ASHRAE WINTER CONFERENCE

February 1–5, 2020 | Orlando, FL | ASHRAE Celebrates 125 Years!

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CELEBRATING 125 YEARS

ASHRAE 365 App

ASHRAE has a free app to use at the conference. Download ASHRAE 365 for conference notifications, venue floor plans, Orlando-area information and the option to connect with other attendees. You can also customize your schedule, participate in live audience polls and complete speaker evaluations. After the conference, ASHRAE 365 will be available year-round to provide you with the latest information and resources from ASHRAE, including new exclusive Tech Hour videos.

Download ASHRAE 365 for free on the App Store or Google Play. For additional information, go to ashrae.org/365

SCHEDULE AT A GLANCE

For a full schedule of all meetings, events and sessions, download the **ASHRAE 365** app and select the **2020 Winter Conference**. You can build your custom schedule on your smart phone or tablet. Use the "Schedule" feature to view the full conference schedule. Filter by session/event type, track, level, day or room name.

All meetings and events are located on the Lobby (L) and Lower Level (LL) at the Hilton Orlando unless noted below.

Friday, January 31

TIME	EVENT NAME	LOCATION
8:00 am–5:00 pm	Committee Meetings	Hilton Meeting Rooms (L, LL)
10:00 am–5:00 pm	Registration and Bookstore	Florida 4 (LL)
12:00 pm–5:00 pm	ASHRAE Headquarters	Key Largo A (LL)

Saturday, February 1

TIME	EVENT NAME	LOCATION
7:15 am–6:00 pm	Registration and Bookstore	Florida 4 (LL)
7:30 am–3:00 pm	ASHRAE Member Lounge	Orlando VI (LL)
7:30 am–3:00 pm	Companion Lounge	Lobby Bar (L)
8:00 am–3:00 pm	ALI Professional Development Seminars *ticket required*	Orange A, B and C (LL)
8:00 am–5:00 pm	Committee Meetings	Hilton Meeting Rooms
8:00 pm–5:00 pm	ASHRAE Headquarters	Key Largo A (LL)
12:00 pm–3:00	ALI Short Course *ticket required*	Florida 1 (LL)
1:00 pm–3:00 pm	Speakers' Lounge	Orlando IV (LL)
1:00 pm–3:00 pm	Student Welcome	Orlando III (LL)
3:15 pm–5:00 pm	Meeting of the Members, Plenary Session ***sponsored by*** DAIKIN	Orlando I/II (LL)
5:00 pm–6:30 pm	YEA and Student Mixer	Fountain Plaza (LL) *Outside space accessed through Orlando Foyer*
6:30 pm–8:30 pm	Welcome Party at TopGolf Orlando *ticket required*	*Buses depart near Scratch Market (L)*

Sunday, February 2

TIME	EVENT NAME	LOCATION
7:00 am–5:00 pm	Speakers' Lounge	Orlando IV (LL)
7:00 am–5:00 pm	Registration and Bookstore	Florida 4 (LL)
7:30 am–4:00 pm	ASHRAE Member Lounge and TC Collaboration Area	Orange D (LL) **New location*
7:30 am–3:00 pm	Companion Lounge	Lobby Bar (L)
8:00 am–1:30 pm	Student Program	Orlando III (LL)
8:00 am–4:45 pm	Technical Sessions	Orange A, B, C, E, F, G (LL) Orlando V, VI (LL)
8:00 am–5:00 pm	Committee Meetings	Hilton Meeting Rooms
8:00 pm–5:00 pm	ASHRAE Headquarters	Key Largo A (LL)
8:30 am–4:30 pm	General Tour: Kennedy Space Center *ticket required*	*Buses depart near Scratch Market (L)*
9:00 am–9:30 am	Networking Coffee Break	Orange Ballroom Foyer (LL)
1:30 pm–3:30 pm	Student Tour: Orange County Convention Center *ticket required*	
1:30 pm–5:30 pm	Board of Directors meeting	Orlando I/II (LL)
3:30 pm–5:30 pm	Technical Tour: Orlando International Airport Intermodal Terminal Facility *ticket required*	*Buses depart near Scratch Market (L)*
3:30 pm–6:30 pm	ALI Short Courses *ticket required*	*Orange County Convention Center West* (OCCC-West) W304A, W304B, W304C, W304D (3)
4:00 pm–6:00 pm	Young Engineers in ASHRAE (YEA) Hospitality Reception ***sponsored by*** xylem Let's Solve Water	Grande Lawn (LL) *Outside space accessed through Florida Foyer*

notes

Monday, February 3

TIME	EVENT NAME	LOCATION
7:00 am–12:15 pm	Speakers' Lounge	Orlando IV (LL)
7:00 am–5:00 pm	Registration and Bookstore	Florida 4 (LL)
7:30 am–8:30 am	Women in ASHRAE Breakfast *ticket required* ***sponsored by*** LG Air Conditioning Technologies	Orlando III (LL)
7:30 am–4:00 pm	ASHRAE Member Lounge and TC Collaboration Area	Orange D (LL)
7:30 am–3:00 pm	Companion Lounge	Lobby Bar (L)
8:00 am–12:00 pm	Technical Sessions	Orange A, B, C, E, F, G (LL) Orlando V, VI (LL)
8:00 am–5:00 pm	Committee Meetings	Hilton Meeting Rooms
8:00 pm–5:00 pm	ASHRAE Headquarters	Key Largo A (LL)
9:30 am–11:00 am	Meet and Greet	Lake Hart (L)
10:00 am–6:00 pm	AHR Expo *20-minute walk from Hilton*	OCCC – West
11:00 am–5:15 am	Technical Sessions at the AHR Expo	W311D, W311E (3), OCCC-West
12:15 pm–2:00 pm	President's Luncheon *ticket required*	Orlando I/II (LL)
1:30 pm–4:00 pm	Speakers' Lounge	Orlando IV (LL)
2:15 pm–3:45 pm	Technical Sessions	Orlando VI (LL)
2:00 pm – 5:00 pm	Technical Tour: UFC Energy Plant *ticket required*	*Buses depart near Scratch Market (L)*
2:15 pm – 5:15 pm	General Tour: Titanic the Exhibition *ticket required*	*Buses depart near Scratch Market (L)*
2:30 pm–5:30 pm	ALI Short Courses *ticket required*	W304A, W304B, W304C, W304D, (3), OCCC-West
After 5:00pm	Regional Dinners *sign up in advance*	Info posted at Registration Florida 4

Thank You to our Sponsors

Keynote Speaker Sponsor

DAIKIN AIR INTELLIGENCE™

Women in ASHRAE Breakfast Sponsor

LG Air Conditioning Technologies

Notepad Sponsor

SUPER RADIATOR COILS™

YEA Hospitality Reception Sponsor

xylem Let's Solve Water

Tuesday, February 4

TIME	EVENT NAME	LOCATION
6:30 am–7:30 am	Fun Run and Walk	Hilton Main Entrance
7:00 am–5:00 pm	Speakers' Lounge	Orlando IV (LL)
7:30 am–4:30 pm	Registration and Bookstore	Florida 4 (LL)
7:30 am–4:00 pm	ASHRAE Member Lounge and TC Collaboration Area	Orange D (LL)
7:30 am–3:00 pm	Companion Lounge	Lobby Bar (L)
8:00 am–4:45 pm	Technical Sessions	Orange A, B, C, E, F, G (LL) Orlando V, VI (LL)
8:00 am–5:00 pm	Committee Meetings	Hilton Meeting Rooms (L, LL)
8:00 pm–5:00 pm	ASHRAE Headquarters	Key Largo A (LL)
9:00 am–12:00 pm	ALI Short Courses *ticket required*	W304B, W304C (3), OCCC-West
9:00 am–4:00 pm	ALI Professional Development Seminar *ticket required*	W304A (3), OCCC-West
10:00 am–6:00 pm	AHR Expo *20-minute walk from Hilton*	OCCC-West
12:00 pm–1:30 pm	Life Members' Lunch *ticket required*	Lake Hart (L)
1:00 pm–4:00 pm	ALI Short Course *ticket required*	W304B, W304C (3), OCCC-West
2:30 pm–5:30 pm	General Tour: Florida Everglades Tour ticket required	Departs near Scratch Market (L)
2:30 pm–6:00 pm	Technical Tour: Florida Solar Energy Center ticket required	Departs near Scratch Market (L)
6:15 pm–10:00 pm	Reception and Members' Night Out *ticket required*	Orlando I/II (LL)

Wednesday, February 5

TIME	EVENT NAME	LOCATION
7:00 am–1:00 pm	Speakers' Lounge	Orlando IV (LL)
7:30 am–11:00 am	Registration	Florida 4 (LL)
7:30 am–1:00 pm	Bookstore	Florida 4 (LL)
7:30 am–1:00 pm	ASHRAE Member Lounge and TC Collaboration Area	Orange D (LL)
7:30 am–1:00 pm	Companion Lounge	Lobby Bar (L)
8:00 am–12:30 pm	Technical Sessions	Orange A, B, C, E, F, G (LL) Orlando V, VI (LL)
8:00 pm–1:00 pm	ASHRAE Headquarters	Key Largo A (LL)
8:00 am–2:00 pm	Committee Meetings	Hilton Meeting Rooms (L, LL)
10:00 am–6:00 pm	AHR Expo *20-minute walk from Hilton*	OCCC-West
2:00 pm–5:30 pm	Certification Exam *pre-registration required*	W310A (3), OCCC-West
2:00 pm–6:00 pm	Board of Directors meeting	Orlando I/II (LL)

VENUE FLOOR PLANS

Hilton Orlando

6001 Destination Parkway, Orlando, FL 32819

The Hilton Orlando has meeting space on two floors: Lobby (L) and Lower Level (LL). To access the Lower Level (LL) use the escalator or elevators past the Lake Rooms.

The meeting rooms are grouped by name:

Lobby (L)

Boardrooms (near guest room elevators)
Winter Park, College Park, Heathrow, Bay Hill, Celebration, Clermont, Thornton Park, Maitland, Champions Gate

Lake Rooms
Pocket Lake, Conway Lake, Clear Lake, Turkey Lake, Ruby Lake, Sand Lake, Spring Lake, Lake Concord, Lake Hart, Lake George, Lake Down, Lake Lucerne, Lake Highland, Lake Sheen, Lake Monroe, Lake Florence, Lake Nona, Lake Virginia, Lake Louise, Lake Eola, Lake Mizell

Lower Level (LL)

Ballrooms
Orlando, Orange, Florida

Key Rooms
Key West , Key Largo

Outdoor Promenade
Fountain Plaza, Grande Lawn

Orange County Convention Center, West Concourse (OCCC-West)

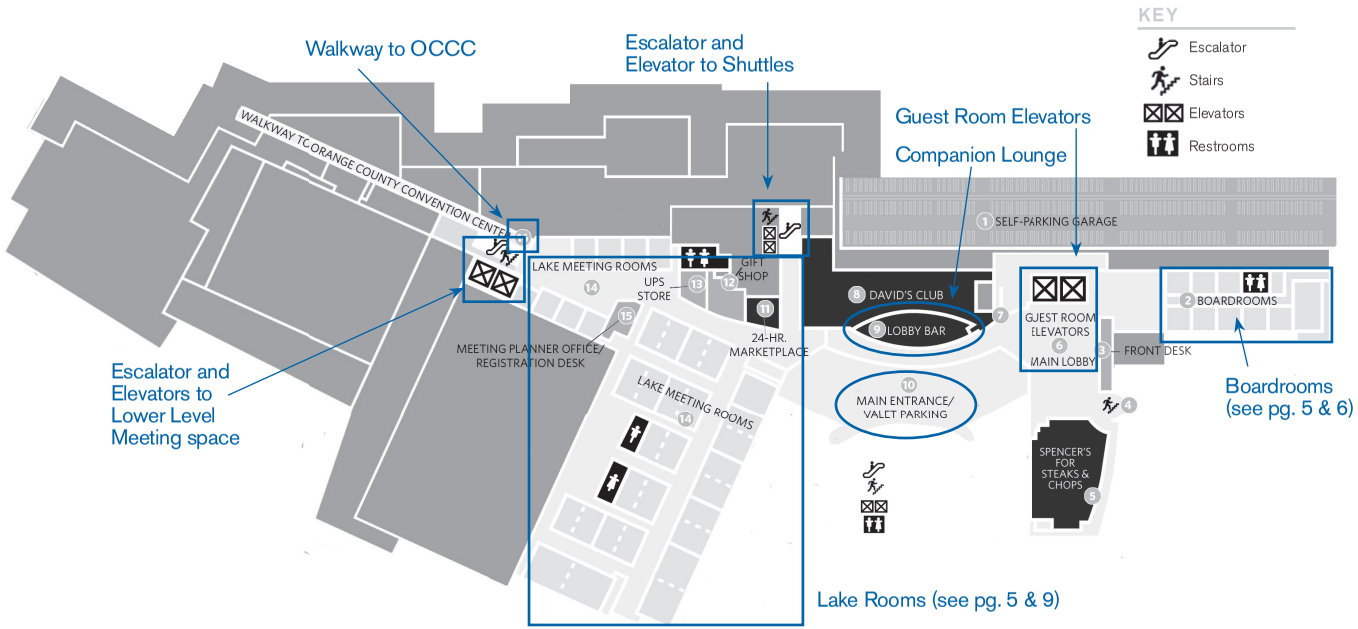
9800 International Drive, Orlando, FL 32819

The Hilton is connected to the Orange County Convention Center, West Concourse via several sky walks. The Walkway to the OCCC is on the Lobby (L) level past the Lake meeting rooms and near the escalators down to the Lower Level (LL).

