3:30 pm Montrose 2 (7)

TC 1.2 TC Seminar: How Accurate is Your Air Flow Capture Hood Measurement? (12/50) Screen
Tuesday (1/23) 3:30 pm – 4:30 pm Honore (Lobby)

TC 1.3 Heat Transfer and Fluid Flow (25/25)

Tuesday (1/23) 1:00 pm – 3:30 pm Salon 10 (3)

TC 1.3/8.5 Research Subcommittee Meeting and Project Review (20/30) Screen/Electric
Sunday (1/21) 3:00 pm – 7:00 pm Price (5)

TC 1.4 Control Theory and Application (20/80) Screen/Electric

Tuesday (1/23) 1:00 pm – 3:30 pm Salon 4/5 (3)

TC 1.4 YEA/Education (15/15) Screen/Electric
Sunday (1/21) 2:00 pm – 3:00 pm Sandburg 2 (7)
TC 1.4 Control Components and Applications (15/15) Screen/Electric
Sunday (1/21) 3:00 pm – 4:00 pm Sandburg 2 (7)
TC 1.4 Programs (15/15) Screen/Electric
Sunday (1/21) 4:00 pm – 5:30 pm Sandburg 2 (7)
TC 1.4 Research (15/15) Screen/Electric
Monday (1/22) 2:30 pm – 4:30 pm Dearborn 1 (7)
TC 1.4 Handbook (10/0) Screen/Electric
Monday (1/22) 4:30 pm – 6:30 pm Dearborn 1 (7)
TC 1.4 RP-1747 Implementation of DCV for Multiple Zone Systems (8/5) Screen/Electric
Monday (1/22) 6:30 pm – 8:00 pm Dearborn 1 (7)
TC 1.4 Executive (10/0) Screen/Electric
Tuesday (1/23) 8:30 am – 9:30 am Burnham 2 (7)
TC 1.4 RP-1711 Advanced Sequences of Operation for HVAC Systems – Phase II Central Plants and Hydronic Systems (15/15) Screen/Electric
Tuesday (1/23) 9:30 am – 10:30 am Burnham 2 (7)
TC 1.4 TC Seminar: Building Automation, Social Media and Millennials! What Do They Have in Common? (20/80) Screen/Electric
Tuesday (1/23) 1:00 pm – 1:30 pm Salon 4/5 (3)

TC 1.5 Computer Applications (25/25) Screen/Electric

Monday (1/22) 6:30 pm – 9:00 pm Salon 10 (3)

TC 1.5 DBOSS (20/10)
Sunday (1/21) 3:00 pm – 4:00 pm Madison (3)

TC 1.5 Cyber Security (20/10) Electric
Sunday (1/21) 4:00 pm – 5:00 pm Madison (3)
TC 1.5 Emerging Applications (10/5)
Sunday (1/21) 5:00 pm – 6:00 pm Madison (3)
TC 1.5 Research (10/5)
Sunday (1/21) 6:00 pm – 7:00 pm Madison (3)
TC 1.5 Program (10/5)
Sunday (1/21) 7:00 pm – 8:00 pm Madison (3)
TC 1.5 Handbook (15/5)
Monday (1/22) 6:00 pm – 6:30 pm Salon 10 (3)

TC 1.6 Terminology (10/8) Screen/Electric

Monday (1/22) 4:15 pm – 6:30 pm Sandburg 3 (7)

TC 1.6 Working Group Subcommittee (10/3) Screen/Electric
Monday (1/22) 9:00 am – 12:00 pm Sandburg 3 (7)

TC 1.7 Business, Management & General Legal Education (20/5)

Monday (1/22) 10:15 am – 12:00 pm Indiana (3)

TC 1.8 Mechanical Systems Insulation (6/6)

Monday (1/22) 4:15 pm – 6:30 pm LaSalle 4 (7)

TC 1.8 Handbook (20/5) Screen
Sunday (1/21) 8:00 am – 10:30 am Clark 7 (7)
TC 1.8 Program (20/5) Screen
Sunday (1/21) 10:30 am – 11:00 am Clark 7 (7)
TC 1.8 Research (20/10) Screen/Electric
Sunday (1/21) 11:00 am – 12:00 pm Clark 7 (7)

TC 1.9 Electrical Systems (8/4)

Tuesday (1/23) 3:30 pm – 6:00 pm Montrose 5 (7)

TC 1.10 Cogeneration Systems (20/8)

Tuesday (1/23) 2:30 pm – 6:00 pm LaSalle 2 (7)

TC 1.10 Research, Program, Handbook, Standards (20/8)
Tuesday (1/23) 1:00 pm – 2:30 pm LaSalle 2 (7)

TC 1.11 Electric Motors and Motor Control (13/7)

Tuesday (1/23) 1:00 pm – 3:30 pm Montrose 3 (7)

TC 1.12 Moisture Management in Buildings (20/20) Electric

Saturday (1/20) 1:00 pm – 3:00 pm Buckingham (5)

TC 1.12 Research, Program, Handbook, Standards (15/5) Electric
Saturday (1/20) 8:00 am – 12:00 pm Buckingham (5)

TC 1.13 Optimization (20/5)

Sunday (1/21) 1:00 pm – 3:00 pm Price (5)

TC 2.1 Physiology and Human Environment (12/18) Electric

Tuesday (1/23) 1:00 pm – 3:30 pm Cresthill (3)

TC 2.1 Research and Programs (15/20) Screen/Electric
Sunday (1/21) 1:30 pm – 4:00 pm Montrose 1 (7)
TC 2.1 Handbook
(met prior to Chicago via conference call)

TC 2.2 Plant and Animal Environment (10/5) Screen/Electric

Monday (1/22) 4:15 pm – 6:30 pm Dearborn 3 (7)

TC 2.3 Gaseous Air Contaminants and Gas Contaminant Removal Equipment (30/30) Screen

Tuesday (1/23) 1:00 pm – 3:30 pm Spire (6)

TC 2.3 Standards
(Conference Call Prior to Chicago Conference)
TC 2.3 Research (12/10) Electric
Sunday (1/21) 5:00 pm – 7:00 pm Salon 2 (3)
TC 2.3 Handbook (7/4) Electric
Monday (1/22) 4:15 pm – 6:30 pm Harvard (3)
TC 2.3 Planning (15/5) Electric
Tuesday (1/23) 6:30 am – 8:00 am Spire (6)
TC 2.3 Programs (10/4) Electric
Tuesday (1/23) 12:00 pm – 12:45 pm Spire (6)

TC 2.4 Particulate Air Contaminants and Particulate Contaminant Removal Equipment (18/70) Screen/ Electric

Tuesday (1/23) 3:30 pm – 6:00 pm Red Lacquer (4)

TC 2.4 Handbook (18/0) Screen/Electric
Saturday (1/20) 1:00 pm – 2:30 pm Clark 3 (7)
TC 2.4 1649-RP PMS (5/20) Screen/Electric
Saturday (1/20) 1:30 pm – 2:30 pm Clark 9 (7)
TC 2.4 1734-RP PMS (5/20) Screen/Electric
Sunday (1/21) 1:00 pm – 2:00 pm Salon 2 (3)
TC 2.4 Research (18/30) Screen/Electric
Sunday (1/21) 3:00 pm – 5:00 pm Salon 2 (3)
TC 2.4 Program (18/10) Screen/Electric
Monday (1/22) 3:15 pm – 4:15 pm Salon 10 (3)
TC 2.4 Standards (18/20) Screen/Electric
Monday (1/22) 4:15 pm – 5:15 pm Salon 10 (3)

TC 2.5 Global Climate Change (20/10)

Tuesday (1/23) 1:30 pm – 3:30 pm Madison (3)

TC 2.5 Research, Programs (5/15) Electric
Monday (1/22) 2:15 pm – 4:15 pm Sandburg 4 (7)

TC 2.6 Sound and Vibration (25/45) Screen/Electric

Monday (1/22) 2:15 pm – 4:15 pm Water Tower (6)

TC 2.6 Vibration Isolation (15/10) Screen/Electric
Sunday (1/21) 9:00 am – 10:00 am Handcock (6)
TC 2.6 Hot Topic 1 (15/10) Screen/Electric
Sunday (1/21) 10:00 am – 12:00 pm Handcock (6)
TC 2.6 Programs (15/10) Screen/Electric
Sunday (1/21) 3:00 pm – 4:00 pm Handcock (6)
TC 2.6 Hot Topic 2 (15/10) Screen/Electric
Sunday (1/21) 4:00 pm – 5:00 pm Handcock (6)
TC 2.6 Executive Committee (15/10) Screen/Electric
Sunday (1/21) 5:00 pm – 6:00 pm Handcock (6)
TC 2.6 Publications (15/10) Screen/Electric
Monday (1/22) 9:00 am – 10:00 am Clark 3 (7)
TC 2.6 Research (15/10) Screen/Electric
Monday (1/22) 10:00 am – 11:00 am Clark 3 (7)

TC 2.6 Standards/Criteria (15/10) Screen/Electric
Monday (1/22) 11:00 am – 12:00 pm Clark 3 (7)

TC 2.7 Seismic, Wind and Flood Resistant Design (17/24) Screen/Electric

Tuesday (1/23) 3:30 pm – 6:00 pm Burnham 4 (7)
TC 2.7 Handbook, Programs, Long Range Planning Subcommittees (20/5) Screen/Electric
Tuesday (1/23) 1:00 pm – 3:30 pm Burnham 4 (7)

TC 2.8 Building Environmental Impacts and Sustainability (15/30) Screen/Electric

Sunday (1/21) 5:30 pm – 7:00 pm Salon 10 (3)
TC 2.8 Green Guide (10/20) Screen/Electric
Sunday (1/21) 12:00 pm – 12:30 pm Salon 10 (3)
TC 2.8 Existing & Future Building Challenges (7/10) Screen/Electric
Sunday (1/21) 12:30 pm – 1:30 pm Salon 10 (3)
TC 2.8 Water Energy Nexus (10/20) Screen/Electric
Sunday (1/21) 1:30 pm – 2:30 pm Salon 10 (3)
TC 2.8 International (10/10) Screen/Electric
Sunday (1/21) 2:30 pm – 3:00 pm Salon 10 (3)
TC 2.8 Research (7/15) Screen/Electric
Sunday (1/21) 3:00 pm – 4:00 pm Salon 10 (3)
TC 2.8 Handbook (5/15) Screen/Electric
Sunday (1/21) 4:00 pm – 4:30 pm Salon 10 (3)
TC 2.8 Programs (7/15) Screen/Electric
Sunday (1/21) 4:30 pm – 5:00 pm Salon 10 (3)

TC 2.9 Ultraviolet Air and Surface Treatment (10/20)

Monday (1/22) 10:00 am – 12:00 pm Kimball (3)
TC 2.9 Programs (8/5)
Sunday (1/21) 8:00 am – 10:00 am Clark 10 (7)
TC 2.9 Handbook (5/5)
Sunday (1/21) 10:00 am – 12:00 pm Clark 10 (7)
TC 2.9 Standards (6/6)
Sunday (1/21) 1:00 pm – 3:00 pm Clark 10 (7)
TC 2.9 Research (10/8)
Monday (1/22) 8:00 am – 10:00 am Kimball (3)

TC 3.1 Refrigerants and Secondary Coolants (10/30) Screen/Electric

Monday (1/22) 4:15 pm – 6:30 pm Salon 7/8 (3)
TC 3.1 Research (combined with 3.2, 3.3, 3.4 and 3.8 Research) (15/40) Screen/Electric
Sunday (1/21) 4:00 pm – 6:00 pm Clark 5 (7)
TC 3.1 Program (Combined with 3.2, 3.3, 3.4 and 3.8 Program) (15/40) Screen/Electric
Monday (1/22) 10:30 am – 12:00 pm Clark 5 (7)
TC 3.1 Handbook (4/3)
Tuesday (1/23) 2:30 pm – 3:00 pm Clark 2 (7)

TC 3.2 Refrigerant System Chemistry (12/40) Screen/Electric

Monday (1/22) 2:15 pm – 4:15 pm Clark 5 (7)

TC 3.2 Research (combined with 3.1, 3.3, 3.4 and 3.8 Research) (15/40) Screen/Electric
Sunday (1/21) 4:00 pm – 6:00 pm Clark 5 (7)
TC 3.2 Program (combined with 3.1, 3.3, 3. 4 and 3.8 Program) (15/40) Screen/Electric
Monday (1/22) 10:30 am – 12:00 pm Clark 5 (7)

TC 3.3 Refrigerant Contaminant Control (14/25)

Tuesday (1/23) 3:30 pm – 6:00 pm Clark 5 (7)
TC 3.3 Research (combined with 3.1, 3.2, 3.4 and 3.8 Research) (15/40) Screen/Electric
Sunday (1/21) 4:00 pm – 6:00 pm Clark 5 (7)
TC 3.3 Program (combined with 3.1, 3.2, 3.4 and 3.8 Program) (15/40) Screen/Electric
Monday (1/22) 10:30 am – 12:00 pm Clark 5 (7)

TC 3.4 Lubrication (30/15) Screen/Electric

Tuesday (1/23) 1:30 pm – 3:30 pm Clark 5 (7)
TC 3.4 Research (combined with 3.1, 3.2, 3.3 and 3.8 Research) (15/40) Screen/Electric
Sunday (1/21) 4:00 pm – 6:00 pm Clark 5 (7)
TC 3.4 Program (combined with 3.1, 3.2, 3.3 and 3.8 Program) (15/40) Screen/Electric
Monday (1/22) 10:30 am – 12:00 pm Clark 5 (7)

TC 3.6 Water Treatment (18/10)

Tuesday (1/23) 1:00 pm – 3:30 pm Logan (3)
TC 3.6 Handbook, Research, Program Subcommittee (14/10) Screen/Electric
Sunday (1/21) 3:00 pm – 5:00 pm Sandburg 4 (7)

TC 3.8 Refrigerant Containment (9/5)

Monday (1/22) 4:15 pm – 6:30 pm Clark 1 (7)
TC 3.8 Research (combined with 3.1, 3.2, 3.3 and 3.4 Research) (15/40) Screen/Electric
Sunday (1/21) 4:00 pm – 6:00 pm Clark 5 (7)
TC 3.8 Program (combined with 3.1, 3.2, 3.3 and 3.4 Program) (15/40) Screen/Electric
Monday (1/22) 10:30 am – 12:00 pm Clark 5 (7)

TC 4.1 Load Calculation Data and Procedures (20/10)

Monday (1/22) 2:15 pm – 4:15 pm LaSalle 5 (7)
TC 4.1 RP-1729 PMS (8/5) Screen/Electric
Sunday (1/21) 8:00 am – 9:00 am Buckingham (5)
TC 4.1 Handbook (15/10)
Sunday (1/21) 3:00 pm – 4:00 pm Dearborn 2 (7)
TC 4.1 Research (15/10)
Sunday (1/21) 4:00 pm – 5:00 pm Dearborn 2 (7)
TC 4.1 Programs (15/10)
Sunday (1/21) 5:00 pm – 6:00 pm Dearborn 2 (7)
TC 4.1 Standards (15/10)
Sunday (1/21) 6:00 pm – 7:00 pm Dearborn 2 (7)

TC 4.2 Climatic Information (20/10) Screen/Electric

Tuesday (1/23) 1:00 pm – 3:30 pm Buckingham (5)
TC 4.2 1745 PMS (4/6) Screen/Electric
Sunday (1/21) 1:00 pm – 2:30 pm Sandburg 7 (7)

TC 4.2 Handbook (8/7) Screen/Electric
Sunday (1/21) 2:30 pm – 3:30 pm Sandburg 7 (7)
TC 4.2 Program (7/8) Screen/Electric
Sunday (1/21) 3:30 pm – 4:30 pm Sandburg 7 (7)
TC 4.2 Research (8/7) Screen/Electric
Monday (1/22) 4:15 pm – 6:00 pm Sandburg 5 (7)

TC 4.3 Ventilation Requirements and Infiltration (12/30) Screen/Electric

Monday (1/22) 4:15 pm – 6:30 pm Adams (6)

TC 4.4 Building Materials and Building Envelope Performance (40/10) Screen/Electric

Monday (1/22) 2:15 pm – 4:15 pm Honore (Lobby)
TC 4.4 PES 1759-TRP-R (20/10) Screen/Electric
Sunday (1/21) 10:00 am – 11:00 am Salon 12 (3)
TC 4.4 PMS 1696-RP (20/10) Screen/Electric
Sunday (1/21) 11:00 am – 12:30 pm Salon 12 (3)
TC 4.4 Program (30/15) Screen/Electric
Sunday (1/21) 1:00 pm – 2:30 pm Salon 12 (3)
TC 4.4 Handbook (30/15) Screen/Electric
Sunday (1/21) 2:30 pm – 3:30 pm Salon 12 (3)
TC 4.4 Research (30/15) Screen/Electric
Sunday (1/21) 3:30 pm – 5:00 pm Salon 12 (3)
TC 4.4 Standards (30/15) Screen/Electric
Sunday (1/21) 5:00 pm – 5:30 pm Salon 12 (3)

TC 4.5 Fenestration (15/15) Screen

Tuesday (1/23) 2:00 pm – 4:00 pm LaSalle 3 (7)
TC 4.5 Research (10/10)
Monday (1/22) 2:15 pm – 3:15 pm Sandburg 6 (7)
TC 4.5 Program (10/10)
Monday (1/22) 3:15 pm – 4:15 pm Sandburg 6 (7)
TC 4.5 Handbook (10/10)
Monday (1/22) 4:15 pm – 5:30 pm Sandburg 6 (7)
TC 4.5 Calculation Methods (15/10)
Tuesday (1/23) 1:00 pm – 2:00 pm LaSalle 3 (7)

TC 4.7 Energy Calculations (25/50) Screen/Electric

Tuesday (1/23) 6:00 pm – 8:30 pm Red Lacquer (4)
TC 4.7 Simulation and Component Models (25/20) Screen/Electric
Monday (1/22) 6:00 pm – 7:30 pm Monroe (6)
TC 4.7 Data-Driven Models (25/20) Screen/Electric
Monday (1/22) 7:30 pm – 9:00 pm Monroe (6)
TC 4.7 Applications (25/20) Screen/Electric
Tuesday (1/23) 3:30 pm – 5:00 pm Salon 1 (3)
TC 4.7 Handbook (25/20) Screen/Electric
Tuesday (1/23) 5:00 pm – 6:00 pm Salon 1 (3)

TC 4.10 Indoor Environmental Modeling (20/20) Electric

Monday (1/22) 2:15 pm – 4:15 pm Montrose 1 (7)
TC 4.10 RP-1675 PMS (5/10) Screen/Electric
Sunday (1/21) 2:00 pm – 3:00 pm Clark 9 (7)
TC 4.10 Program (15/10) Electric
Sunday (1/21) 3:00 pm – 4:00 pm Clark 9 (7)

TC 4.10 Handbook (15/10) Electric
Sunday (1/21) 4:00 pm – 5:00 pm Clark 9 (7)
TC 4.10 Research (15/10) Electric
Sunday (1/21) 5:00 pm – 6:00 pm Clark 9 (7)