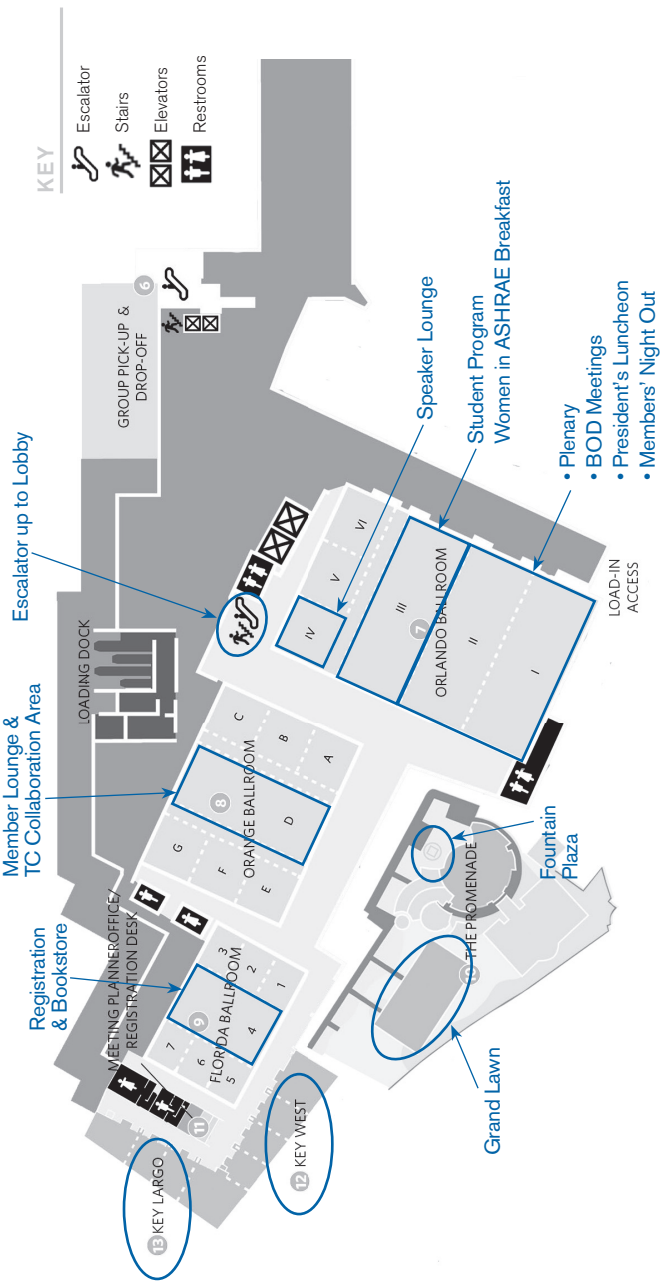
Plan for a 20-minute walk from the Hilton to the OCCC-West Concourse.

Take the Walkway from the Hilton to the OCCC, go through the North/South Building and continue following the signs to the West Concourse. A detailed map is included on pages 14–16. Once inside the OCCC-West take the escalators or elevators up to level 3 to access ALI courses, Technical Sessions and the Certification Exams.

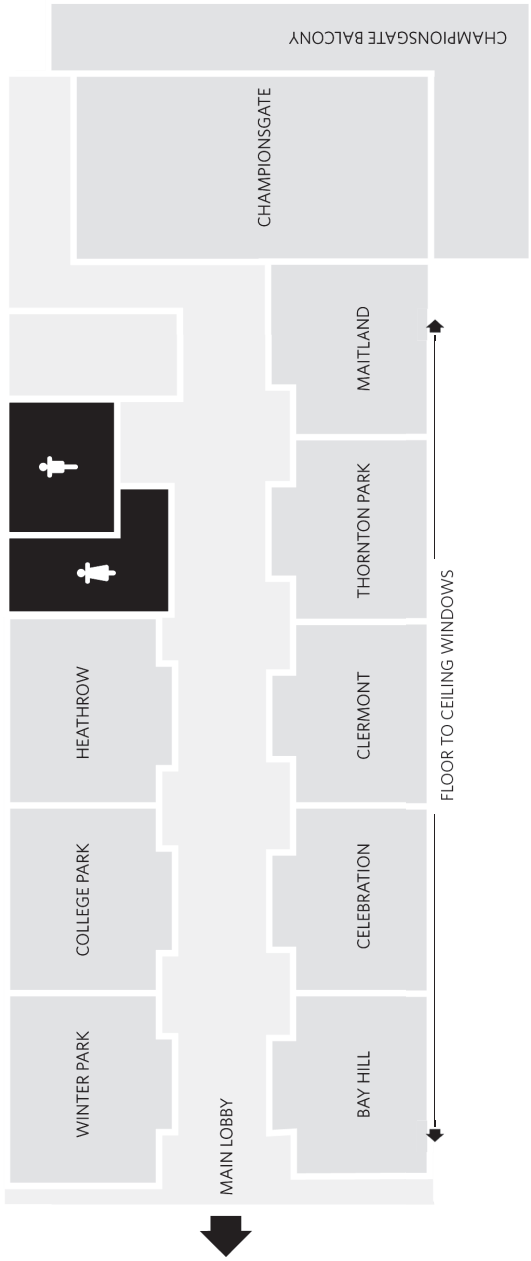
Hilton Orlando – Lobby Level



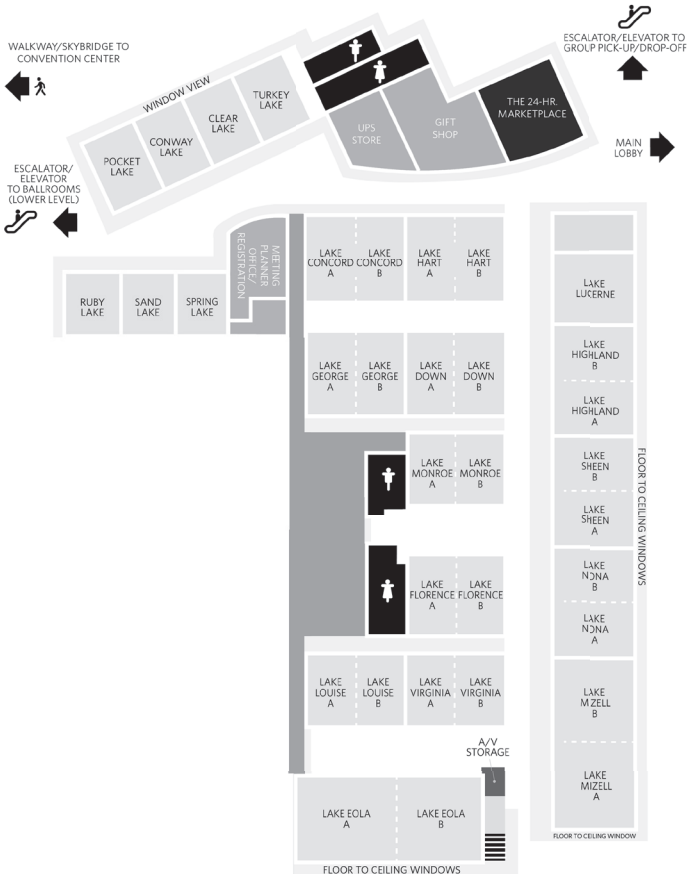
Hilton Orlando – Lower Level



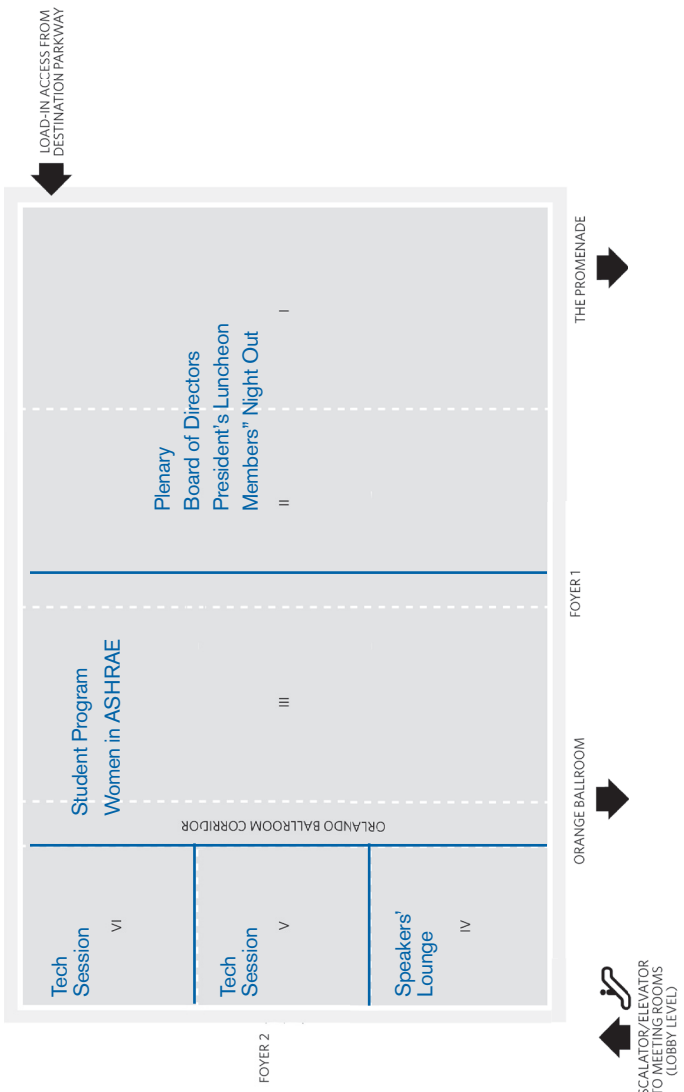
Hilton Orlando – Boardrooms (L)



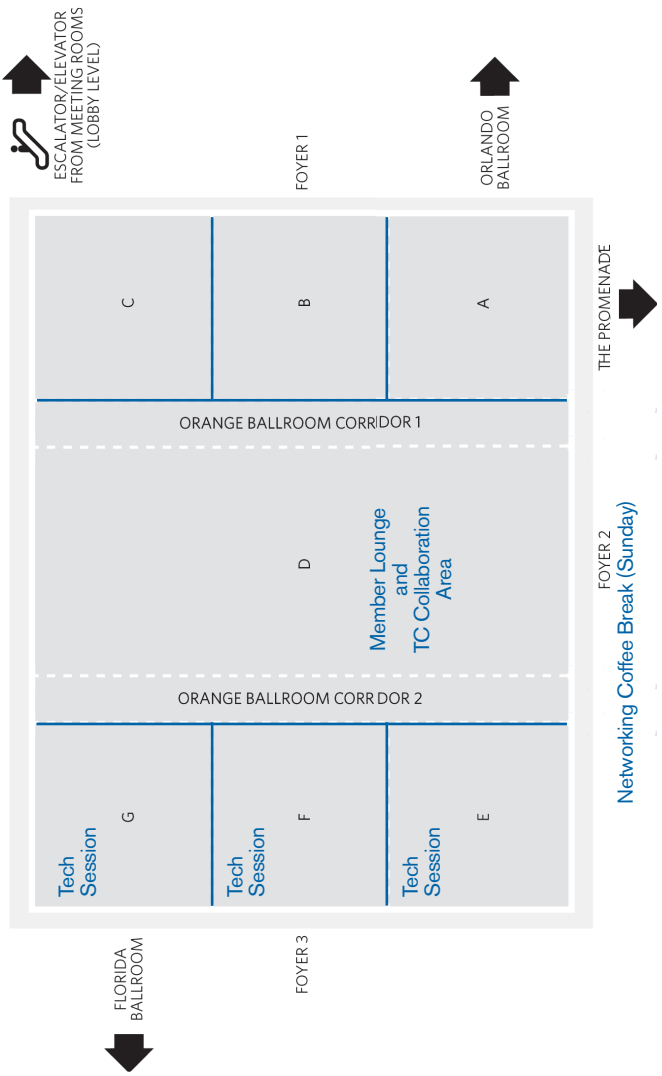
Hilton Orlando – Lake Meeting Rooms (L)



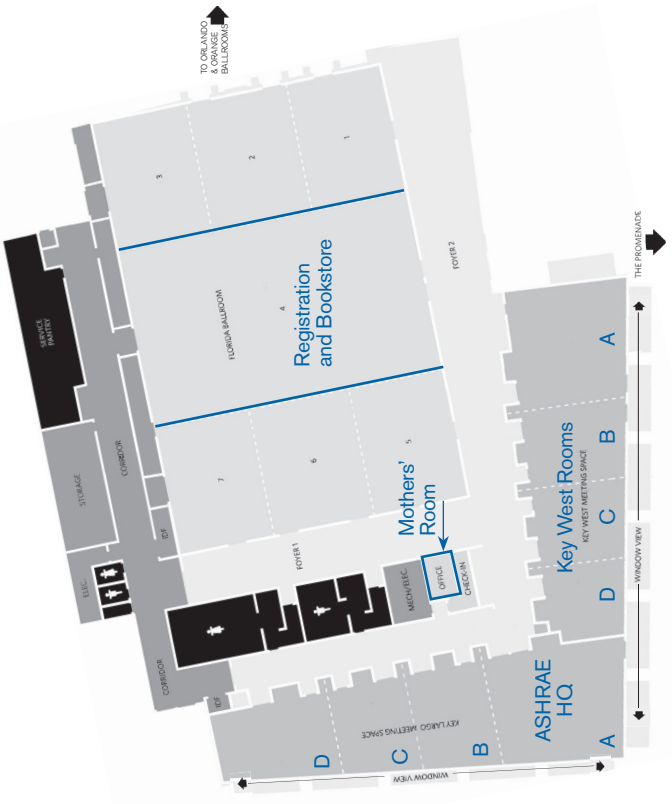
Hilton Orlando – Orlando Ballroom (LL)