TC 5.1 Fans (20/20) Screen

Monday (1/22) 4:15 pm – 6:30 pm Montrose 1 (7)
TC 5.1 Handbook (12/12) Screen/Electric
Sunday (1/21) 2:00 pm – 3:00 pm Dearborn 1 (7)
TC 5.1 Research (12/15) Screen/Electric
Sunday (1/21) 3:00 pm – 4:00 pm Dearborn 1 (7)
TC 5.1 Program (12/12) Screen/Electric
Sunday (1/21) 4:00 pm – 4:30 pm Dearborn 1 (7)
TC 5.1 Fan Efficiency (20/15) Screen/Electric
Sunday (1/21) 4:30 pm – 6:00 pm Dearborn 1 (7)

TC 5.2 Duct Design (12/20) Screen/Electric

Tuesday (1/23) 3:30 pm – 6:00 pm Logan (3)
TC 5.2 Duct Design Subcommittees (40/20) Screen/Electric
Monday (1/22) 8:00 am – 12:00 pm Water Tower (6)

TC 5.3 Room Air Distribution (30/30) Screen/Electric

Tuesday (1/23) 1:00 pm – 3:30 pm Clark 7 (7)
TC 5.3 Handbook (25/5) Screen/Electric
Friday (1/19) 12:00 pm – 5:00 pm Salon 2 (3)
Saturday (1/20) 8:00 am – 3:00 pm Salon 6 (3)
TC 5.3 1741–RP Understanding Fan Coil Components and How They relate to Energy Consumption And Energy Modeling (5/5) Screen/Electric
Saturday (1/20) 12:00 pm – 1:30 pm Sandburg 5 (7)
TC 5.3 Fan Coils Units (25/5) Screen/Electric
Sunday (1/21) 8:00 am – 9:00 am Burnham 1 (7)
TC 5.3 RP-1666 PMS (10/0) Screen /Electric
Sunday (1/21) 9:00 am – 10:00 am Burnham 1 (7)
TC 5.3 Air Curtains (25/5) Screen/Electric
Sunday (1/21) 10:00 am – 10:45 am Burnham 1 (7)
TC 5.3 Research (25/5) Screen/Electric
Sunday (1/21) 10:45 am – 12:00 pm Burnham 1 (7)
TC 5.3 Programs (25/5) Screen/Electric
Sunday (1/21) 1:00 pm – 2:30 pm Burnham 1 (7)
TC 5.3 RP- 1629 Testing and Modeling Energy Performance of Active Chilled Beams systems (8/10)
Sunday (1/21) 10:00 am – 11:00 am Sandburg 6 (7)

TC 5.4 Industrial Process Air Cleaning (Air Pollution Control) (11/6)

Monday (1/22) 2:15 pm – 4:15 pm Dearborn 3 (7)

TC 5.5 Air-to-Air Energy Recovery (30/10)

Tuesday (1/23) 3:30 pm – 6:00 pm Burnham 1 (7)
TC 5.5 Handbook, Program, Research (12/6) Screen/Electric
Tuesday (1/23) 1:00 pm – 3:30 pm Burnham 2 (7)

TC 5.6 Control of Fire and Smoke (23/30)

Monday (1/22) 4:15 pm – 6:30 pm Salon 2 (3)
TC 5.6 Program/Research/Handbook (13/20)
Sunday (1/21) 3:00 pm – 6:30 pm LaSalle 1 (7)

TC 5.7 Evaporative Cooling (20/10)

Monday (1/22) 4:15 pm – 6:30 pm LaSalle 2 (7)

TC 5.9 Enclosed Vehicular Facilities (40/20) Screen/Electric

Tuesday (1/23) 3:30 pm – 6:00 pm Water Tower (6)

TC 5.9 Program, Standards, Handbook, Research (30/10) Screen/Electric
Tuesday (1/23) 1:00 pm – 3:30 pm Water Tower (6)

TC 5.10 Kitchen Ventilation (20/15) Screen

Monday (1/22) 6:30 pm – 7:30 pm Burnham 4 (7)

TC 5.10 Handbook (20/10) Screen/Electric
Monday (1/22) 2:00 pm – 3:30 pm Burnham 4 (7)
TC 5.10 Program (20/10) Screen/Electric
Monday (1/22) 3:30 pm – 4:30 pm Burnham 4 (7)
TC 5.10 Research (20/10) Screen/Electric
Monday (1/22) 4:30 pm – 6:30 pm Burnham 4 (7)

TC 5.11 Humidifying Equipment (10/5) Screen/Electric

Monday (1/22) 2:15 pm – 4:15 pm Sandburg 8 (7)

TC 5.11 Humidifying Equipment Research Subcommittee (10/5) Screen/Electric
Sunday (1/21) 3:00 pm – 5:00 pm Sandburg 5 (7)

TC 6.1 Hydronic and Steam Equipment and Systems (20/25) Screen/Electric

Tuesday (1/23) 1:00 pm – 3:30 pm Burnham 1 (7)

TC 6.1 Handbook (12/8) Screen/Electric
Sunday (1/21) 5:00 pm – 6:00 pm LaSalle 2 (7)
TC 6.1 Chilled Water Plant (10/6) Screen/Electric
Sunday (1/21) 6:00 pm – 7:00 pm LaSalle 2 (7)
TC 6.1 Program (10/8) Screen/Electric
Monday (1/22) 2:15 pm – 3:15 pm Montrose 2 (7)
TC 6.1 Research (10/8) Screen/Electric
Monday (1/22) 3:15 pm – 4:15 pm Montrose 2 (7)

TC 6.2 District Energy (20/30)

Sunday (1/21) 3:00 pm – 5:00 pm Burnham 4 (7)

TC 6.2 Programs, Research, Handbook (8/26) Electric
Sunday (1/21) 1:00 pm – 3:00 pm Burnham 4 (7)

TC 6.3 Central Forced Air Heating and Cooling Systems (20/12)

Tuesday (1/23) 1:00 pm – 3:30 pm LaSalle 5 (7)

TC 6.5 Radiant Heating and Cooling (17/10)

Monday (1/22) 2:15 pm – 4:15 pm Sandburg 2 (7)

TC 6.5 RP 1766 PMS (15/20) Screen/Electric
Sunday (1/21) 2:00 pm – 3:00 pm Salon 4 (3)
TC 6.5 Research (15/20) Screen/Electric
Sunday (1/21) 3:00 pm – 4:00 pm Salon 4 (3)
TC 6.5 Handbook (15/20) Screen/Electric
Sunday (1/21) 4:00 pm – 5:00 pm Salon 4 (3)
TC 6.5 CBE Reports (20/10)
Sunday (1/21) 5:00 pm – 6:00 pm Salon 4 (3)

TC 6.6 Service Water Heating Systems (18/15)

Monday (1/22) 4:15 pm – 6:30 pm Clark 3 (7)

TC 6.6 Research, Handbook, and Program (20/5) Screen/Electric

Monday (1/22) 2:15 pm – 4:15 pm Clark 3 (7)

TC 6.7 Solar and Other Renewable Energies (20/55) Screen

Tuesday (1/23) 1:00 pm – 3:30 pm Salon 7/8 (3)

TC 6.7 Research and Standards (15/10) Electric

Monday (1/22) 4:15 pm – 6:30 pm LaSalle 1 (7)

TC 6.7 Programs and Handbook (15/10) Electric

Monday (1/22) 6:30 pm – 8:30 pm LaSalle 1 (7)

TC 6.8 Geothermal Heat Pump and Energy Recovery Applications (16/25) Screen/Electric

Tuesday (1/23) 3:30 pm – 6:00 pm Buckingham (5)

TC 6.8 Handbook: Geothermal Energy (10/10) Electric

Sunday (1/21) 3:00 pm – 5:00 pm LaSalle 4 (7)

TC 6.8 Programs (10/10) Electric

Sunday (1/21) 5:00 pm – 7:00 pm LaSalle 4 (7)

TC 6.8 Research (10/10) Electric

Monday (1/22) 4:15 pm – 6:15 pm Sandburg 8 (7)

TC 6.9 Thermal Storage (11/30) Screen/Electric

Monday (1/22) 4:30 pm – 6:00 pm Empire (Lobby)

TC 6.9 Standards/SPC 150 (30/20) Screen/Electric

Monday (1/22) 2:15 pm – 2:40 pm Empire (Lobby)

TC 6.9 Programs (30/20) Screen/Electric

Monday (1/22) 2:40 pm – 3:10 pm Empire (Lobby)

TC 6.9 Handbook (30/20) Screen/Electric

Monday (1/22) 3:10 pm – 3:30 pm Empire (Lobby)

TC 6.9 Research (30/20) Screen/Electric

Monday (1/22) 3:30 pm – 3:50 pm Empire (Lobby)

TC 6.9 Long Range Planning and Website (30/20) Screen/Electric

Monday (1/22) 3:50 pm – 4:10 pm Empire (Lobby)

TC 6.10 Fuels and Combustion (20/10) Screen /Electric

Tuesday (1/23) 3:30 pm – 6:00 pm Dearborn 1 (7)

TC 6.10 Handbook (15/10) Screen/Electric

Monday (1/22) 2:15 pm – 4:15 pm Dearborn 2 (7)

TC 7.1 Integrated Building Design (25/10)

Monday (1/22) 8:15 am – 10:00 am Dearborn 1 (7)

TC 7.1 Programs and Resesarch

(Met prior to Chicago via conference call)

TC 7.2 HVAC&R Construction & Design Build Technologies (10/5)

Sunday (1/21) 10:00 am – 12:00 pm Sandburg 7 (7)

TC 7.3 Operations and Maintenance Management (25/7) Screen/Electric

Tuesday (1/23) 1:00 pm – 3:30 pm Salon 2 (3)

TC 7.3 Education & Training (7/5) Screen/Electric

Sunday (1/21) 1:30 pm – 3:00 pm Sandburg 4 (7)

TC 7.3 Standards and Program (20/10) Screen/Electric
Monday (1/22) 2:15 pm – 4:15 pm Salon 6 (3)
TC 7.3 Research and Handbook (20/10) Screen/Electric
Monday (1/22) 4:15 pm – 6:30 pm Salon 6 (3)
TC 7.3 RP-1650 PMS (6/0)
Tuesday (1/23) 8:00 am – 9:00 am Montrose 5 (7)

TC 7.4 Exergy Analysis for Sustainable Buildings (EXER) (14/8)

Sunday (1/21) 8:00 am – 10:00 am Salon 4 (3)

TC 7.5 Smart Building Systems (11/50) Screen/Electric

Tuesday (1/23) 3:30 pm – 6:00 pm Empire (Lobby)
TC 7.5 Fault Detection & Diagnosis (15/50) Electric
Sunday (1/21) 2:30 pm – 3:15 pm Salon 1 (3)
TC 7.5 Enabling Technologies (15/50) Electric
Sunday (1/21) 3:15 pm – 4:00 pm Salon 1 (3)
TC 7.5 Smart Grid (15/50) Electric
Sunday (1/21) 4:00 pm – 4:45 pm Salon 1 (3)
TC 7.5 Handbook (15/50) Electric
Sunday (1/21) 4:45 pm – 5:30 pm Salon 1 (3)
TC 7.5 Program (15/50) Electric
Sunday (1/21) 5:30 pm – 6:00 pm Salon 1 (3)
TC 7.5 Buildings Operations and Dynamics (15/50) Electric
Monday (1/22) 4:30 pm – 5:15 pm State Ballroom (4)
TC 7.5 Research (15/50) Electric
Monday (1/22) 5:15 pm – 6:00 pm State Ballroom (4)

TC 7.6 Building Energy Performance (10/30)

Tuesday (1/23) 1:00 pm – 3:30 pm Medinah (6)
TC 7.6 Federal Buildings (25/25) Electric
Saturday (1/20) 9:00 am – 3:00 pm Spire (6)
Sunday (1/21) 9:00 am – 12:00 pm Water Tower (6)
TC 7.6 Project Monitoring Committee for 1702–RP (8/0) Electric
Sunday (1/21) 11:30 am – 1:00 pm Marshfield (3)
TC 7.6 Research (10/10) Electric
Sunday (1/21) 1:00 pm – 2:00 pm Marshfield (3)
TC 7.6 Commercial Building Energy Audit (10/15) Electric
Sunday (1/21) 2:00 pm – 3:00 pm Marshfield (3)
TC 7.6 Handbook (10/10) Electric
Sunday (1/21) 3:00 pm – 4:00 pm Marshfield (3)
TC 7.6 Monitoring and Energy Performance (10/30) Electric
Monday (1/22) 2:15 pm – 4:15 pm Indiana (3)
TC 7.6 Energy Management (10/15) Electric
Monday (1/22) 4:15 pm – 5:15 pm Indiana (3)
TC 7.6 Standards and Programs (10/10) Electric
Monday (1/22) 5:15 pm – 6:15 pm Indiana (3)
TC 7.6 Executive (10/10) Electric
Monday (1/22) 6:15 pm – 7:00 pm Indiana (3)

TC 7.7 Testing and Balancing (9/14)

Monday (1/22) 2:15 pm – 4:15 pm Handcock (6)
TC 7.7 Program, Handbook, Research (6/2)
Saturday (1/20) 8:00 am – 10:30 am Sandburg 5 (7)

TC 7.8 Owning and Operating Costs (20/6) Electric

Monday (1/22) 2:15 pm – 4:15 pm Salon 2 (3)

TC 7.9 Building Commissioning (40/20) Screen/Electric

Sunday (1/21) 3:00 pm – 5:00 pm Salon 7/8 (3)
TC 7.9 Programs, Handbook, Research (15/5) Electric
Saturday (1/20) 7:00 am – 10:00 am Montrose 1 (7)

TC 8.1 Positive Displacement Compressors (12/14)

Tuesday (1/23) 3:30 pm – 6:00 pm Montrose 3 (7)
TC 8.1 Research and Programs (10/5) Electric
Sunday (1/21) 6:00 pm – 7:00 pm Burnham 5 (7)

TC 8.2 Centrifugal Machines (20/8) Screen/Electric

Monday (1/22) 2:15 pm – 4:15 pm LaSalle 1 (7)
TC 8.2 Programs, Research, and Handbook (15/6) Screen/Electric
Sunday (1/21) 5:00 pm – 7:00 pm Burnham 4 (7)

TC 8.3 Absorption and Heat Operated Machines (20/10) Electric

Monday (1/22) 3:30 pm – 6:00 pm Clark 7 (7)
TC 8.3 Research/Handbook (5/3) Electric
Monday (1/22) 2:15 pm – 3:30 pm Clark 7 (7)

TC 8.4 Air-to-Refrigerant Heat Transfer Equipment (20/10) Screen/Electric

Tuesday (1/23) 3:30 pm – 6:00 pm Clark 3 (7)
TC 8.4 Research/Standards/Handbook (10/25) Screen/Electric
Monday (1/22) 6:30 pm – 9:30 pm Red Lacquer (4)

TC 8.5 Liquid to Refrigerant Heat Exchangers (47/18) Screen

Monday (1/22) 4:15 pm – 6:30 pm Crystal (3)
TC 1.3/8.5 Research Subcommittee Meeting and Project Review (20/30) Screen/Electric
Sunday (1/21) 3:00 pm – 7:00 pm Price (5)

TC 8.6 Cooling Towers and Evaporative Condensers (20/5)

Monday (1/22) 2:15 pm – 4:15 pm Madison (3)
TC 8.6 Handbook/Program/Research (8/5) Electric
Monday (1/22) 9:00 am – 10:00 am Burnham 5 (7)

TC 8.7 Variable Refrigerant Flow (VRF) (20/30) Screen/Electric

Monday (1/22) 4:15 pm – 6:30 pm Honore (Lobby)
TC 8.7 Programs (5/5)
Sunday (1/21) 3:00 pm – 4:00 pm Montrose 4 (7)

TC 8.8 Refrigerant System Controls and Accessories (10/10) Screen/Electric

Tuesday (1/23) 1:00 pm – 3:30 pm Indiana (3)
TC 8.8 Handbook, Programs, Research (5/3)
Sunday (1/21) 6:30 pm – 9:30 pm Sandburg 8 (7)

TC 8.9 Residential Refrigerators and Food Freezers (6/10)

Monday (1/22) 2:15 pm – 4:15 pm Montrose 4 (7)

TC 8.10 Mechanical Dehumidifiers Equipment and Heat Pipes (16/10)

Tuesday (1/23) 3:30 pm – 6:00 pm Price (5)

TC 8.10 Program/Handbook/Research/Standards (25/5) Screen/Electric

Tuesday (1/23) 1:00 pm – 3:30 pm Price (5)

TC 8.11 Unitary and Room Air Conditioners and Heat Pumps (20/30)

Monday (1/22) 4:15 pm – 6:30 pm Water Tower (6)

TC 8.11 PMS Meeting: RP-1721 Oil Return/Retention in Unitary Split System Gas Lines (5/20) Screen/Electric

Sunday (1/21) 2:00 pm – 3:00 pm Clark 7 (7)

TC 8.11 Handbook/Program/Research Subcommittee (12/30) Screen/Electric

Sunday (1/21) 3:00 pm – 6:30 pm Clark 7 (7)

TC 8.12 Desiccant Dehumidification Equipment and Components (15/15)

Monday (1/22) 2:15 pm – 4:15 pm Marshfield (3)

TC 9.1 Large Building Air-Conditioning Systems (14/15) Screen/Electric

Tuesday (1/23) 1:00 pm – 3:30 pm Dearborn 3 (7)

TC 9.1 Programs and Handbook (10/5) Electric

Tuesday (1/23) 12:00 pm – 1:00 pm Dearborn 3 (7)

TC 9.2 Industrial Air Conditioning and Ventilation (25/10) Screen/Electric

Tuesday (1/23) 1:00 pm – 3:30 pm Salon 1 (3)

TC 9.2 Programs/Research/Handbook (12/2)

Sunday (1/21) 4:00 pm – 6:00 pm Dearborn 3 (7)

TC 9.2 Nuclear Subcommittee (10/2) Screen/Electric

Monday (1/22) 2:15 pm – 4:15 pm Burnham 2 (7)

TC 9.3 Transportation Air Conditioning (21/5) Screen/Electric

Monday (1/22) 4:15 pm – 6:15 pm Wilson (3)

TC 9.3 Research (14/20) Screen/Electric

Monday (1/22) 10:00 am – 12:00 pm Wilson (3)

TC 9.3 Handbook Subcommittee (14/20) Screen/Electric

Monday (1/22) 2:15 pm – 3:00 pm Wilson (3)

TC 9.3 Rail/Mass Transit Subcommittee (14/20) Screen/Electric

Monday (1/22) 3:00 pm – 4:15 pm Wilson (3)

TC 9.4 Justice Facilities (12/2) Electric

Monday (1/22) 10:00 am – 12:00 pm Logan (3)

TC 9.6 Healthcare Facilities (20/100) Screen/Electric

Sunday (1/21) 5:00 pm – 7:00 pm Adams (6)

TC 9.6 Healthcare Water (30/15) Screen/Electric

Sunday (1/21) 9:00 am – 10:00 am Grant Park (6)

TC 9.6 Infectious Diseases (30/15) Screen/Electric

Sunday (1/21) 10:00 am – 12:00 pm Grant Park (6)

TC 9.6 Research (30/15) Screen/Electric

Sunday (1/21) 1:00 pm – 2:00 pm Grant Park (6)

TC 9.6 Handbook (30/15) Screen/Electric
Sunday (1/21) 2:00 pm – 3:00 pm Grant Park (6)
TC 9.6 Healthcare Energy (30/15) Screen/Electric
Sunday (1/21) 3:00 pm – 4:00 pm Grant Park (6)
TC 9.6 Program (30/15) Screen/Electric
Sunday (1/21) 4:00 pm – 5:00 pm Grant Park (6)