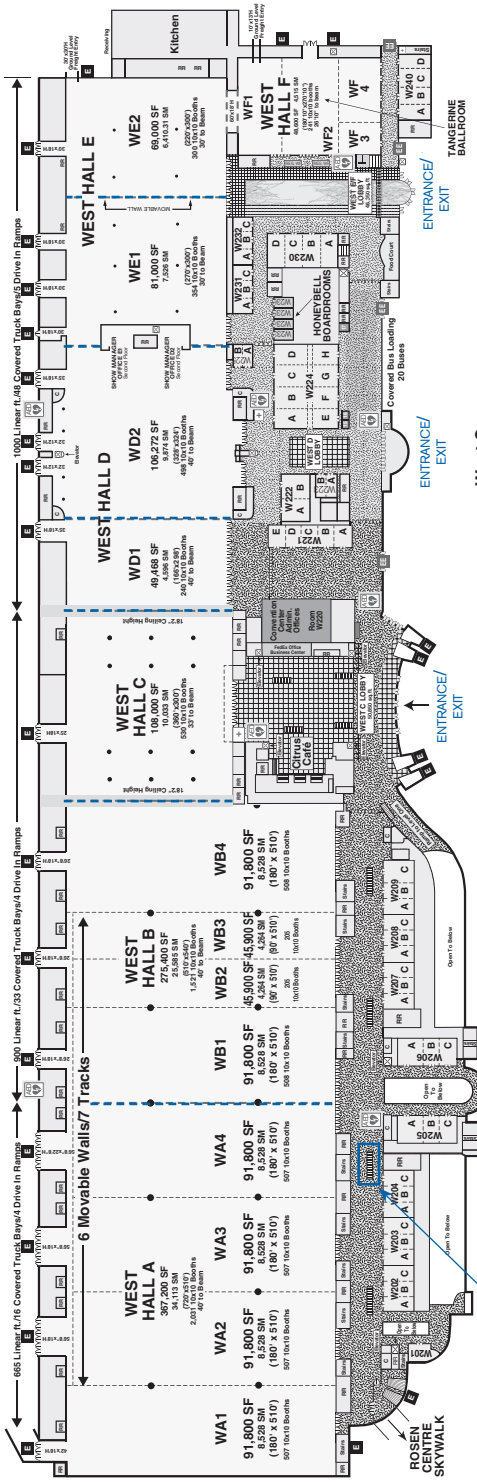
Hilton Orlando – Orange Ballroom (LL)



Hilton Orlando – Florida Ballroom (LL)

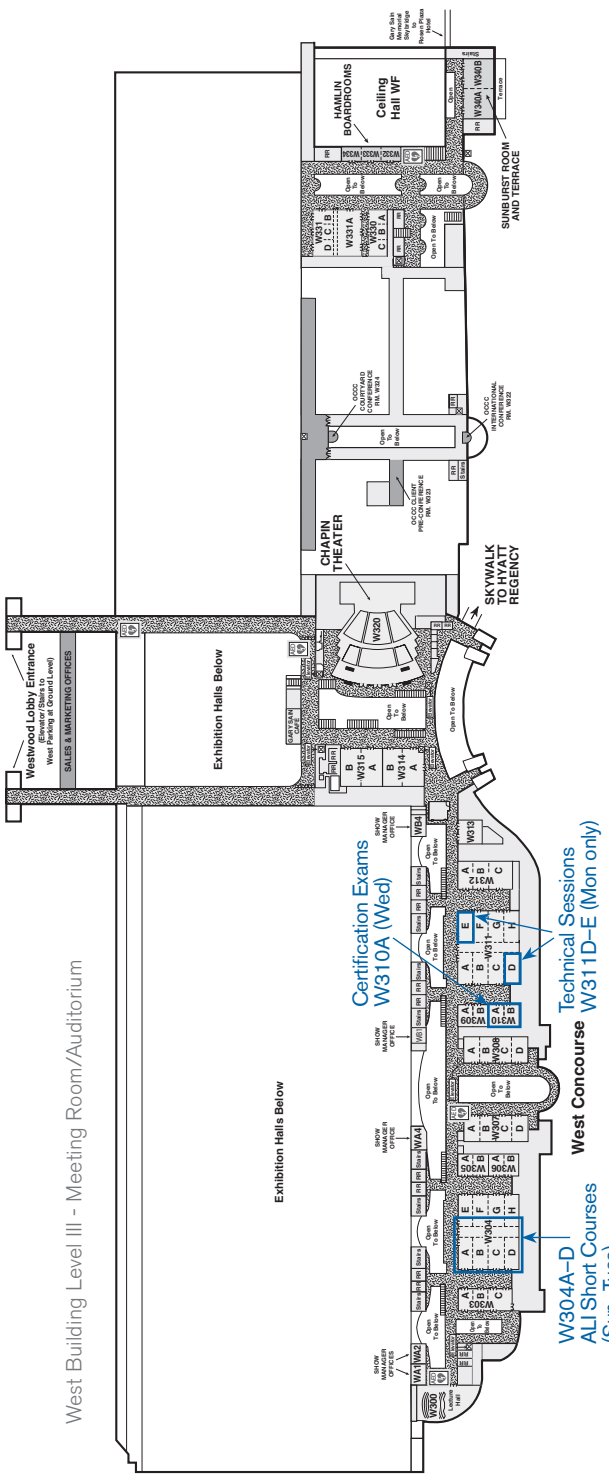


OCCC West Concourse – Level II

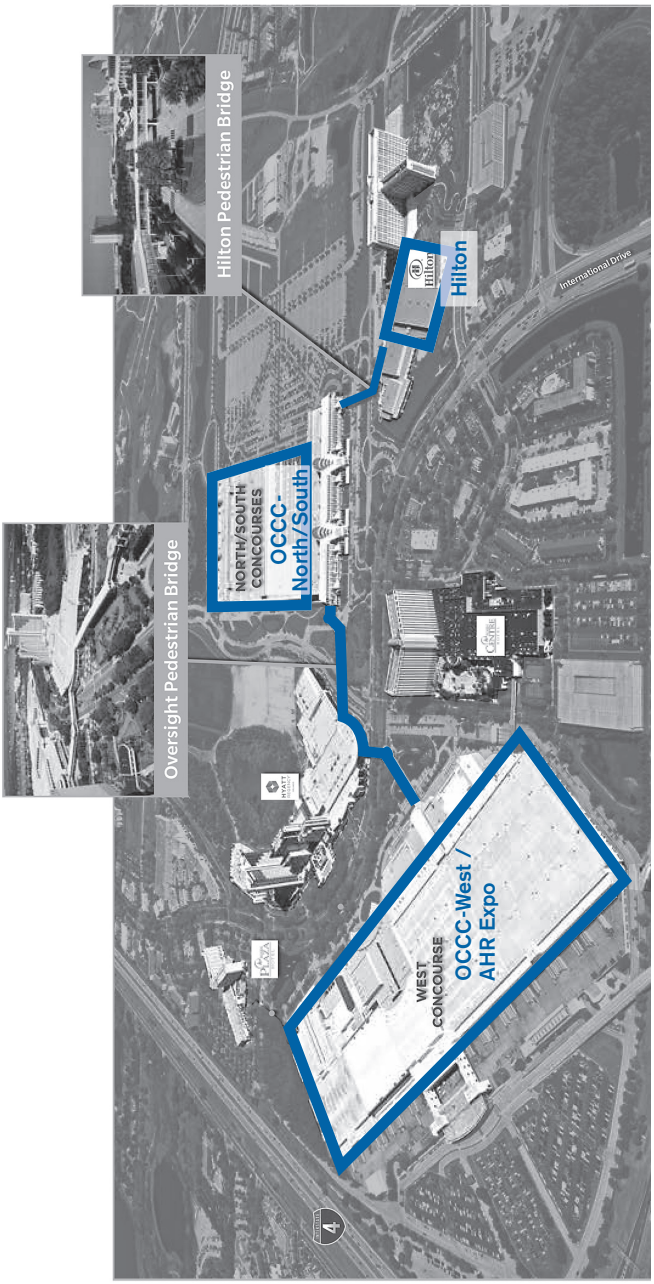


West Building Level II - Exhibit Halls/Meeting Room

OCCC West Concourse – Level III



OCCC Convention Center District Connectivity



CHAPTER AND SOCIETY OFFICIALS

Thank You to our Volunteers

ORLANDO HOST COMMITTEE

General Chair: Wade Conlan
Vice Chairman: Nate Boyd
Entertainment: Amy McClurg, Mike Dillard
Tours: Jason Alphonso, Todd Moore, Kaila Burke
Information/Publicity: Ian LaHiff
Publicity: Jacob Moberg
Hospitality: Firouz Keikavousi
Sessions: Paul Albers, Kyle Ingle

CONFERENCES AND EXPOSITIONS COMMITTEE

Chair: Michael Collarin
Vice Chair: Corey Metzger
Conference Chair:
Melanie Derby
Devin Abellon
Vikrant Aute
Nohad Boudani
Kristen Cetin
Robert Cox
Gary Debes
Joseph Firrantello
Ashu Gupta
Stephen Idem
Kyle Inge
Rupesh Iyengar
Nivedita Jadhav
Bing Liu
Ryan MacGillivray
Farhan Adil Mehboob
Maggie Moninski
Letica De Oliveira Neves
Scott Peach
Kimberly Pierson
Sonya Pouncy
Christine Reinders-Caron
Lee Riback
Rual Simonetti
Marianna Vallejo
Marites Calad,
BOD Ex-Officio
Chuck Gulledge,
Coordinating Officer

ASHRAE Celebrates 125 Years

Thank you for being part of ASHRAE as we celebrate a 125-year legacy of shaping the built environment, together. We hope you enjoy your complimentary copy of Proclaiming the Truth, which chronicles the beginnings and growth of ASHRAE, and you are invited to attend the session Commemorating ASHRAE's 125th Anniversary: Progress of Key Industries, which takes place Sunday, Feb. 2 from 1:30-3:00pm in Orange Ballroom A. Finally, we encourage you to visit the ASHRAE booth (#3201) at the AHR Expo to pick up your complimentary ASHRAE 125th commemorative anniversary lapel pin.

Every registered attendee* will receive a copy of Proclaiming the Truth at ASHRAE registration. Additional copies may be purchased in the ASHARE Bookstore located in Florida 4.

**Excludes some registration categories. (italics)*

GENERAL INFORMATION

Internet Access

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

Network: ASHRAE
Password: ASHRAE125

Conference attendees who booked their hotel room within the official ASHRAE room block at the Hilton will also receive complimentary guest room internet. The front desk will provide username and password when attendees check-in.

Conference Policies

RECORDINGS

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, video and audio recording of this program is 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 Hilton Orlando.

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.

Technical Program Information

BADGE SCANNING AND SESSION EVALUATIONS

Badges must be worn for admission to the technical program. Your badge will be scanned as you enter a technical session so that ASHRAE may provide you with a summary of all sessions attended which will be emailed to you after the conference. Question/comment cards are distributed to Paper session attendees. Completed cards can be returned to a monitor. Questions/comments can also be provided online via ashrae.org/QConline. Questions are given to the authors for reply and published with Technical Papers in ASHRAE Transactions. Please access the ASHRAE 365 app to complete the technical program speaker and session evaluations.

PROFESSIONAL DEVELOPMENT HOURS (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 have been submitted for approval for the State of New York PDHs and AIA Learning Units. Those programs are indicated with a NY PDH symbol. Others have been submitted 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.

Sign-in sheets are available in the session room for AIA licensees. Sessions are approved for 1, or 1.5 PDHs depending on the length of the session.

CONFERENCE PAPERS

During the Annual and Winter Conferences, papers presented in the paper sessions are available as a collection via subscription to the Technology Portal online, and the final papers are published in ASHRAE Transactions. 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 Orlando 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. To access the Orlando Virtual Conference, go to www.ashrae.org/orlandovirtual.

Virtual Conference registration includes:

- Synced audio and PowerPoint presentations from all, paper sessions, seminars, and workshops.
- Ability to post comments and rate presentations.
- Print presentation slides in notes format.

Presentations are available online for 18 months with the ability to post questions or answers for selected sessions through Wednesday, February 19.

A full slate of technical programs will be posted daily beginning Monday, February 3 through Thursday, February 6, of the sessions that were presented the previous day.

Access to the Orlando Virtual Conference is free with your conference registration. To register for the Virtual Conference only, register online at www.ashrae.org/orlando.