TC 9.7 Educational Facilities (15/10) Screen/Electric

Sunday (1/21) 1:00 pm – 3:00 pm Dearborn 2 (7)

TC 9.8 Large Building Air-Conditioning Applications (20/10)

Monday (1/22) 2:15 pm – 4:15 pm Buckingham (5)
TC 9.8 Handbook/Research/Programs (10/5) Electric
Monday (1/22) 9:00 am – 12:00 pm Montrose 3 (7)

TC 9.9 Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment (25/100) Screen/Electric

Monday (1/22) 2:15 pm – 6:30 pm Red Lacquer (4)
TC 9.9 Working Group with SSPC 90.4 (12/4)
Sunday (1/21) 9:00 am – 2:00 pm Sandburg 2 (7)
TC 9.9 Programs, Handbook and Research (15/60) Screen/Electric
Sunday (1/21) 5:00 pm – 7:00 pm Empire (Lobby)
TC 9.9 IT Equipment Manufacturers Subcommittee Working Group (12/0)
Monday (1/22) 8:00 am – 10:00 am Burnham 2 (7)
TC 9.9 IT Equipment Manufacturers Subcommittee Working Group (12/0)
Monday (1/22) 10:00 am – 12:00 pm Burnham 2 (7)
TC 9.9 PMS RP-1755 (8/0) Screen/Electric
Monday (1/22) 7:30 am – 9:00 am Dearborn 2 (7)

TC 9.10 Laboratory Systems (20/35) Screen/Electric

Tuesday (1/23) 3:30 pm – 5:30 pm Handcock (6)
TC 9.10 RP-1573 PMS Monitoring Subcommittee (10/2) Screen /Electric
Sunday (1/21) 1:00 pm – 3:00 pm Burnham 1 (7)
TC 9.10 Standards (20/5) Screen /Electric
Sunday (1/21) 3:00 pm – 3:30 pm Burnham 1 (7)
TC 9.10 Research (25/5) Screen /Electric
Sunday (1/21) 3:30 pm – 4:15 pm Burnham 1 (7)
TC 9.10 Program (25/5) Screen /Electric
Sunday (1/21) 4:15 pm – 4:45 pm Burnham 1 (7)
TC 9.10 Handbook (20/5) Screen /Electric
Tuesday (1/23) 1:00 pm – 1:45 pm Handcock (6)
TC 9.10 Lab Classifications (25/5) Screen /Electric
Tuesday (1/23) 1:45 pm – 2:30 pm Handcock (6)
TC 9.10 Labs Energy Efficiency (25/5) Screen /Electric
Tuesday (1/23) 2:30 pm – 3:30 pm Handcock (6)

TC 9.11 Clean Spaces (30/45) Screen/Electric

Monday (1/22) 3:00 pm – 5:00 pm Salon 4/5 (3)
TC 9.11 Research (9/5) Screen/Electric
Monday (1/22) 2:15 pm – 3:00 pm Salon 4/5 (3)

TC 9.11 Energy Efficiency (10/10) Electric
Sunday (1/21) 1:00 pm – 2:00 pm Medinah (6)
TC 9.11 Handbook (9/5) Screen/Electric
Monday (1/22) 5:00 pm – 5:30 pm Salon 4/5 (3)
TC 9.11 Design Guide (9/5) Screen/Electric
Monday (1/22) 5:30 pm – 6:00 pm Salon 4/5 (3)

TC 9.12 Tall Buildings (8/8) Screen/Electric

Sunday (1/21) 12:15 pm – 2:00 pm Ashland (3)

TC 10.1 Custom Engineered Refrigeration Systems (30/10)

Monday (1/22) 2:15 pm – 4:15 pm Salon 12 (3)

TC 10.2 Automatic Ice Making Plants and Skating Rinks (12/3) Screen/Electric

Monday (1/22) 4:30 pm – 6:30 pm Sandburg 4 (7)

TC 10.3 Refrigerant Piping, Controls and Accessories (20/10) Screen/Electric

Tuesday (1/23) 1:00 pm – 3:30 pm Clark 3 (7)
TC 10.3 TC Seminar: CFD Study of Hydraulic Shock in Two-Phase Anhydrous Ammonia (15/0) Screen/Electric
Tuesday (1/23) 2:00 pm – 3:00 pm Clark 3 (7)
TC 10.3 RP-1569 PMS (15/0) Screen/Electric
Tuesday (1/23) 8:00 am – 10:00 am Clark 1 (7)

TC 10.5 Refrigerated Processing and Storage (15/10)

Tuesday (1/23) 3:30 pm – 6:00 pm Medinah (6)

TC 10.6 Transport Refrigeration (10/15) Screen/Electric

Monday (1/22) 4:45 pm – 7:00 pm Burnham 5 (7)

TC 10.7 Commercial Food and Beverage Refrigeration Equipment (24/30)

Monday (1/22) 2:15 pm – 4:15 pm Burnham 1 (7)
TC 10.7 Program (10/10) Electric
Sunday (1/21) 5:15 pm – 6:00 pm Grant Park (6)
TC 10.7 Research (10/10) Electric
Sunday (1/21) 6:00 pm – 6:45 pm Grant Park (6)

TC 10.8 Refrigeration Load Calculations (10/10)

Sunday (1/21) 3:00 pm – 5:00 pm Sandburg 8 (7)

Task Groups (TG), Technical Resource Groups (TRG), and Multidisciplinary Task Groups (MTG)

TG2 Heating Ventilation and Air-Conditioning Security (20/6) Electric

Tuesday (1/23) 9:00 am – 12:00 pm Handcock (6)

TRG4 Indoor Air Quality Procedure Development (15/20) Screen/Electric

Sunday (1/21) 10:30 am – 12:00 pm LaSalle 5 (7)

TRG9 Cold Climate Design (12/3) Screen/Electric

Wednesday (1/24) 9:00 am – 11:00 am Salon 4 (3)

MTG.BIM Building Information Modeling (20/0) Screen

Monday (1/22) 10:15 am – 12:00 pm Salon 6 (3)

BIM Meeting (20/0) Screen
Monday (1/22) 4:00 pm – 5:00 pm Grant Park (6)

MTG.HCDG Hot Climate Design Guide (20/0)

Sunday (1/21) 8:00 am – 9:00 am Salon 1 (3)

MTG.HCDG Hot Climate Design Guide Workshop (20/0)
Wednesday (1/24) 8:00 am - 10:00 am Clark 5 (7)

MTG.IAST Impact of ASHRAE Standards and Technology on Energy Savings/Performance (15/10) Electric

Saturday (1/20) 1:00 pm – 2:30 pm Marshfield (3)

MTG.LowGWP Low GWP Refrigerants - Part A (26/36) Screen/Electric

Sunday (1/21) 5:00 pm – 6:00 pm Salon 7/8 (3)

MTG.LowGWP Low GWP Refrigerants - Part B (27/60) Screen/Electric

Wednesday (1/24) 10:00 am – 12:00 pm Clark 5 (7)

MTG.LowGWP Research Update (20/30) Screen/Electric
Sunday (1/21) 12:00 pm – 2:00 pm Clark 5 (7)
MTG.LowGWP Codes and Standards Subcommittee (20/15) Screen/Electric
Tuesday (1/23) 1:00 pm – 3:30 pm Dearborn 1 (7)

MTG.OBB Occupant Behavior in Buildings (30/10) Screen

Monday (1/22) 8:00 am – 10:00 am Clark 5 (7)

Standard Project Committees (SPC) and Standing Standard Project Committees (SSPC)

PC Chairs Training Breakfast (104/0) Screen

Sunday (1/21) 7:30 am – 9:00 am Grand Ballroom (4)

SSPC 15 Safety Standard for Refrigeration Systems (16/30) Electric

Sunday (1/21) 1:00 pm – 5:00 pm Spire (6)

SSPC 15 Safety Standards for Refrigeration Systems Addendum D, H and A (16/30) Electric
Saturday (1/20) 1:00 pm – 4:00 pm Dearborn 1 (7)
SSPC 15 Safety Standards for Refrigeration Systems Addendum D, H and A (16/30) Electric
Sunday (1/21) 9:00 am – 12:00 pm Spire (6)
SSPC 15 Subcommittee 15.2 Safety Standard for Refrigeration Systems in Residential Applications (15/15) Screen/Electric
Tuesday (1/23) 8:00 am – 12:00 pm Salon 9 (3)

SPC 23.2 MOT of Positive Displacement Compressors and Compressor Units that Operate at Supercritical Pressures of the Refrigerant (7/2)

Monday (1/22) 10:00 am – 12:00 pm LaSalle 4 (7)

SPC 24 Method of Testing for Rating Evaporators Used for Cooling Liquids (6/10) Screen/Electric

Tuesday (1/23) 8:00 am – 10:00 am LaSalle 3 (7)

SPC 25-2001R, Methods of Testing Forced Convection and Natural Convection Air Coolers for Refrigeration (7/4) Electric

Monday (1/22) 7:30 pm – 11:00 pm Sandburg 7 (7)

SPC 26 Mechanical Refrigeration and Air Conditioning Installations Aboard Ship (6/4) Screen/Electric

Monday (1/22) 2:15 pm – 6:15 pm Montrose 3 (7)

SPC 28 MOT Flow Capacity of Refrigerant Capillary Tubes (6/5) Electric

Sunday (1/21) 5:00 pm – 7:00 pm Sandburg 6 (7)

SPC 30 Method of Testing Liquid Chillers (10/5) Screen/Electric

Monday (1/22) 8:00 am – 11:00 am Montrose 2 (7)

SPC 32.2 Methods of Testing for Rating Pre-Mix and Post-Mix Beverage Dispensing Equipment (6/2)

Tuesday (1/23) 8:00 am – 12:00 pm Montrose 4 (7)

SSPC 34 Designation and Safety Classification of Refrigerants (17/40) Screen /Electric

Monday (1/22) 6:30 pm – 10:00 pm Salon 7/8 (3)

SSPC 34 Designation and Nomenclature Subcommittee (Designation and Safety Classification of Refrigerants) (14/30) Screen/Electric
Saturday (1/20) 7:00 am – 10:00 am Water Tower (6)

SSPC 34 Flammability Subcommittee (Designation and Safety Classification of Refrigerants) (17/43) Screen/Electric
Saturday (1/20) 10:00 am – 3:00 pm Water Tower (6)

SSPC 34 Toxicity Subcommittee (Designation and Safety Classification of Refrigerants) (11/40) Screen/Electric
Sunday (1/21) 6:30 pm – 10:00 pm Salon 7/8 (3)

SPC 37 MOT for Rating Electrically Driven Unitary Air-Conditioners and Heat Pump Equipment (21/20) Screen/Electric

Wednesday (1/24) 8:00 am – 12:00 pm Handcock (6)

SSPC 41 Standard Methods for Measurement (19/10) Electric

Sunday (1/21) 1:00 pm – 3:00 pm Clark 3 (7)

41.3 Subcommittee, Standard Methods for Pressure Measurement (15/5) Screen/Electric
Sunday (1/21) 10:00 am – 12:00 pm Clark 3 (7)

SSPC 41, Standard Methods for Measurement – Uncertainty Ad Hoc Committee (19/10) Electric
Sunday (1/21) 3:00 pm – 4:00 pm Clark 3 (7)

41.6 Subcommittee, Standard Methods for Humidity Measurement (15/5) Screen/Electric
Monday (1/22) 10:00 am – 12:00 pm Clark 10 (7)
41.11 Subcommittee, Standard Methods for Power Measurement (15/5) Screen/Electric
Monday (1/22) 2:15 pm – 4:15 pm Clark 10 (7)
41.4 Subcommittee, Standard Methods for Proportion of Lubricant in Liquid Refrigerant Measurement (10/5) Screen/Electric
Monday (1/22) 4:15 pm – 6:15 pm Clark 10 (7)
41.10, Standard Methods for Refrigerant Mass Flow Measurement Using Flowmeters (15/10) Screen/Electric
Tuesday (1/23) 8:00 am – 10:00 am Clark 10 (7)
41.1, Standard Methods for Temperature Measurement (15/10) Screen/Electric
Tuesday (1/23) 10:00 am – 12:00 pm Clark 10 (7)

SSPC 52.2 Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size (18/62) Electric

Saturday (1/20) 8:00 am – 12:00 pm Chicago (5)

SSPC 55 Thermal Environmental Conditions for Human Occupancy (12/4)

Saturday (1/20) 8:00 am – 3:00 pm Dearborn 3 (7)
Sunday (1/21) 8:00 am – 12:00 pm LaSalle 4 (7)

SSPC 62.1 Ventilation for Acceptable Indoor Air Quality (30/30) Screen/Electric

Saturday (1/20) 8:00 am – 12:00 pm Monroe (6)
Sunday (1/21) 1:00 pm – 7:00 pm Water Tower (6)
SSPC 62.1 IAQ Guideline Subcommittee (15/15) Screen/Electric
Friday (1/19) 8:00 am – 12:00 pm LaSalle 1 (7)
SSPC 62.1 Administration Subcommittee (15/15) Screen/Electric
Friday (1/19) 1:00 pm – 5:00 pm LaSalle 3 (7)
Saturday (1/20) 1:00 pm – 3:00 pm LaSalle 3 (7)
SSPC 62.1 Research and Education Subcommittee (15/15) Screen/Electric
Friday (1/19) 1:00 pm – 5:00 pm LaSalle 1 (7)
Saturday (1/20) 1:00 pm – 3:00 pm LaSalle 1 (7)
SSPC 62.1 Buildings, Systems and Equipment (15/15) Screen/Electric
Friday (1/19) 1:00 pm – 5:00 pm Sandburg 2 (7)
Saturday (1/20) 1:00 pm – 3:00 pm LaSalle 2 (7)
SSPC 62.1 Ventilation Subcommittee (15/15) Screen/Electric
Friday (1/19) 1:00 pm – 5:00 pm LaSalle 5 (7)
Saturday (1/20) 1:00 pm – 3:00 pm LaSalle 5 (7)
SSPC 62.1 Natural Ventilation Working Group (15/15) Screen/Electric
Monday (1/22) 8:00 am – 12:00 pm LaSalle 1 (7)

SSPC 62.2 Ventilation and Acceptable IAQ in Residential Buildings (30/20) Screen/Electric

Friday (1/19) 9:00 am – 2:30 pm Salon 12 (3)
Saturday (1/20) 8:00 am – 3:00 pm Salon 12 (3)

SSPC 62.2 Envelope Subcommittee (20/20) Screen
Friday (1/19) 2:30 pm – 5:00 pm Salon 8 (3)
SSPC 62.2 IAQ Subcommittee (12/20) Screen
Friday (1/19) 2:30 pm – 5:00 pm Salon 9 (3)
SSPC 62.2 System Subcommittee (12/20) Screen
Friday (1/19) 2:30 pm – 5:00 pm Salon 12 (3)

SPC 63.1 Method of Testing Liquid Line Filter Driers (6/4)
Sunday (1/21) 6:00 pm – 10:00 pm Montrose 4 (7)

SPC 64 Methods of Lab Testing Remote Mechanical Draft Evaporative Refrigerant Condensers (6/2)
Monday (1/22) 10:00 am – 11:00 am Burnham 5 (7)

SPC 70 Method of Testing the Performance of Air Outlets and Air Inlets (9/20) Screen/Electric
Monday (1/22) 8:00 am – 12:00 pm Sandburg 2 (7)

SSPC 72 Method of Testing Open and Closed Commercial Refrigerators and Freezers (16/15) Screen
Sunday (1/21) 1:00 pm – 5:00 pm Burnham 2 (7)

SPC 84 Method of Testing Air-to-Air Heat/Energy Exchangers (16/8) Screen/Electric
Monday (1/22) 4:15 pm – 6:30 pm Cresthill (3)

SSPC 90.1 Energy Eff. Design of New Bldg. (50/60) Screen/Electric
Saturday (1/20) 8:00 am – 12:00 pm Wabash (3)
Sunday (1/21) 9:00 am – 12:00 pm Wabash (3)
Monday (1/22) 8:00 am – 12:00 pm Wabash (3)
SSPC 90.1 Envelope Subcommittee (15/30) Screen/Electric
Friday (1/19) 9:00 am – 10:00 pm Wilson (3)
Saturday (1/20) 1:00 pm – 8:00 pm Wilson (3)
Sunday (1/21) 1:00 pm – 8:00 pm Wilson (3)
SSPC 90.1 Lighting Subcommittee (12/10) Screen/Electric
Friday (1/19) 9:00 am – 10:00 pm Indiana (3)
Saturday (1/20) 1:00 pm – 7:00 pm Indiana (3)
Sunday (1/21) 1:00 pm – 8:00 pm Indiana (3)
SSPC 90.1 Mechanical Subcommittee (25/25) Screen/Electric
Friday (1/19) 9:00 am – 10:00 pm Wabash (3)
Saturday (1/20) 1:00 pm – 7:00 pm Wabash (3)
Sunday (1/21) 1:00 pm – 8:00 pm Wabash (3)
SSPC 90.1 ECB Subcommittee (12/18) Screen/Electric
Friday (1/19) 3:00 pm – 8:00 pm Kimball (3)
Saturday (1/20) 1:00 pm – 5:00 pm Cresthill (3)
Sunday (1/21) 1:00 pm – 4:00 pm Cresthill (3)
SSPC 90.1 Envelope Subcommittee Working Group (10/20) Screen/Electric
Friday (1/19) 4:00 pm – 6:00 pm Marshfield (3)
Saturday (1/20) 4:00 pm – 6:00 pm Kimball (3)
SSPC 90.1 Format & Compliance Subcommittee (6/6) Screen/Electric
Friday (1/19) 5:00 pm – 10:00 pm Harvard (3)
Saturday (1/20) 1:00 pm – 5:00 pm Harvard (3)
Sunday (1/21) 4:00 pm – 7:00 pm Cresthill (3)

SSPC 90.1/TC 6.2 District Energy Coordination Kick Off (12/0)
Monday (1/22) 7:30 am – 9:00 am Sandburg 5 (7)

SSPC 90.2 Energy Efficient Design of New Low Rise Residential Buildings (30/10) Screen/Electric

Monday (1/22) 2:15 pm – 6:15 pm Spire (6)

Tuesday (1/23) 1:00 pm – 5:00 pm Grant Park (6)

SSPC 90.2 Envelope (12/5) Screen/Electric
Monday (1/22) 6:30 pm – 9:30 pm Spire (6)
Tuesday (1/23) 8:00 am – 12:00 pm Grant Park (6)

SSPC 90.2 Lighting (5/2) Screen/Electric
Monday (1/22) 6:30 pm – 9:30 pm Dearborn 3 (7)
Tuesday (1/23) 8:00 am – 12:00 pm Clark 8 (7)

SSPC 90.2 Mechanical (10/5) Screen/Electric
Monday (1/22) 6:30 pm – 9:30 pm Dearborn 2 (7)
Tuesday (1/23) 8:00 am – 12:00 pm Clark 9 (7)

SSPC 90.4 Energy Standard for Data Centers and Telecommunications Buildings (17/20) Screen/Electric

Saturday (1/20) 9:00 am – 1:00 pm Salon 2 (3)

Monday (1/22) 7:30 am – 11:30 am LaSalle 2 (7)

SPC 97 Sealed Glass Tube Method to Test the Chemical Stability of Materials for Use Within Refrigerant Systems (8/10) Screen/Electric