$179 ASHRAE member; $249 non-member

AHR EXPO®

SEE NEW PRODUCTS FROM 1,800+ EXHIBITORS

Orange County Convention Center (OCCC)
West Concourse
9800 International Dr, Orlando, FL 32819

If you have registered for the ASHRAE Winter 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 OCCC-West. **Registration for the AHR Expo® will be open starting on Sunday, February 2 from 12:00 p.m. – 3:00 p.m.**

Show Hours:

Monday, February 3	10:00 a.m.–6:00 p.m. *(Registration opens at 8:00 a.m.)*
Tuesday, February 4	10:00 a.m.–6:00 p.m. *(Registration opens at 9:00 a.m.)*
Wednesday, February 5	10:00 a.m.–4:00 p.m. *(Registration opens at 9:00 a.m.)*

You must be 18 years or older to be admitted to the show floor. Students ages 16 and 17 will be admitted on show days but only if accompanied by an adult.

If you are staying at one of the AHR Expo Official Show Hotels, free shuttle bus services will operate between your hotel (or points nearby) on show days (Monday – Wednesday). Be sure to check the schedule posted in your hotel lobby to confirm the times and exact pick-up location.

ARH Expo Shuttle Bus Hours of Operation:

Monday, February 3	7:00–11:00 a.m. and 3:30–7:00 p.m.
Tuesday, February 4	8:00–11:00 a.m. and 3:30–7:00 p.m.
Wednesday, February 5	8:00–11:00 a.m. and 2:00–6:00 p.m.

The Hilton Orlando is connected to OCCC-West through a series of covered walkways. See page 16 for a connectivity map. Plan for a 20-minute walk from the Hilton to OCCC-West. There will NOT be a shuttle from the Hilton Orlando to the OCCC-West.

For more information on the AHR Expo, visit www.ahrexpo.com.

In Case of an Emergency

Plan ahead—when you reach your destination, check the location of exits. Walk to the nearest exit; learn the route, obstacles, etc.

HILTON ORLANDO

Dial 66 from any hotel phone to contact security or call 911 directly from your personal phone. When 911 is called please also notify the hotel to assist when emergency services arrive on property. If speaking to 911 dispatch, the Hilton Orlando address is **6001 Destination Parkway.**

The hotel has an emergency response team 24 hours a day. In the event of an emergency, 911 may be called from all phones within the hotel.

The Hilton has qualified first aid/CPR trained personnel on duty 24/7. To contact the Hilton's 24-hour Security Department dial extensions **8517, 8518 or 8519** from any Hilton phone.

In the event of an evacuation, the hotel will use the PA system to inform guests in affected areas to evacuate the hotel and inform them of an evacuation location. Additional hotel management will be walking the property to help direct hotel guests in the event of an emergency.

OCCC-WEST

In the event of an emergency, please dial 911 or 51119 from an OCCC house phone.

For non-emergencies, dial ext. 59828 from any house phone for the Security Command Center. The security division can be contacted from outside the convention center by dialing 407-685-9828.

The Security Command Center is located at Dock 7 in the West building and is staffed 24 hours a day.

OCCC Security Officers are uniformed with the majority being first aid and CPR/AED qualified.

Automated External Defibrillators (AED) are located throughout all four levels of OCCC-West.

West Building First Aid Rooms. Availability of first aid stations is dependent upon event activity.

- Med 1 – Located near W240
- Med 2 – In front of Hall WD2 (W224)
- Med 3 – In Central Lobby (Hall WC)
- Med 4 – Level 1 Lobby (below Hall WA)

The OCCC has many fire prevention features including an extensive fire sprinkler network, smoke detectors located throughout the facility, a powerful horn and light alarm system and multiple fire extinguisher units. The Orange County Fire Rescue Department is located on the OCCC Campus. If you see a fire, dial 911.

EMERGENCY NUMBERS AND ADDRESSES

Hospital
Dr. Phillips Hospital
407- 351-8500
9400 Turkey Lake Rd. (4 mi)

Police
Orlando PD West Patrol
321-235-5300
Across the Street

Fire
Orlando FD Station 57
407-836-9000
6014 Destination Pkwy
Across the Street

Pharmacy
Walgreens
407-385-1697
9858 International Dr
(0.5 mi)

Urgent Care
Paramount Urgent Care
407-226-1906
8972 Turkey Lake Rd (4 mi)

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.

Helpful Information

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 meal options at the Hilton:

Scratch Market

24-hours

Serves coffee, pastries, snacks, beverages, pizzas, sandwiches, sides and salads located on the lobby level near the Lake meeting rooms.

The Bistro

Daily, 6:30 a.m. – 2:30 p.m.

Casual dining for breakfast and lunch.

Located on the Lower Level near the Pool. The Bistro is accessible using the Guest Room elevators or the grand staircase in the lobby near the front desk. The Bistro is NOT accessible from the meeting rooms on the Lower Level.

David's Club Bar & Grill

Daily 4:00 p.m. – 1:00 a.m.

Sports bar specializing in burgers and bourbon. Located on the lobby level near the Lobby Bar and Scratch Market.

Spencer's for Steaks & Chops

Tuesdays – Saturdays

5:30 – 10:00 p.m.

Serves dinner only. Sophisticated and approachable, this contemporary steakhouse redefines the classic steakhouse with intelligent preparations and modern twists.

Lobby Bar

Daily, 3:00 p.m. – 11:00 p.m.

Handcrafted cocktails and a small-bite menu available.

Tropics Pool Bar and Grill

Daily

Grill: 11:00 a.m. – 7:00 p.m.

Bar: 11:00 a.m. – 9:00 p.m.

Classic bar food and cocktails.

Orlando Host Desk

THINGS TO DO IN ORLANDO

Florida 4 | Hilton

Stop by the Host Committee desk outside of Florida 4 on the Lower Level outside of ASHRAE Registration and Bookstore. The Orlando host committee will provide "Things to Do" recommendations as well as local restaurants.

LOCAL RESTAURANT LIST – INTERNATIONAL DRIVE

Buffalo Wild Wings
8363 Intl. Dr.
American

Mellow Mushroom
10725 Intl. Dr #150
Pizza

Mango's Tropical Cafe
8126 Intl. Dr.
Steak and Seafood

The Pub Orlando
9101 Intl. Dr. Ste. 1003
British and Irish

Benihana
12690 Intl. Dr. S.
Japanese and Sushi

Tapa Toro Tapas Bar & Paella Pit
8441 Intl. Dr. Ste. 260
Spanish & Portuguese

Dave & Buster's Inc
8986 Intl. Dr.
Bar, American, Games

Kings Dining & Entertainment
8255 S. Intl. Dr. Ste. 120
American

Tony Roma's
8560 Intl. Dr.
American

Miller's I-Dr. Ale House
8963 Intl. Dr.
American

Carrabba's Italian Grill
8355 Intl. Dr.
Italian

Cuba Libre Restaurant & Rum Bar
9101 Intl. Dr. Ste. 1004
Steak and Seafood,

Marlows Tavern
9101 Intl. Dr., Ste. 1204
American, Bar

Bar Louie
8510 Intl. Dr.
American, Bar

Coco Thai Cuisine
6304 Intl. Dr.
Asian, Pacific Rim

Señor Frog's Orlando
8747 Intl. Dr. Ste. 103
Mexican

Vincenzo Cucina Italiana
8255 Intl. Dr. Ste. 112
Italian

Lafayette's
9101 Intl. Dr. Ste. 2220
Southern

Itta Bena
9101 Intl. Dr. Ste. 2210
Southern

Hopdoddy Burger Bar
9101 Intl. Dr. Ste. 1208
American

Cafe Tu Tu Tango
9101 Intl. Dr. Ste. 1208
American

Uncle Julio's
8409 Intl. Dr
Mexican

The Capital Grille
9101 Intl. Dr.
Steak and Seafood

Texas de Brazil
5259 Intl. Dr.
Steak and Seafood

Saltgrass Steakhouse
8440 Intl. Dr.
Steak and Seafood

Fogo de Chao Brazilian Steakhouse
8282 Intl. Dr.
Steak and Seafood

Del Frisco's Double Eagle Steak House
9150 Intl. Dr.
Steak and Seafood

Bahama Breeze Island Grille
8849 Intl. Dr.
Steak and Seafood

Yard House
8367 Intl. Dr.
American

Shake Shack
8359 Intl. Dr.
American

Cooper's Hawk
Winery & Restaurant
8005 Intl. Dr.
American

Thai Thani Restaurant
11025 Intl. Dr.
Asian and Pacific Rim

Olive Garden
8984 Intl. Dr.
Italian

Mia's Italian Kitchen
8717 Intl. Dr.
Italian

Kobe Ichiban
Japanese Steakhouse
8148 Intl. Dr.
Japanese

The Oceanaire
Seafood Room
9101 Intl. Dr. , Ste. 1002
Seafood

Joe's Crab Shack
8400 Intl. Dr.
Seafood

Boston Lobster Feast
8731 Intl. Dr.
Seafood

BB King's Blues Club
9101 Intl. Dr. Ste. 2230
Southern

Panera Bread
10739 Intl. Dr.
Deli, Cafe

HILTON CONCIERGE DESK

The Hilton Orlando's Concierge Desk is in the lobby near the main entrance to the hotel. The Hilton's Concierge can help conference attendees and their guests:

- Find tickets to attractions or tours
- Dinner reservations
- Local information

Visit the concierge desk to see what the Hilton staff can do to facilitate plans. Conference attendees can also make reservations with the Hilton's Concierge by calling 407-313-8465.

Discounted tickets to local attractions may be available to conference attendees and guests. Make sure to identify yourself as an ASHRAE attendee and guest.

FAMILY SERVICES

The Hilton, recommends the following company for childcare services while in Orlando:

Kids Nite Out
www.kidsniteout.com
407-828-0920 or 800-696-8105
reservations@kidsniteout.com

Kids Nite Out offers:

- In-Room Babysitter Services
- Equipment Rental (car seats, strollers, cribs, pack 'n' plays)
- Professional caregivers provide age-appropriate toys, activities, books, games, and arts & crafts.
- "Mother/Father's Helper" services if you need extra help

Advance reservations required.

ASHRAE makes no representation as to the quality or suitability of the childcare 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 childcare facilities.

MOTHERS' ROOM

ASHRAE is pleased to offer a private room to nursing mothers in both locations. Please visit the Registration Desk in Florida 4 to inquire about access.

Hilton	OCCC-West
Florida 4 Lower Level	Wellness Room Hall WC Lobby on left near entrance to Hall WC

LOST AND FOUND

Items found during the conference should be turned into the staff at the following locations:

	Hilton	OCCC-West
ASHRAE Lost and Found	Staff Headquarters Key Largo A, Lower Level	AHR Expo Show Office W224 A-D
Venue Lost and Found	Or contact the Hilton's Security Team at x8517, x8518 or x8519	OCCC Building Security 407-685-9828

LeadershipU

At each ASHRAE conference, the LeadershipU 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 LeadershipU participants for the 2020 ASHRAE Winter Conference are:

Badri Patel, Toronto Chapter, Region II
Shaun Nienhueser, Nebraska Chapter, Region IX
Kelly Gunn, Illinois Chapter, Region VI
Chris Krieps, Illinois Chapter, Region VI

EVENT DETAILS

Saturday, February 1

STUDENT WELCOME

Orlando III (LL), Hilton | 1:00 – 3:00 p.m.

Students are invited to hear welcoming remarks from ASHRAE President Darryl K. Boyce followed by a presentation by recipients of last year's Grant program, an awards ceremony and a talk by Gina Ladner, Deputy Chief for the NASA Operations and Maintenance (O&M) Division, Center Operations Directorate at the John C. Stennis Space Center in MS.

Grant Presentation: Closed Loop Hydronic System for Undergraduate Laboratory, University of Regina

MEETING OF THE MEMBERS – PLENARY SESSION

Orlando I/II (LL), Hilton | 3:15 – 5:30 p.m.

Kick off the ASHRAE Winter Conference with the opening Plenary session. ASHRAE award winners are recognized and updates on the Society will be presented. The plenary session is open, no badge or registration is required to attend.
Doors open at 3:00 p.m.

Opening and Welcome Remarks	ASHRAE President, Darryl Boyce
Welcome to Region XII	Director and Regional Chair, Robin Bryant
Secretary's Report	Executive Vice President, Jeff Littleton
Awards Presentation	See list of award winners on pages 36–39
Keynote Address	Ed Hochuli, Retired Head Referee in the National Football League (NFL)

Is this Pop Warner or the Super Bowl?.... The Average Joe Principle

Ed Hochuli is a Phoenix trial attorney with his own law firm, who has personally tried over 150 civil jury trials. But he is most widely recognized as a Referee in the National Football League, where he has worked for the last 28 years. Hochuli refereed two Super Bowls and 10 championship games, along with almost 600 games in the NFL. Having been highly successful at both jobs, one wonders what he views as the keys to his success. How does a football official go from officiating 8-year-olds in front of 50 parents, to refereeing a Super Bowl with 350 million people watching?

By the very definition of the word "Average," most people are either average or below average, but Ed believes that instead, anyone can be highly successful, if they just follow a few simple principles. In this very entertaining and enlightening presentation, Ed sums up the secret to his success in what he calls "The Average Joe Principle." His presentation includes anecdotes and a variety of video clips from his long career in the NFL. It provides his tips and beliefs on the secrets to being successful at whatever job or avocation one takes on.

Keynote Speaker sponsored by: DAIKIN AIR INTELLIGENCE

YEA AND STUDENT MIXER

Fountain Plaza, Promenade, Hilton (Outside, LL) | 5:00 – 6:30 p.m.

Student are invited to mix and mingle with Young Engineers in ASHRAE (YEA) and Technical Committee members. Meet new friends, win prizes in our group poker run activity, and enjoy free food and drinks.