Tuesday (1/23) 9:30 am – 11:00 am Sandburg 8 (7)

SSPC 100 Energy Efficiency in Existing Buildings (20/10) Screen/Electric

Tuesday (1/23) 8:00 am – 12:00 pm Price (5)

SSPC 100 Alternative to EUI (WG5) (16/10) Screen/Electric
Sunday (1/21) 12:00 pm – 2:00 pm LaSalle 5 (7)

SSPC 100 International Target Table and Climate Zones (WG4) (4/5) Screen/Electric
Sunday (1/21) 4:00 pm – 6:00 pm LaSalle 5 (7)

SPC 111 Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation and Air-Conditioning Systems (12) (8/4) Screen/Electric

Tuesday (1/23) 8:00 am – 12:00 pm Sandburg 7 (7)

SPC 113 Method of Testing Room Air Diffusion (15/10) Screen/Electric

Tuesday (1/23) 3:30 pm – 5:00 pm LaSalle 5 (7)

SPC 118.1 Method of Testing for Rating Commericial Gas, Electric and Oil Service Water Heating Equipment (9/15) Screen/Electric

Sunday (1/21) 9:00 am – 11:00 am LaSalle 1 (7)

SPC 118.2 Method of Testing for Rating Residential Water Heaters (15/15) Electric

Tuesday (1/23) 1:00 pm – 5:00 pm Salon 9 (3)

SPC 124 MOT/Rating Combined Space-Heating & Water Heating Appliances (20/10) Electric

Tuesday (1/23) 9:00 am – 12:00 pm LaSalle 1 (7)

SPC 127 Method of Testing for Rating Air Conditioning Units Serving Data Center (DC) and Other Information Technology Equipment (ITE) Spaces (12/8) Screen/ Electric

Wednesday (1/24) 8:00 am – 12:00 pm Salon 9 (3)

SPC 128 Method of Rating Portable Air Conditioners (6/0)

Sunday (1/21) 2:00 pm – 3:00 pm LaSalle 5 (7)

SPC 130 MOT/for Rating Ducted Air Terminal Units (20/20)

Sunday (1/21) 2:00 pm – 4:00 pm Salon 9 (3)

SSPC 135 BACnet (15/5) Electric

Thursday (1/18) 8:00 am – 5:00 pm Wilson (3)

SSPC 135 BACnet (25/5) Electric

Friday (1/19) 8:00 am – 5:00 pm Salon 5 (3)

SSPC 135 BACnet (40/10) Electric

Saturday (1/20) 8:00 am – 3:30 pm Honore (Lobby)

SSPC 135 BACnet (25/5) Electric

Sunday (1/21) 8:00 am – 5:00 pm Salon 5 (3)

Sunday (1/21) 8:00 am – 5:00 pm Salon 6 (3)

SSPC 135 BACnet (40/10) Electric

Monday (1/22) 8:00 am – 12:00 pm Salon 7/8 (3)

SSPC 135 BACnet Working Group (25/5) Electric
Friday (1/19) 8:00 am – 5:00 pm Salon 6 (3)

SSPC 140: Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs (18/10) Screen/Electric

Monday (1/22) 2:15 pm – 6:15 pm LaSalle 3 (7)

SSPC 145 Test Method for Assessing the Performance of Gas Phase Air Cleaning Equipment (10/50) Screen/ Electric

Sunday (1/21) 12:00 pm – 3:00 pm Handcock (6)

SPC 146 Method of Testing and Rating Pool Heaters (7/5) Electric

Tuesday (1/23) 10:00 am – 12:00 pm Burnham 3 (7)

SSPC 147 Reducing the Release of Halogenated Refrigerants from Refrigerating and Air-Conditioning Systems (10/10) Screen/Electric

Tuesday (1/23) 8:00 am – 12:00 pm Sandburg 5 (7)

SPC 150-2000: Method of Testing for Performance of Cool Storage Systems/TC 6.9 Standards (30/20) Screen/ Electric

Monday (1/22) 2:15 pm – 2:40 pm Empire (Lobby)

SSPC 154 Ventilation for Commercial Cooking (12/10) Screen/Electric

Sunday (1/21) **9:00 am – 12:00 pm** **LaSalle 3 (7)**

SPC 155P MOT for Rating Commercial Space Heating Boiler Systems (17/10) Screen/Electric

Sunday (1/21) **1:00 pm – 5:00 pm** **LaSalle 3 (7)**

SPC 158.1 MOT for Capacity of Refrigerant Solenoid Valves (6/5) Electric

Sunday (1/21) **5:00 pm – 7:00 pm** **Sandburg 6 (7)**

SPC 158.2 MOT Capacity of Refrigerant Pressure Regulators (5/5) Electric

Sunday (1/21) **5:00 pm – 7:00 pm** **Sandburg 6 (7)**

SSPC 160 Criteria for Moisture Control Design Analysis in Buildings (30/5) Screen/Electric

Tuesday (1/23) **8:00 am – 12:00 pm** **Burnham 1 (7)**

SSPC 161 Air Quality within Commercial Aircaft (21/5) Screen/Electric

Monday (1/22) **8:00 am – 10:00 am** **Wilson (3)**

SPC 164 Method of Test for Humidifiers (10/5) Screen/Electric

Monday (1/22) **9:00 am – 11:00 am** **Dearborn 3 (7)**

SSPC 169 Climatic Data for Building Design Standards (7/10) Screen/Electric

Monday (1/22) **10:00 am – 12:00 pm** **Sandburg 6 (7)**

SSPC 170 Ventilation of Healthcare Facilities (23/50) Screen/Electric

Monday (1/22) **4:00 pm – 6:00 pm** **Monroe (6)**

Tuesday (1/23) **8:00 am – 1:00 pm** **Salon 4/5 (3)**

SSPC 170 Ventilation of Health Care Facilities, Natural Ventilation Work Group (12/12) Screen/Electric

Monday (1/22) 2:15 pm – 4:00 pm Grant Park (6)

SPC 174P Method of Test for Rating Desiccant-Based Dehumidification Equipment (6/2)

Monday (1/22) **10:00 am – 12:00 pm** **Clark 2 (7)**

SPC 180 Standard Practice for Inspection and Maintenance of Commercial-Building HVAC Systems (15/5) Screen/Electric

Friday (1/19) **2:00 pm – 6:00 pm** **Sandburg 8 (7)**

SPC 182 MOT Absorption Water-Chilling and Water-Heating Packages (5/5) Electric

Monday (1/22) **11:00 am – 12:00 pm** **Clark 9 (7)**

SPC 184 Method of Test for Field Performance of Liquid-Chilling Systems (7/3) Screen/Electric

Tuesday (1/23) **8:00 am – 10:00 pm** **Dearborn 3 (7)**

SSPC 185 Methods of Test to Inactivate Micro-organisms in HVAC Systems with UV-C Lights (6/6)

Saturday (1/20) 8:00 am – 9:00 am Sandburg 2 (7)

SSPC 188 Legionellosis: Risk Management for Building Water Systems (40/10) Screen/Electric

Tuesday (1/23) 8:00 am – 12:00 pm Salon 7/8 (3)

Tuesday (1/23) 3:30 pm – 5:30 pm Salon 7/8 (3)

Wednesday (1/24) 8:00 am – 12:00 pm Salon 7/8 (3)

SSPC 189.1 ASHRAE/USGBC/IES Standard for the Design of High-Performance Green Buildings except Low-Rise Residential Buildings (67/50) Screen/Electric

Tuesday (1/23) 8:00 am – 10:00 am Wabash (3)

Wednesday (1/24) 8:00 am – 12:00 pm Wabash (3)

SSPC 189.1 Working Group 6 (Water Use) (30/20) Screen/Electric
Tuesday (1/23) 10:00 am – 12:30 pm Salon 12 (3)

SSPC 189.1 Working Group 7 (Energy Efficiency) (67/30) Screen/Electric
Tuesday (1/23) 10:00 am – 1:00 pm Wabash (3)

SSPC 189.1 Working Group 9 (Materials and Resources) (30/20) Screen/Electric
Tuesday (1/23) 1:00 pm – 3:00 pm Salon 12 (3)

SSPC 189.1 Working Group 8 (IEQ) (30/30) Screen/Electric
Tuesday (1/23) 1:00 pm – 4:00 pm Crystal (3)

SSPC 189.1 Working Group 7.5 (30/30) Screen/Electric
Tuesday (1/23) 1:30 pm – 4:30 pm Wabash (3)

SSPC 189.1 Working Group 5 (Site Sustainability) (30/20) Screen/Electric
Tuesday (1/23) 4:00 pm – 6:00 pm Crystal (3)

SSPC 189.1 Working Group 10 (20/20) Screen /Electric
Tuesday (1/23) 5:00 pm – 7:00 pm Salon 12 (3)

SPC 189.3 Design, Construction and Operation of Sustainable High Performance Health Care Facilities (11/18) Screen/Electric

Monday (1/22) 8:00 am – 12:00 pm Salon 4/5 (3)

SPC 191 Standard for the Efficient Use of Water in Building and Mechanical Systems (12/6) Screen/Electric

Sunday (1/21) 8:00 am – 12:00 pm Montrose 2 (7)

SPC 194 Method of Test for Direct Expansion Ground Source Heat Pumps (5/10)

Sunday (1/21) 1:00 pm – 3:00 pm Clark 8 (7)

SPC 195 Method of Test for Rating Air Terminal Unit Controls (8/5) Screen

Tuesday (1/23) 10:00 am – 12:00 pm Clark 1 (7)

SPC 196 Method of Test for Measuring Refrigerant Leak Rates (7/10) Screen/Electric

Sunday (1/21) 6:00 pm – 10:00 pm Sandburg 7 (7)

SPC 198 Method of Test for Rating DX-Dedicated Outdoor Air Systems for Moisture Removal Capacity and Moisture Removal Efficiency (20/0) Screen/Electric