WELCOME PARTY

TopGolf Orlando | 6:30 – 8:30 p.m. | $65

Enjoy catching up with old friends and making new ones at the 2020 ASHRAE Winter Conference Welcome Party. The Welcome Party will take place at TopGolf on Saturday, Feb. 1. TopGolf is a sports entertainment complex that features an inclusive, high-tech golf game that everyone can enjoy. Food and drinks will be available as well as access to climate-controlled hitting bays.

Continuous shuttle service is provided starting at 6:15 p.m. Shuttles depart from the Group Transportation area near Scratch Market on the lobby level of the Hilton.

Menu

Apps on display include caprese skewers, Italian meatballs, tomato bruschetta, chicken pot stickers, shrimp cocktail, mini crab cakes, an assortment of cheeses, cured meats, pepper jam, house relish, candied pecans, pepperoncini and crostini.

Buffet items include chimichurri shrimp skewers, chopped brisket sliders, Topgolf BBQ mop sauce, craft beer queso, guacamole, salsa, tortilla chips, seasonal sliced fruit, grilled portobello sliders.

Dessert: Injectable donut holes with chocolate and raspberry filling

Your ticket includes (2) drink tickets. Sodas, water, coffee and tea are included. No drink ticket required for the non-alcoholic drinks.

All food items will be labeled with dietary information and ingredients (dairy, nuts, gluten-free, etc).

Sunday, February 2

TECHNICAL PROGRAM

Orange A, B, C, E, F, G, Orlando V, VI (LL) |
8:00 a.m. – 3:00 p.m.

Check out pages 57–71 for Sunday's presentation schedule. Tracks include:

HVAC&R Fundamentals and Applications	Systems and Equipment
Refrigeration and Refrigerants	Cutting Edge Approaches
High Efficiency Design and Operation	Big Data and Smart Controls
Ventilation, IAQ and Air Distribution Systems	Standards, Guidelines and Codes

STUDENT PROGRAM

Orlando III (LL) | 8:00 a.m. – 1:30 p.m.

The program will feature technical talks, a career panel Q&A session, plus roundtable discussions over lunch.

NETWORKING COFFEE BREAK

Orange Ballroom Foyer (LL) | 9:00 a.m.

Join your fellow conference-goers over a cup of joe between the first and second Technical Program sessions.

STUDENT TOUR: ORANGE COUNTY CONVENTION CENTER

Orange Ballroom Foyer (LL) | 1:30 – 3:30 p.m.

Join us for a mini-seminar and facility tour which gives participants a quick look at the massive scale of equipment required to run the Orange County Convention Center, the largest LEED Gold Certified convention center in the world. With over 7.1 million square feet of building space, it takes a lot to keep 1.4 million visitors comfortable during the 200 client events hosted here each year. Join us to see how we make it all work. As a sustainability leader, OCCC has learned much over the past decade.

Ticket required. Meet at entrance of Hilton Skywalk to OCCC located near the FedEx office on Lobby level.

BUILDING EQ PORTAL DEMONSTRATION

Orange C (LL) | 4:00 – 5:00 p.m.

A live demonstration of ASHRAE's Building EQ Portal will provide an overview of how the program works, outline basic usage of the Portal, and review the available reports and latest updates to the system. A Q&A session at the end will allow users to get answers to specific questions on their projects and provide feedback to the Building EQ committee. The Building EQ program helps building owners make informed decisions to improve their energy performance by connecting

them with energy audit solutions, and actionable recommendations. Building EQ provides solutions for both new buildings (As Designed/asset rating) and existing buildings (In Operation/operational rating). The Portal improves the process with online data entry and validation, standardized reports, and quick processing time.

YOUNG ENGINEERS IN ASHAE (YEA) HOSPITALITY RECEPTION

Grande Lawn, Promenade (Outside, LL) | 4:00 – 6:00 p.m.

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.

Entrance to the Grande Lawn is easiest from the doors near the Florida Ballroom Foyer (outside ASHRAE Registration and Bookstore).

Sponsored by: xylem Let's Solve Water

Monday, February 3

WOMEN IN ASHRAE BREAKFAST

Orlando III (LL) | 7:00 – 8:30 a.m. | $30

Come and listen to ASHRAE Distinguished Lecturer, Karine Leblanc, present "Everyone Communicates, Few Connect" at this year's Women in ASHRAE Breakfast.

"Only One Thing Stands Between You and Success. It Isn't Experience. It Isn't Talent." ~John Maxwell

World-renowned leadership expert John C. Maxwell says if you want to succeed, you must learn how to connect with people. And while it may seem like some folks are just born with it, the fact is anyone can learn how to make every communication an opportunity for a powerful connection. In this presentation, I will share the Five Principles and Practices to develop the crucial skill of connecting, including:

- Finding Common Ground
- Keeping Your Communication Simple
- Capturing People's Interest
- Inspiring People
- Staying Authentic in all Your Relationships

The ability to connect with others is a major determining factor in reaching your full potential. Connecting is a skill you can learn and apply in your personal, professional, and family relationships.

Ticket Required. Everyone is welcome and coffee and breakfast will be served!

Sponsored by: LG Air Conditioning Technologies

TECHNICAL PROGRAM
Orange A, B, C, E, F, G, Orlando V, VI (LL) |
8:00 a.m. – 12:00 p.m.

Check out pages 72–84 for Monday's presentation schedule.

PRESIDENT'S LUNCH
Orlando I/II (LL) | 12:15 – 2:00 P.M. | $55
2019-20 ASHRAE President Darryl Boyce provides an update on his presidential theme, Building for People and Performance. Achieving Operational Excellence. Special donors and major contributors to the ASHRAE RP Campaign are also recognized.

TECHNICAL SESSIONS AT THE AHR EXPO
W311D, W311E (3), OCCC-West | 11:00 a.m. – 4:30 p.m.
Check out pages 82–83 for Monday's presentations at the AHR Expo. Presentations are part of the Residential Mini-Track and the Refrigeration track.

Tuesday, February 4

FUN RUN 5K
Meet at Hilton's Front Entrance | 6:30 am

This fun run is organized **by** members **for** members! Meet at the front entrance of the Hilton Orlando for a casual run/walk with some of your closest ASHRAE friends before the Technical Program starts at 8:00 a.m. Multiple course distance options will be offered from 1 to 5 miles. All paces are welcome. The courses will be marked in chalk and/or flour and maps will be available the morning of the event.

TECHNICAL PROGRAM
Orange A, B, C, E, F, G, Orlando V, VI (LL) |
8:00 a.m. – 12:30 p.m.
Check out pages 84–96 for Tuesdays' presentation schedule.

LIFE MEMBERS' LUNCHEON
Lake Hart (L) | 12:00 – 1:30 p.m. | $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.

MEMBERS' NIGHT ~~OUT~~ IN
Orlando I/II (LL) | Reception and Cash Bar 6:15 p.m. |
Dinner and Entertainment 7:15 p.m. | $65
Looking for a fun night with colleagues and friends? Attend Members' Night ~~Out~~ IN and paint the town with special guests Painting with a Twist Orlando for an upbeat class for both the artistic and not-so-artistic. Enjoy a drink while professional artists guide you in recreating the evening's featured painting. By the end of the night, you will be amazed at the artwork you have created! Whether you consider

yourself an artist or not, join the fun and get creative. Attire for the evening will be business casual. Aprons will be provided to assist in keeping the paint on the canvas and not you. Raffle prizes will be given out throughout the evening and, yes, you must be present to win!

Attendees will be taught to paint the Mount Dora Lighthouse.

Wednesday, February 5

TECHNICAL PROGRAM

Orange A, B, C, E, F, G, Orlando V, VI (LL) | 8:00 a.m. – 12:30 p.m.

Check out pages 96–107 for Wednesday's presentation schedule.

CERTIFICATION EXAM

W310A (3), OCCC-West | 8:00 a.m. – 12:00 p.m.

Recognized by over 40 national, state and local government bodies – and with over 3,000 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: NEW! HVAC Design (CHD), Commissioning (BCxP), Energy Assessment (BEAP), Energy Modeling (BEMP), Healthcare Facility Design (HFDP), High-Performance Building Design (HBDP), and Building Operations (OPMP).

Pre-application required. ASHRAE Certified

COMPANION GUIDE

COMPANION LOUNGE

Lobby Bar | Lobby | Hilton

The Companion Lounge is open daily with light refreshments available in the morning and beverages available all day. The lounge is open to all registered companions and is a great place to meet others.

Saturday, Feb. 1	7:30 a.m. – 3:00 p.m.
Sunday, Feb. 2	7:30 a.m. – 3:00 p.m.
Monday, Feb. 3	7:30 a.m. – 3:00 p.m.
Tuesday, Feb. 4	7:30 a.m. – 3:00 p.m.
Wednesday, Feb. 5	7:30 a.m. – 1:00 p.m.

MEET AND GREET

Lake Hart, Lobby, Hilton | Monday, Feb 3 | 9:30 – 11:00 a.m.

The Meet and Greet, open to all registered companions and guests, gives companions an opportunity to meet with old friends and greet new ones.

Indulge in an experience that will leave you feeling rejuvenated, restored and relaxed in a spa-like atmosphere with a social twist!

The Meet and Greet will begin with a presentation from Orlando-based A.O.A. Learn how the tourism of Orlando wouldn't be what it is today without the innovative and transformative work that A.O.A. does in Orlando with their support in the creation of themed rides and attractions, live shows, impactful museums and interactive exhibits, highly kinetic retail and world-class themed dining. They are the creative minds for many of Orlando's attractions. A.O.A. will share their thought process on how they approach big projects for Disney, Universal, Margaretville and Four Seasons, just to name a few.

After the presentation, guests will have the opportunity to pamper themselves with several relaxing and rejuvenating activities along with conversation and light refreshments. Activities include:

- Chair Massage/Hand Massage
- Interactive, Custom Blend Aroma Therapy, Body Butter or Body Oil
- Instructor Led Mindful Meditation

TIPS FOR FIRST TIME ATTENDEES

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.

If this is your first time attending, you may have questions about what is available to registered attendees. Here are a few tips to help you navigate the conference.

Technical Program

The technical program for the ASHRAE Conference includes paper sessions, seminars, debates, panels, workshops and forums. Check the program book or ASHRAE 365 app to see what you want to attend. You can jump between sessions if you want to hear one specific presentation in each session. Volunteers will be at the door checking and scanning badges.

See page 55 for descriptions of the different types of sessions available within the Technical Program.

All registered attendees receive access to the Virtual Conference, PowerPoint presentations with audio descriptions.

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. 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: Committee 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) and Guideline project committees (GPCs) are appointed specifically by the Standards

Committee to develop and revise standards and guidelines to reflect technical advances in the areas that they cover. To qualify for membership in a committee, you should be knowledgeable in the discipline of the proposed standard and need to apply to the committee.

A schedule of all meetings is included in the conference program on pages 108–136 and the ASHRAE 365 app. Attendance at TC, SPC, and GPC meetings is open to any interested party.

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 books, standards, and conference papers, are available for sale in the ASHRAE Bookstore. Located in the registration area, the bookstore features publications devoted entirely to the HVAC&R industry. Selected titles from ASHRAE's publications catalog, as well as a variety of new publications and books from allied organizations are on display. You can browse and purchase publications on site, or you may wish to order several items and have them shipped to you at a later date. If you prefer, you can examine publications in the store and then use the online bookstore at **www.ashrae.org/bookstore** to order print and/or digital editions.

The Membership Desk is located in the registration area. Membership applications are available, as well as brochures about the HVAC&R industry and information on student membership. Conference registrants paying the non-member registration fee receive their first year of Society 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: Get 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 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. Attend events to get to know other members and attendees. Event details are on pages 27–32.

SOCIETY AWARDS

PLENARY SESSION AWARDS PRESENTATION

Orlando I/II, Lower Level | 3:15 – 5:30 p.m.

At the Plenary session, the Honors and Awards Program recognizes dedicated ASHRAE members who voluntarily give freely of their time and expertise to "serve humanity by advancing the arts and sciences of heating, ventilation, air conditioning, refrigeration and their allied fields."

Student Design Project Competition

Given in recognition of outstanding student research and design projects.

FIRST PLACE: HVAC SYSTEM SELECTION

University of Nebraska

Mitch Mallett-Hiatt, Colin Miller, and **Samuel Underwood**

FIRST PLACE: HVAC DESIGN CALCULATIONS

Ain Shams University

Beshoy Badr, George Mounir, John Victor, Kerollos Samir, Paula Wanis and **Samaa Khaled**

FIRST PLACE: INTEGRATED SUSTAINABLE BUILDING DESIGN

Loughborough University

Greeshma Bindu-Nandakumar, Vijay Chithambaram, Hope Tique Organista and **Joshua Vasudevan**

FIRST PLACE: THE SETTY FAMILY FOUNDATION APPLIED ENGINEERING CHALLENGE

University of New Hampshire

Samuel Bean, Alexander Sparks, Jacob Scarpino and **Sarah Mayer**

Technology Awards

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

FIRST PLACE AND AWARD OF ENGINEERING EXCELLENCE

Given in recognition of a first-place winner of the Technology Award competition for an outstanding application of innovative design and effective energy utilization. The recipient of the Award of Engineering Excellence has demonstrated the best overall compliance with the judging criteria.

Category I – Commercial Buildings – New

Susumu Horikawa, Kosuke Sato, and **Eri Kataoka** for the Shogakukan Building

Owner Representative, Masafumi Iwashige, Shogakukan Inc.

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 II – Educational Facilities – New

Henry Johnstone for Environmental and Natural Resources II
Owner Representative, Ralph Banks, University of Arizona, Planning Design & Construction

Category II – Educational Facilities – Existing

Chad Luning, Michael McDermott, Eric Huber, and **David Nelson** for University of Illinois at Urbana-Champaign, Frederick Seitz Materials Research Laboratory, Renovation
Owner Representative, Joshua Whitson, University of Illinois at Urbana-Champaign

Category III – Health Care Facilities – New

Kurt Monteiro and **Kevin Sharples** for Peel Memorial Centre
Owner Representative, John Marshman, William Osler Health System

Category IV – Industrial Facilities or Processes – New

Paul Finch for Kao Data Campus
Owner Representative, Gerard Thibault, Kao Data

Category V – Public Assembly – New

Leighton Deer and **Kevin Kaufman** for Tennessee State Museum
Owner Representative, Peter Heimbach, State of Tennessee, Department of General Services, Real Estate Asset Mgmt.

ASHRAE Honorary Member

Given to recognize notable persons of preeminent professional distinction.

Jimmy Carter, Atlanta, Georgia

E.K. Campbell Award of Merit

Given in recognition of outstanding service and achievement in teaching.

Janice Kathleen Means, P.E., Life Member ASHRAE, Southfield, Michigan

ASHRAE Award for Distinguished Public Service

Given to recognize members who have performed outstanding public service in their community and, in doing so, have helped to improve the public image of the engineer.

Carl F. Huber, P.E., Life Member ASHRAE, Fort Wayne, Indiana

John F. James International Award

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

Farooq Mehboob, Fellow Life Member ASHRAE, Karachi, Pakistan

ASHRAE Fellow

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

Andrew C. Äsk, P.E., Life Member ASHRAE, Fort Myers, Florida
Bratislav D. Blagojevic, Ph.D., Feniks BB, Nis, Serbia
Jui-Chen "Roger" Chang, P.E., Washington, D.C.
Fabio M. Clavijo, P.E., Life Member ASHRAE, Bogota, Colombia
Chandana N. Dalugoda, C.Eng., Piliyandala, Sri Lanka
J.A. Hugh C. De Saram, Life Member ASHRAE, Colombo, Sri Lanka
Ioan Silviu DOBOŞI, Dr. Eng., Timişoara, Romania
Daniel L. Doyle, P.E., Evanston, Illinois
Michael W. Gallagher, P.E., Santa Fe Springs, California
Nesreen K. Ghaddar, Ph.D., Beirut, Lebanon
Ying "Eric" Gong, Ph.D., P.E., Waller Texas
Charles E. Gulledge III, P.E., HBDP, High Point, North Carolina
William A. Harrison, Presidential Life Member ASHRAE, Little Rock, Arkansas
Linda K. Lawrie, Life Member ASHRAE, Pagosa Springs, Colorado
Nicolas Lemire, P.Eng., Montreal, Quebec, Canada
Bing Liu, P.E., Portland, Oregon
Antonio Luis De Campos Mariani, Ph.D, Sao Paulo, Brazil
Gian Chand Modgil, New Delhi, India
S.K. Murthy, Life Member ASHRAE, Mumbai, India
Matthew Ngan Ping Leung, Er., Singapore
C. Wijitha K. Perera, C.Eng., Colombo, Sri Lanka
Fabrizio Pesce, Livonia, Michigan
Shailesh Phatak, P.E., Pune, India
Uma Shanker, Noida, India
Charles D. Simpson, Life Member ASHRAE, Monroe, North Carolina
Michael G. Talbot, P.E., Raleigh, North Carolina
Paul A. Torcellini, Ph.D., P.E., Golden, Colorado
Paolo Tronville, Ph.D., Turin, Italy
Xinlei Wang, Ph.D., Urbana, Illinois
Michael W. Woodford, Life Member ASHRAE, Arlington, Virginia
Shitong Zha, Ph.D., Stone Mountain, Georgia
Zhiqiand (John) Zhai, Ph.D., Boulder, Colorado
Alexander Zhivov, Ph.D., Life Member ASHRAE, Champaign, Illinois

ASHRAE Pioneer of the Industry

Given to recognize deceased individuals who have made milestone contributions to the growth of air conditioning, heating, refrigeration and ventilation.
Warren S. Johnson, 1847-1911

ASHRAE Hall of Fame

Given to honor deceased members who have made milestone contributions to the growth of ASHRAE-related technology.
Frederick E. Giesecke, Ph.D., Presidential Life Member ASHVE – 1869-1953
Richard P. Perry, P.Eng., Presidential Fellow Life Member ASHRAE – 1923-2014

F. Paul Anderson Award

Given in recognition of notable achievement, outstanding work, or service in any field of the Society.
William P. Bahnfleth, Ph.D., P.E., Presidential Fellow Member ASHRAE, University Park, Pennsylvania

notes

ASHRAE CONFERENCES: PAST AND FUTURE

Upcoming Topical Conferences

2020 ASHRAE Building Performance Analysis Conference & SimBuild, co-organized by ASHRAE and IBPSA-USA
Aug. 12–14, 2020 | Chicago, IL | ashrae.org/BuildPerform2020

2020 Indoor Environmental Quality Performance Approaches – Transitioning from IAQ to IEQ
Sept. 14–16, 2020 | Athens, Greece | ashrae.org/IAQ2020

The Fourth International Conference on Efficient Building Design: Materials and HVAC Equipment Technologies
Oct. 1–2, 2020 | Beirut, Lebanon | ashrae.org/beirut

Ventilation 2021: 13th International Industrial Ventilation Conference for Contaminant Control
Aug. 15–18, 2021 | Toronto, Ontario | ashrae.org/ventilation2021

Upcoming Winter and Annual Conferences

Year	Winter	Annual
2020	Orlando, FL, Feb. 1–4	Austin, TX, June 27–July 1
2021	Chicago, IL, Jan. 23–27	Phoenix, AZ, June 26–30
2022	Las Vegas, NV, Jan. 29–Feb. 2	Toronto, ON, June 25–29
2023	Atlanta, GA, Feb. 4–8	Tampa, FL, June 24–28

Past Winter and Annual Conferences

Year	Winter	Annual
1980	Los Angeles	Denver
1981	Chicago	Cincinnati
1982	Houston	Toronto
1983	Atlantic City	Washington
1984	Atlanta	Kansas City
1985	Chicago	Honolulu
1986	San Francisco	Portland
1987	New York	Nashville
1988	Dallas	Ottawa
1989	Chicago	Vancouver
1990	Atlanta	St. Louis
1991	New York	Indianapolis
1992	Anaheim	Baltimore
1993	Chicago	Denver
1994	New Orleans	Orlando
1995	Chicago	San Diego
1996	Atlanta	San Antonio
1997	Philadelphia	Boston
1998	San Francisco	Toronto
1999	Chicago	Seattle
2000	Dallas	Minneapolis
2001	Atlanta	Cincinnati
2002	Atlantic City	Honolulu
2003	Chicago	Kansas City
2004	Anaheim	Nashville
2005	Orlando	Denver
2006	Chicago	Quebec City
2007	Dallas	Long Beach
2008	New York	Salt Lake City
2009	Chicago	Louisville
2010	Orlando	Albuquerque
2011	Las Vegas	Montreal
2012	Chicago	San Antonio
2013	Dallas	Denver
2014	New York	Seattle
2015	Chicago	Atlanta
2016	Orlando	St. Louis
2017	Las Vegas	Long Beach
2018	Chicago	Houston
2019	Atlanta	Kansas City

Registration and ASHRAE Bookstore and Logo Store

Florida 4 | Lower Level | Hilton

Registration is required for all conference participants. Official badges must be worn at all functions and for admission into the technical sessions. 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.

Friday, Jan. 31 . . . . . 10:00 a.m. – 5:00 p.m.
Saturday, Feb. 1 . . . . . 7:15 a.m. – 6:00 p.m.
Sunday, Feb. 2. . . . . 7:00 a.m. – 5:00 p.m.
Monday, Feb. 3 . . . . . 7:00 a.m. – 5:00 p.m.
Tuesday, Feb. 4 . . . . . 7:30 a.m. – 4:30 p.m.
Wednesday, Feb. 5. . . . . 7:30 a.m. – 11:00 a.m.

**Bookstore closes at 1:00 p.m.*

E-LEARNING

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.

PROCLAIMING THE TRUTH – 125th Anniversary Edition

To celebrate ASHRAE's 125th Anniversary, each registered conference attendee* will receive a complimentary copy of Proclaiming the Truth, which chronicles the beginnings and growth of ASHRAE at the registration desk. Additional copies may be purchased in the ASHRAE bookstore.

**Attendees who registered as "Student Members," "Student Non-Members," "Student Brach Advisors," "Guests/Companions," "Monitors," and "Press" will not receive a complimentary copy of Proclaiming the Truth.*

ONLINE BOOKSTORE DISCOUNT

Use discount code **ORLANDO2020** in the online bookstore. This discount code is good for 10% off any online bookstore purchases made during the dates of the Winter Conference.

Speakers' Lounge

Orlando IV | Lower Level | Hilton

Saturday, Feb. 1 . . . . . 1:00 p.m. – 3:00 p.m.
Sunday, Feb. 2. . . . . 7:00 a.m. – 5:00 p.m.
Monday, Feb. 3 . . . . . 7:00 a.m. – 12:15 p.m. & 1:30 p.m. – 5:00 p.m.
Tuesday, Feb. 4 . . . . . 7:00 a.m. – 5:00 p.m.
Wednesday, Feb. 5. . . . . 7:00 a.m. – 1:00 p.m.

Membership Desk

Florida 4 | Lower Level | Hilton

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.

Headquarters Office

Key Largo A | Lower Level | Hilton

The ASHRAE Headquarter office offers members complimentary copying and access to printers for laptop computers.

Friday, Jan. 31 . . . . . 12:00 p.m. – 5:00 p.m.
Saturday, Feb. 1 . . . . . 8:00 a.m. – 5:00 p.m.
Sunday, Feb. 2. . . . . 8:00 a.m. – 5:00 p.m.
Monday, Feb. 3 . . . . . 8:00 a.m. – 5:00 p.m.
Tuesday, Feb. 4 . . . . . 8:00 a.m. – 5:00 p.m.
Wednesday, Feb. 5. . . . . 8:00 a.m. – 1:00 p.m.

Lounges

MEMBER LOUNGE

Saturday: **Orlando VI*** | Lower Level | Hilton
Sunday–Wednesday: **Orange D** | Lower Level | Hilton

Lounge is open to all registered attendees. The Members Lounge will be in Orlando VI on Saturday only and then move to Orange D starting on Sunday through Wednesday.

*Saturday, Feb. 1. . . . . 7:30 a.m. – 3:00 p.m.
Sunday, Feb. 2. . . . . 7:30 a.m. – 4:00 p.m.
Monday, Feb. 3 . . . . . 7:30 a.m. – 4:00 p.m.
Tuesday, Feb. 4 . . . . . 7:30 a.m. – 4:00 p.m.
Wednesday, Feb. 5. . . . . 7:30 a.m. – 1:00 p.m.

COMPANION LOUNGE

Lobby Bar | Lobby | Hilton

Lounge is open to all registered companions. See page 33 for more information.

Saturday, Feb. 1 . . . . . 7:30 a.m. – 3:00 p.m.
Sunday, Feb. 2. . . . . 7:30 a.m. – 3:00 p.m.
Monday, Feb. 3 . . . . . 7:30 a.m. – 3:00 p.m.
Tuesday, Feb. 4 . . . . . 7:30 a.m. – 3:00 p.m.
Wednesday, Feb. 5. . . . . 7:30 a.m. – 1:00 p.m.

TC COLLABORATION AREA

Orange D | Lower Level | Hilton

NEW! The TC Collaboration Area is a new space designed to provide an informal and collaborative meeting space for TC subcommittee meetings or other small meetings throughout the conference.

Sunday, Feb. 2. . . . . 7:30 a.m. – 4:00 p.m.
Monday, Feb. 3 . . . . . 7:30 a.m. – 4:00 p.m.
Tuesday, Feb. 4 . . . . . 7:30 a.m. – 4:00 p.m.
Wednesday, Feb. 5. . . . . 7:30 a.m. – 1:00 p.m.

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.

Longer descriptions of the tours can be found in the ASHRAE 365 app or at www.ashrae.org/orlando.

All tours depart from the Group Transportation Area located outside of Scratch Market on the Lobby level of the Hilton. Please arrive at least 10 minutes before the tour is scheduled to depart.

Technical Tours

ORLANDO INTERNATIONAL AIRPORT INTERMODAL TERMINAL FACILITY

Sunday, February 2 | 3:30 – 5:30 p.m. | $30

Tour the MCO airport's newest expansion, the Intermodal Terminal Facility, which served as a multi-use transportation hub. MCO is the largest airport in Florida and the 11th largest in the country.

UCF ENERGY PLANT

Monday, February 3 | 2:00 – 5:00 p.m. | $30

Tour the UCF campus which has a 17,000 ton cooling district served by four central plants located around the campus. The plants are connected to a 3 mile long distribution loop that serves most buildings on the campus. The tour will visit some highlights of mechanical systems on the campus including a large 3M gallon thermal storage tank and a Combined Heat and Power plant (CHP).