Sunday (1/21) 12:00 pm - 1:00 pm Salon 4 (3)

SPC 200 Methods of Testing Chilled Beams (20/10) Electric

Monday (1/22) 8:00 am – 10:00 am LaSalle 5 (7)

SPC 204P Method of Test for Rating Micro Combined Heat and Power Devices (12/12) Electric

Monday (1/22) 6:30 pm – 9:30 pm Clark 3 (7)

SPC 205 Standard Representation of Performance Simulation Data for HVAC&R and Other Facility Equipment (20/20) Screen /Electric

Tuesday (1/23) 8:00 am – 12:00 pm Spire (6)

Sunday (1/21) 9:00 am – 12:00 pm Montrose 1 (7)

SPC 207P Laboratory Method of Test of Fault Detection and Diagnostics Applied Commercial Air-Cooled Packaged Systems (20/20) Screen/Electric

Monday (1/22) 8:00 am – 10:00 am Buckingham (5)

SPC 207 Usability and Verification (15/5) Screen/Electric
Monday (1/22) 10:00 am – 12:00 pm Buckingham (5)
SPC 207 Draft Development (15/5) Screen/Electric
Monday (1/22) 4:30 pm – 6:30 pm Buckingham (5)
SPC 207 Refrigeration and Airflow (15/5) Screen/Electric
Monday (1/22) 6:30 pm – 8:30 pm Buckingham (5)

SPC 210 Method of Testing for Rating Commercial Walk in Cooler and Freezer Equipment (10/25) Screen/ Electric

Monday (1/22) 8:00 am – 12:00 pm Burnham 4 (7)

SPC 211 Commercial Building Energy Audits (18/15) Screen/Electric

Monday (1/22) 8:00 am – 12:00 pm Marshfield (3)

SPC 212P Method of Test for Determining Energy Performance and Water-Use Efficiency of Add-On Evaporative Pre-Coolers for Unitary Air Conditioning Equipment (7/5) Screen/Electric

Tuesday (1/23) 12:00 pm – 4:00 pm Sandburg 6 (7)

SPC 213P Method of Calculating Moist Air Thermodynamic Properties (8/5)

Tuesday (1/23) 8:00 am – 12:00 pm LaSalle 5 (7)

SPC 215P Method of Test to Determine Leakage of Operating HVAC Air-Distribution Systems (12/10) Screen /Electric

Monday (1/22) 2:15 pm – 6:15 pm Logan (3)

SPC 216 MOT for Determining Application Data of Overhead Circulator Fans (10/15) Screen/Electric

Monday (1/22) 2:15 pm – 5:15 pm Medinah (6)

SPC 217 Non-Emergency Ventilation in Enclosed Road, Rail and Mass Transit Facilities (10/10) Screen/Electric

Tuesday (1/23) 7:00 am – 12:00 pm Cresthill (3)

SPC 218P – MOT for Lubricant and Refrigerant Miscibility Determination (10/5) Screen/Electric

Monday (1/22) 8:00 am – 10:00 am Clark 9 (7)

SPC 219 Method of Testing the Ability of Liquid Line Filter Driers or Absorbents to Remove Organic Acid (5/3) Screen

Monday (1/22) 10:00 am – 12:00 pm Montrose 4 (7)

SPC 220P Method of Testing for Rating Small Commerical Blast Chillers, Chiller Freezers and Freezers (20/10) Screen

Monday (1/22) 4:30 pm – 6:00 pm LaSalle 5 (7)

SPC 221 Test Method to Measure and Score the Operating Performance of an Installed Constant Volume Unitary HVAC System (18/10) Screen/Electric

Tuesday (1/23) 8:00 am – 10:00 am Montrose 1 (7)

SPC 222 Method of Test for Electric Power Drive Systems (5/5) Screen/Electric

Tuesday (1/23) 7:30 am – 11:00 am Clark 2 (7)

SSPC 300 Commissioning (15/30) Screen/Electric

Monday (1/22) 8:00 am – 12:00 pm Salon 1 (3)

SSPC 300 Subcommittee: GLD 0-2013 The Commissioning Process (12/10) Screen/Electric
Saturday (1/20) 10:00 am – 11:30 am Montrose 1 (7)

SSPC 300 Subcommittee: GLD 1.1 The HVAC&R Technical Requirements for Commissioning Process (12/12) Screen/Electric
Saturday (1/20) 12:00 pm – 1:30 pm Montrose 1 (7)

SSPC 300 Standard 202 subcommittee, Commissioning Process for Buildings and Systems (16/10) Screen/Electric
Saturday (1/20) 1:30 pm – 3:00 pm Montrose 1 (7)

SSPC 300 Subcommittee: GLD 1.4, Procedures for Preparing Facility Systems Manuals (12/12) Screen/Electric
Sunday (1/21) 10:00 am – 12:00 pm Montrose 3 (7)

Guideline Project Committees (GPC) and Standing Guideline Project Committees (SGPC)

GPC 1.2 The Commissioning Process for Existing HVAC&R Systems (16/6) Screen/Electric

Friday (1/19) 1:00 am – 5:00 pm LaSalle 2 (7)

GPC 1.3 Building Operation and Maintenance Training for the HVAC&R Commissioning Process (8/2) Electric

Tuesday (1/23) 1:00 pm – 5:00 pm Clark 1 (7)

GPC 4-2008R Preparation of Operating and Maintenance Documentation for HVAC&R Systems (6/2)
Sunday (1/21) 8:00 am – 12:00 pm Sandburg 3 (7)

GPC 11 Field Testing of HVAC Controls Components (6/3) Screen/Electric
Saturday (1/20) 9:00 am – 12:00 pm Sandburg 4 (7)

GPC 14 Measurement of Energy, Demand, and Water Savings (15/0) Screen
Sunday (1/21) 6:00 pm – 10:00 pm Logan (3)

GPC 22 Instrumentation for Monitoring Central Chilled Water Plant Efficiency (8/4) Screen/Electric
Tuesday (1/23) 10:00 am – 12:00 pm LaSalle 4 (7)

GPC 27P Measurement Procedures for Gaseous Contaminants in Commercial Buildings (9/6)
Sunday (1/21) 3:00 pm – 5:00 pm Sandburg 3 (7)

GPC 29 Guideline for Risk Management (6/4)
Sunday (1/21) 1:00 pm – 5:00 pm Burnham 5 (7)

GPC 32 Sustainable, High Performance Operations & Maintenance (7/2)
Saturday (1/20) 12:00 pm – 2:00 pm Montrose 4 (7)

GPC 35 Method for Determining the Energy Consumption Caused By Air-Cleaning and Filtration Devices (11/40) Screen/Electric
Monday (1/22) 8:00 am – 12:00 pm Salon 9 (3)

GPC 36P High Performance Sequences of Operation for HVAC Systems (20/30) Screen/Electric
Monday (1/22) 8:00 am – 12:00 pm Burnham 1 (7)

GPC 37 Upper Room Ultraviolet Germicidal (UV-C) Devices to Control the Transmission of Airborne Pathogens (10/6)
Saturday (1/20) 9:00 am – 12:00 pm Sandburg 2 (7)

GPC 38P Guideline for Using Metal Pressure Vessels to Test Materials Used in Refrigeration Systems (7/5)
Monday (1/22) 4:15 pm – 6:15 pm Montrose 2 (7)

GPC 41P Design, Installation and Commissioning of Variable Refrigerant Flow Systems (25/10) Electric
Monday (1/22) 8:00 am – 12:00 pm Montrose 1 (7)

SGPC 10 Interaction Affecting the Achievement of Acceptable Indoor Environments (8/10)
Sunday (1/21) 9:00 am – 12:00 pm Sandburg 4 (7)

SGPC 13 Specifying Building Automation Systems (15/15) Screen /Electric
Saturday (1/20) 8:00 am – 12:00 pm LaSalle 3 (7)

Other

US TAG to ISO/TC 86 (20/10) Screen/Electric

Monday (1/22) 8:00 am – 10:00 am Salon 6 (3)

US TAG to ISO/TC 142 Cleaning Equipment for Air and other Gases (36/30) Screen/Electric

Saturday (1/20) 2:30 pm – 3:15 pm Crystal (3)

US TAG to ISO/TC 163 Thermal Performance and Energy in a Building Environment (18/11) Screen/Electric

Tuesday (1/23) 3:00 pm – 4:30 pm LaSalle 1 (7)

JWG ISO/TC 163/WG4 and ISO/TC 205 (18/11) Screen/Electric

Tuesday (1/23) 2:30 pm – 3:00 pm LaSalle 1 (7)

US Tag to ISO/TC 205 (22/12) Screen/Electric

Tuesday (1/23) 1:00 pm – 2:30 pm LaSalle 1 (7)

ISO 817 MA (23/11) Screen/Electric

Tuesday (1/23) 8:00 am – 12:00 pm Salon 2 (3)

ISO 817 MA-Flammability (15/10) Screen/Electric
Monday (1/22) 8:00 am – 9:00 am Indiana (3)

ISO 817 MA-Toxicity (15/10) Screen/Electric
Monday (1/22) 8:00 am – 10:00 am Logan (3)

ISO 817 MA - Design and Nomenclature (15/10) Screen/Electric
Monday (1/22) 9:00 am – 10:00 am Indiana (3)

ISO/TC 86/SC 8/ WG7 Refrigerant Properties (ISO 17584) (20/10) Screen/Electric

Wednesday (1/24) 7:00 am – 10:00 am Salon 2 (3)

gbXML (10/0)

Monday (1/22) 2:00 pm – 3:00 pm Harvard (3)

USNC/IIR (20/20) Screen

Tuesday (1/23) 2:00 pm – 4:00 pm Montrose 1 (7)

USNT/IEA (20/10) Screen

Tuesday (1/23) 4:00 pm – 6:00 pm Montrose 1 (7)