FLORIDA SOLAR ENERGY CENTER

Tuesday, February 4 | 2:00 – 6:00 p.m. | $30

Tour the Florida Solar Energy Center (FSEC) to discover how HVAC&R, window technology, natural lighting, controls and other building technologies were integrated to produce one of the most energy efficient buildings for hot, humid climates. FSEC is the largest and most active state-supported renewable energy and energy efficiency research, training, testing and certification institute in the United States. FSEC's mission is to research and develop energy technologies that enhance Florida's and the nation's economy and environment and to educate the public, students and practitioners on the results of the research. Research at FSEC is based on field monitoring, computer simulations and controlled experiments in highly-instrumented laboratories. This tour involves walking. Participants should wear comfortable shoes and dress for the weather.

General Tours

KENNEDY SPACE CENTER

Sunday, February 2 | 8:30a.m. – 4:30 p.m. | $120

Experience your very own space adventure by exploring the exciting past, present and future of America's space program at Kennedy Space Center Visitor Complex.

The first stop on this go-at-your-own pace tour is the four-story LC-39 Observation Gantry, where guests enjoy a panoramic view of Kennedy Space Center and the Space Shuttle launch pads, as well as the rocket launch pads at Cape Canaveral Air Force Station. A short film and interactive displays demonstrate how the launch pads are constructed and how a Shuttle is launched.

The motor coaches then drive by the monstrous Vehicle Assembly Building (VAB) where the Space Shuttle was stacked for launch, and where the Apollo/Saturn V rockets were once assembled, as well as the Orbiter Processing Facility (OPF) where the Orbiter is examined and maintained after each mission.

The second stop is the Apollo/Saturn V Center, where dramatic multi-media shows, and numerous hands-on displays provide visitors with an inspirational and exhilarating look in America's quest for the moon. Guests relive the historic launch of Apollo at the Firing Room Theater, then marvel at a monstrous 363-foot Saturn V moon rocket, the most powerful rocket ever built, and one of only three Saturn V rockets in existence.

Finally, the Lunar Theater provides a rare look at the harrowing final moments before man landed on the moon. The Apollo/Saturn V Center is also home to the Moon Rock Café, the only place in the where guest can dine next to a genuine moon rock.

TITANIC THE EXHIBITION

Monday, February 3 | 2:15 – 5:15 p.m. | $65

The world's first permanent Titanic Attraction, "Titanic – The Experience," features the only full-scale Titanic room re-creations in existence, including her world-famous Grand Staircase. There are over 200 priceless artifacts and historic treasures from some of the most prestigious private collections in the world, many of them on display for the very first time.

Original movie memorabilia from such films as "A Night to Remember," starring Kenneth More, and "The Search for Titanic," hosted by Orson Welles – as well as a costume worn by Leonardo DiCaprio in the Oscar-winning motion picture, "Titanic." Also, live interactive interpretations by storytellers in period costumes will capture the unforgettable sights, sounds, and emotions of one of the most poignant chapters in modern history.

FLORIDA EVERGLADES TOUR

Tuesday, February 4 | 2:30 – 5:30 p.m. | $125

Deep in the middle of nowhere, a 100-year-old pioneer fish camp awaits you, looking like something straight out of Patrick Smith's bestselling novel, A Land Remembered. Here, you'll enjoy a refreshing soft drink and sample delicious cooked-to order gator tail before boarding a 15-passenger airboat for a breathtaking 30-minute expedition down the St. Johns River and into the Central Florida Everglades, accompanied by your expert eco-guide's spellbinding live narration. With a U.S. Coast Guard-licensed swamp boat captain at the helm, you'll explore the freshwater habitat of the Florida alligator as your airboat skims the shallow waters of this legendary "River of Grass" at speeds up to 45-mph, slowing to an idle at times to let you take advantage of the incredible photo opportunities.

Following your airboat excursion, you'll gather with your fellow explorers to begin a 30-minute guided nature walk through the Tosohatchee Wildlife Refuge along the legendary Florida Trail. The hiking is easy, but the sights are unforgettable as your expert eco-guide leads you through this pristine natural habitat—home to both resident and migratory birds, white-tailed deer, bobcat, fox squirrel, alligators, cows and otters.

Student Tour

STUDENT TOUR: ORANGE COUNTY CONVENTION CENTER

Sunday, February 2 | 1:30 – 3:30p.m. | $20

Join us for a mini-seminar and facility tour which gives participants a quick look at the massive scale of equipment required to run the Orange County Convention Center, the largest LEED Gold Certified convention center in the world. With over 7.1 million square feet of building space, it takes a lot to keep 1.4 million visitors comfortable during the 200 client events hosted here each year. Join us to see how we make it all work. As a sustainability leader, OCCC has learned much over the past decade.

The solar photovoltaic (PV) rooftop system on the Orange County Convention Center in Orlando, Florida, was completed in 2009 over the south concourse. This project is a U.S. Department of Energy Solar America Showcase. This goal of this project has to include five primary components: a 1-mega-watt (MW) PV system, four 10-kilowatt PV systems, a 3,000-square foot Climate-Change Education Center, a statewide marketing program, and an economic development program. The showcase 1-MW PV system is the largest rooftop PV system in the southeast United States.

The tour will be broken into three groups of 30 to 40.
This tour is for students only.

ASHARE LEARNING INSTITUTE (ALI) COURSES

Registration fees: $539 ($435 ASHRAE Member)

Each seminar earns 6 PDHs/AIA LUs. Check with your state for their continuing education credits requirements. Please bring to the course all identification numbers (AIA, NY, NC) to ensure you receive proper credit.

SATURDAY, FEBRUARY 1

8:00 a.m. – 3:00 p.m.

Updated! Commercial Building Energy Audits (Code 60)

Orange A (LL), Hilton Orlando

This seminar provides guidance on how to perform commercial building energy audits. Best practices and other information relevant for building owners, managers, and government entities are covered. The seminar includes a summary of materials essential for performing ASHRAE Level 1, 2, and 3 audits, time-saving tips for every auditor, how to hire an auditor, what to ask for in a comprehensive audit report, and how to build a successful energy efficiency retrofit team.
Instructor: Jim Kelsey, P.E., Member ASHRAE, BEAP, LEED® AP

Commissioning Process in New and Existing Buildings (Code 75)

Orange B (LL), Hilton Orlando

This introductory seminar focuses on how the building commissioning process can be applied cost-effectively to new construction and to existing facilities, with a strong emphasis on existing facilities applications. Learn the fundamentals of the commissioning process through each step of a new construction project, from predesign to occupancy and operations. The seminar will also discuss how the application of the commissioning process in existing facilities differs from new construction. Benefits of commissioning and how the process can improve the built environment, reduce environmental impacts through responsible resource utilization, improve the quality of design and construction, and raise the professional reputation of the entire commissioning team will be covered. Take away compelling information and case studies that demonstrates the value of investing in the commissioning process.
Instructor: Richard Casault, P.E., Member ASHRAE

Integrated Building Design (Code 61)

Orange C (LL), Hilton Orlando

This seminar provides a working knowledge of the integrated building design process, explaining the basic concepts involved and outlining the fundamental application of this approach. Course content will explain the advantages and benefits of integrated building design and how this process differs from

conventional design practice. The program structure will identify the necessary sequencing and scope of activities that should be implemented to support development of collaborative solutions. In addition to design-related philosophy, course content will explore the critical elements of team activity and management of collaborative teams. This seminar will benefit any person who has a role in the planning, design, construction, and operation of a built solution. Attendees will be able to strategically position themselves in the market place by understanding the value of project fundamentals and the importance of holistic interdependencies. Emphasis will be placed on transitioning traditional processes that aggregate isolated silos of knowledge into collaborative thought and shared outcome.
Instructor: E. Mitchell Swann, P.E., Member ASHRAE

TUESDAY – FEBRUARY 4
9:00 a.m. – 4:00 p.m.

Energy Modeling Best Practices and Applications (Code 76)
W304A (3), Orange County Convention Center (OCCC) West Building
This seminar covers the fundamentals of building energy modeling and explains how to use modeling to guide design decisions, with an emphasis on HVAC. Integrating modeling into the design process from the programming stage through post-occupancy and measurements and verification will be discussed. The seminar explains modeling principles and provides modeling tips related to the building envelope, plug loads, lighting systems, and HVAC systems. Concluding with guidance on model calibration and the use of energy models for measurement and verification, this seminar also includes case studies and links to valuable modeling resources.
Instructors: Sam Mason, P.E., Member ASHRAE, BEMP, LEED® AP, BD+C; and Erik Kolderup, P.E., Member

Half-Day Short Course

Registration fees: $214 ($159 ASHRAE Member)

Each course earns 3 PDHs/AIA LUs. Check with your state for their continuing education credits requirements. Please bring to the course all identification numbers (AIA, NY, NC) to ensure you receive proper credit.

SATURDAY – FEBRUARY 1, 2020
12:00 p.m. – 3:00 p.m.

Updated! Air-to-Air Energy Recovery Applications: Best Practices (Code 62)
Florida 1 (LL), Hilton Orlando
Air-to-air energy recovery provides one of the most cost-effective and efficient ways to recycle waste energy and

create superior indoor environments. This course will review real-world examples of where and how air-to-air energy recovery technologies are integrated into some of the most common, commercially available systems. Particular configurations that are most commonly used in high performance buildings and how they can best be used to meet stretch 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, Eng., Member ASHRAE

SUNDAY – FEBRUARY 2

3:30 p.m. – 6:30 p.m.

Guideline 36: Best in Class HVAC Control Sequences (Code 63)
W304C (3), Orange County Convention Center (OCCC) – West Building

This course introduces the current version of ASHRAE Guideline 36, which focuses on variable-air-volume (VAV) systems. The discussion will include the research underlying the current sequences and ongoing and planned future research intended to develop additional advanced sequences for other HVAC system types. In this course, attendees will learn about the ASHRAE Guideline 36 sequences and how they improve energy efficiency, thermal comfort, and indoor air quality. Attendees will also learn how to specify sequences for this guideline.
Instructor: Steven Taylor, P.E., Fellow/Life Member ASHRAE

Humidity Control I: Design Tips and Traps (Code 64)
W304B(3), Orange County Convention Center (OCCC) – West Building

In commercial buildings, excess humidity and moisture promotes mold, mildew, and uncomfortable conditions for occupants. This course helps the designer achieve true control of humidity, rather than just its moderation. Topics covered include how to understand and easily estimate the major humidity loads that must govern the design of the system and how to make decisions about equipment size and configuration.
Instructor: Mark Nunnelly, P.E., Member ASHRAE, CxA, LEED® AP

Laboratory Design: The Basics and Beyond (Code 65)
W304D(3), Orange County Convention Center (OCCC) – West Building

A comprehensive overview of HVAC design for laboratories is examined in this course. 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. Example problems and case studies will also be presented.
Instructor: John Varley, P.E., Member ASHRAE, HBDP, LEED® AP, BD+C

Updated! Latest in High-Performance Dedicated Outdoor Air Systems (DOAS) (Code 66)
W304A (3), Orange County Convention Center (OCCC) – West Building
The dedicated outdoor air system (DOAS) has become a very popular means to provide ventilation for buildings, particularly for low-energy, max tech, and zero energy buildings. DOAS and the accompanying room-level heating/cooling units provide many benefits, including low energy use, cost-effective humidity control, redundancy, and control simplicity. This course covers the latest in DOAS application, design, and control, and the instruction is best suited for those seeking basic to intermediate discussions on DOAS, including an overall introduction to the concept.
Instructor: Arthur Hallstrom, P.E., Fellow/Life Member ASHRAE, BEMP

MONDAY – FEBRUARY 3
8:30 a.m. – 11:30 a.m.

Advanced Designs for Net Zero Buildings (Code 67)
W304B (3), Orange County Convention Center (OCCC) – West Building
This advanced course is for professional engineers and architects who want to expand their practice to include the design, construction, and operation of zero energy (net zero) buildings. The first principle of zero energy design is to make the building as energy efficient as possible. On-site renewable energy systems will then be added to achieve these efficiency goals. If adequate on-site zero energy is not feasible, then options for off-site renewable energy should be explored. The test for zero energy is at the energy meter, so proper commissioning and operator training are critical to success. The zero energy principles outlined above will be presented with case studies and examples showing how other design professionals have met the zero energy goal.
Instructor: Charles Eley, P.E., AIA, CEM, Member ASHRAE, BEMP, LEED® AP

Designing and Operating High-Performing Healthcare HVAC Systems (Code 68)
W304C (3), Orange County Convention Center (OCCC) – West Building
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 ASHRAE/ASHE Standard 170-2017, Ventilation of Health Care Facilities. The course will go into detail on the interactions of the key elements of high performance in

healthcare, infection control, comfort, reliability, safety, maintenance, energy and sustainability. Numerous energy conservation strategies will be considered in the context of achieving all the goals of a high-performing hospital. For example, the hardware and controls for setback of temperature and airflow and the relationship to temperature, relative humidity, air exchange, filtration, and pressurization requirements are discussed.
Instructor: Daniel Koenigshofer, P.E., Member ASHRAE, MSPH, HFDP

High-Performance Building Design: Applications and Future Trends (Code 69)
W304D (3), Orange County Convention Center (OCCC) – West Building
This course presents applications of new technologies and design concepts to achieve the goal of high-performance buildings, including zero energy or nearly zero energy buildings. The course discusses exactly what a high-performance building is from the perspective of various stakeholders. 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 possibilities for high-performance buildings across the globe and quickly summarizes how ASHRAE standards (existing and those in development) address these topics.
Instructor: Thomas Lawrence, Ph.D., P.E., Fellow ASHRAE, LEED® AP

Solar PV and Thermal Systems Analysis and Design (Code 70)
W304A (3), Orange County Convention Center (OCCC) – West Building
This course is designed to introduce the HVAC community (engineers, architects, building owners, facility managers, plus others) to sustainable design principles and provide the knowledge necessary to evaluate and implement cost-effective solar applications for commercial facilities. The purpose is to provide attendees with the knowledge and skills required for the development, evaluation, procurement, and installation of commercial solar projects. The technical focus is on cost-effective photovoltaic and solar water heating applications for commercial properties. A wide variety of solar applications are discussed, such as an overview of the foundation for photovoltaics and solar thermal systems. Topics include site assessment, solar geometry, sizing, common applications and configurations, economics, and commissioning. The objective is to enable the participants to economically assess, procure, and monitor the design and installation of a wide variety of solar energy applications.
Instructors: Khalid Nagidi, Member ASHRAE, LEED® AP; and Svein Morner, Ph.D., Member ASHRAE

MONDAY – FEBRUARY 3
2:45 p.m. – 5:45 p.m.

Save 40% by Complying with Standard 90.1-2019 (Code 71)
W304D (3), Orange County Convention Center (OCCC) – West Building

The 2019 update of ASHRAE/IES Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings, is a major revision, containing more than 100 changes from the 2016 version. Save 40% by Complying with Standard 90.1-2019 is a three-hour course is designed to give the participants a good understanding of how to satisfy the standard's requirements. Changes made in the 2019 edition will be highlighted, along with the context surrounding the history of the requirements and the impact of the updates on energy use in buildings. The courses focus on outlining changes for attendees (for use in their practice) and providing tools to explain changes to customers. Learn compliance paths for ASHRAE/IES Standard 90.1 and discuss HVAC and lighting systems, building envelopes, service water heating, power, and more. The course also covers key mandatory and prescriptive requirements applicable to each system, as well as whole-building compliance options.
Instructors: McHenry Wallace, P.E., Member ASHRAE, LEED® AP; and Joseph Deringer, AIA, Life Member ASHRAE, LEED® AP

Humidity Control II: Real-World Problems and Solutions (Code 72)
W304C (3), Orange County Convention Center (OCCC) – West Building

For those who need to learn beyond the basics of humidity control, this course provides the next step. Based on ASHRAE's best-selling Humidity Control Design Guide for Commercial and Institutional Buildings, the course includes an in-depth discussion of moisture load calculations and how humidity control can be added to HVAC designs for seven different types of commercial buildings. The course also covers the effects of different humidity levels on thermal comfort, corrosion, mold growth, and airborne microorganisms—information that helps the owner and designer define the optimal humidity control level for each application. This course puts the attendee on the fast track to understanding the effects of successful humidity control.
Instructor: Lew Harriman, Fellow ASHRAE

Best Practices for Installing DDC Systems (Code 73)
W304B (3), Orange County Convention Center (OCCC) – West Building

This course covers best installation practices of DDC systems. A facility's direct digital controls (DDCs) form a living, breathing system that an owner will use throughout the life of

the building. If standardized and quality installations are promoted, the short- and long-term success of control systems will be greatly improved. Best Practices for Installing DDC Control Systems will provide tools to ensure uniformity for consultants, contractors, and code officials and will specifically benefit consulting engineers, DDC design integration engineers, commissioning authorities, and contractors who install DDC systems.
Instructor: Larry Fisher, P.E., Life Member ASHRAE

NEW!

IgCC and ASHRAE Standard 189.1 Technical Provisions (co-presented with ICC) (Code 74)

W304A (3), Orange County Convention Center (OCCC) – West Building

The IgCC and ASHRAE Standard 189.1 Technical Provisions course covers how ASHRAE/ICC/USGBC/IES Standard 189.1, Standard for the Design of High-Performance Green Buildings, forms the technical basis for the International Green Construction Code® (IgCC). This course provides a detailed look at the technical standard and its application as a building code, including a description of key requirements contained in the IgCC and ASHRAE/ICC/USGBC/IES Standard 189.1 on the topics of sites, water, energy, indoor environmental quality, and materials. Consulting engineers, architects, facility managers, contractors, and code officials will learn to distinguish between the two compliance path options (prescriptive and performance) and their associated provisions in the IgCC, as well as how to apply these paths in design.
Instructors: Thomas Lawrence, Ph.D., P.E., Member ASHRAE, LEED® AP; and Anthony Floyd, AIA, Member ASHRAE, LEED® AP

TUESDAY – FEBRUARY 4

9:00 a.m. – 12:00 p.m.

NEW!

Principles of Building Commissioning: ASHRAE Guideline 0 and Standard 202 (Code 77)

W304C (3), Orange County Convention Center (OCCC) – West Building

This course presents the defining characteristics of the new construction commissioning process as defined by ASHRAE Guideline 0, *The Commissioning Process*, and ASHRAE/IES Standard 202, *Commissioning Process for Buildings and Systems*. The course explores the implications of employing the ASHRAE commissioning process during the acquisition of a building. Emphasis is placed on the importance of initiating the commissioning process during pre-design so that the owner's project requirements (OPR) document can guide the verification of success across the design, construction, and operation phases of a building project. The supporting role played by other ASHRAE commissioning documents are also discussed.

Instructor: Walter Grondzik, P.E., Fellow/Life Member ASHRAE, LEED® AP

Variable Refrigerant Flow Systems: Design and Applications (Code 78)

W304B (3), Orange County Convention Center (OCCC) – West Building

Variable refrigerant flow (VRF) systems are now being applied in many building types across North America. This course provides non-manufacturer-specific concepts of how to apply VRF systems to buildings. The course supplements the fundamental technology presented in the 2016 *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. This course is geared towards mechanical engineers, design/build contractors, consulting engineers, HVAC system designers, and facility engineers.

Instructor: Jocelyn Léger, P.Eng., CEM, Member ASHRAE, LEED® AP

NEW!

TUESDAY – FEBRUARY 4

1:00 p.m. – 4:00 p.m.

Designing for Cold Climates (Code 79)

W304B (3), Orange County Convention Center (OCCC) – West Building

This course is based on the new ASHRAE *Cold-Climate Buildings Design Guide*, which enables engineers to develop design strategies and solutions that can be successfully applied in cold climates. There are several special considerations for cold climates: remoteness, HVAC function (the need for maintenance, repairs, etc.), fuels, high energy use, low humidity, freeze protection, and more. Net zero energy and sustainability goals also pose special challenges for engineers in cold climates. Net zero energy can be especially difficult in an environment that requires large amounts of heating energy. Sustainability is tough to plan in the face of a delicate and shifting landscape; plans may be affected by climate change and other man-made influences. This course focuses onto applications in cold climates and deals with the specific issues relevant to this climate. The material covers health and safety in cold climates and how to achieve energy-efficient and net zero design in these environments. Also discussed are passive systems and applications (such as natural ventilation in places where external air is subzero) and hybrid passive and mechanical heating and ventilation applications.

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

V in HVAC– What, Why, Where, How, and How Much (Code 80)

W304C (3), Orange County Convention Center (OCCC) – West Building

This course focuses on the basic requirements of ASHRAE Standard 62.1-2019 and covers the scope, application, and multiple compliance paths available in the standard, including the ventilation rate procedure, indoor air quality procedure, and natural ventilation procedure. Topics will include minimum requirements for cleaning outdoor air, designing HVAC systems, determining the ventilation rate quantity, commissioning, and operations and maintenance. The different application conditions for the ventilation rate procedure are also described, along with changes particular to the 2019 version of ASHRAE Standard 62.1. This course is highly recommended for all HVAC designers and engineers.

Instructor: Hoy Bohanon, P.E., Member ASHRAE, BEAP, LEED® AP

notes

2020 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

Paper Sessions. These sessions present both technical and conference papers. Conference papers are written 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. Technical papers cover 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. Comments may be submitted on paper forms available at each session or via ashrae.org/QConline. PowerPoint presentations with audio descriptions of the presentations are posted online in the Virtual Conference. Preprints and final versions of the papers are available as a collection via subscription to the Technology Portal online, and the final papers are published in ASHRAE Transactions.

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. Seminars are available as a collection via subscription to the Technology Portal online and include video files synched with audio, audio files and PDF files of the presentations.

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.

Conference–Papers subscription in Technology Portal (includes Conference Papers, Technical Papers, and Extended Abstracts) – $69

Conference–Seminars subscription in Technology Portal – $109

Preprints of Conference Papers, Technical Papers and Extended Abstracts (individual papers, in print) – $6 each

ASHRAE Transactions (print volume) – $99

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

Submitted for approval for GBCI LEED AP CE Credits

Packages

1. **2020 ASHRAE Winter Conference**
   Conference–Papers subscription and Conference–Seminars subscription, $154

2. **2020 ASHRAE Winter Conference**
   Conference–Papers subscription and *ASHRAE Transactions*, $129

3. **Complete Winter Conference Content Package, 2020 ASHRAE Winter Conference**
   Conference–Papers subscription, Conference–Seminars subscription, and *ASHRAE Transactions*, $179

All prices are special conference-only prices.

Sunday, February 2

All Technical Sessions are located at the Hilton Orlando on the Lower Level unless indicated otherwise.

8:00 AM–9:00 AM

Panel 1 (Intermediate)

What Makes Orlando and Central Florida a Front-Runner in Implementing Clean Energy and Sustainability Solutions?

Track: Cutting Edge Approaches

Room: Orlando VI

Sponsor: 2.8 Building Environmental Impacts and Sustainability

Chair: Rafi Karim, P.E., Member, Affiliated Engineers, Inc., Pasadena, CA

1. City of Orlando

Chris Castro, *Director of Sustainability & Resilience, City of Orlando, Orlando, FL*

2. Architect

Lindsey Piant Perez, AIA, *Southeast Sustainability Leader, DLR Group, Orlando, FL*

3. MEP Engineer

John Chyz, P.E., CPMP, *Building Performance Project Consultant, Affiliated Engineers, Newberry, FL*

8:00 AM–9:00 AM

NY PDH TP G

Paper Session 1 (Intermediate)

Smart Thermostat Sensing and Control

Track: Big Data and Smart Controls

Room: Orange A

Chair: Davide Ziviani, Ph.D., Member, Purdue University, West Lafayette, IN

1. A Case Study of Using Multi-Modal Sensors to Predict the Indoor Air Temperature in Classrooms (OR-20-C001)

Ehsan Kamel, Ph.D., Associate Member, *New York Institute of Technology (NYIT), Old Westbury, NY*

2. Demand Control of Baseboard Heaters Using Connected Thermostats: Lessons Learned from 567-Homes Pilot Study (OR-20-C002)

Ajit Pardasani, *Jennifer A. Veitch, Ph.D., Yitian Hu and Guy R. Newsham, Ph.D., National Research Council Canada, Ottawa, ON, Canada*

3. A Change Point Detection Algorithm with Application to Smart Thermostat Data (OR-20-001)

Austin Rogers, *Fangzhou Guo and Bryan Rasmussen, Ph.D., P.E., Member, Texas A& M University, College Station, TX*

8:00 AM–9:00 AM

Seminar 1 (Intermediate)

NY PDH TP G

Building-Integrated Photovoltaic Systems: Enabling Energy-Resilient High-Performance Buildings

Track: Systems and Equipment

Room: Orange E

Sponsor: 6.7 Solar Energy Utilization, TC04.4, TC07.5

Chair: Eric Yang, P.E., BEAP, HBDP, Member, Energy System Group, Washington, DC

1. BIPV as a Multifunctional Building Envelope Solution

Francesco Frontini, Ph.D., *SUPSI, Canobbio, Switzerland*

2. BIPV as a Distributed Energy Resource

Veronique Delisle, Ph.D.[1] *and Costa Kapsis, Ph.D., Member*[2]*, (1) CanmetENERGY, Varennes, QC, Canada, (2) Natural Resources Canada, Varennes, QC, Canada*

3. BIPV for the Generation of Renewable Thermal and Electric Energy

Andreas Athienitis, Ph.D., P.E., Fellow ASHRAE, *Concordia University, Montreal, QC, Canada*

8:00 AM–9:00 AM

Seminar 2 (Intermediate)

NY PDH TP G

Improve IAQ by Avoiding Architect, Engineer and Contractor's Common Mistakes

Track: Ventilation, IAQ and Air Distribution Systems

Room: Orlando V

Sponsor: 1.12 Moisture Management in Buildings

Chair: Donald Snell, P.E., Member, Liberty Building Forensics Group, Zellwood, FL

1. Common Mistakes Architects Make Regarding Moisture Control and IAQ

Fiona Aldous, Member, *WJE, Boca Raton, FL*

2. Common Mistakes Engineers Make Regarding Moisture Control and IAQ

Norman Nelson, P.E., Life Member, *Jacobs Engineering Group, Portland, OR*

3. Common Mistakes Contractors Make Regarding Moisture Control and IAQ

George Dubose, P.E., Member, *Liberty Building Forensics Group, Zellwood, FL*

8:00 AM – 9:00 AM

Seminar 3 (Intermediate)

Keeping up with the Mouse: Orlando International Airport Expansion Commissioning and Energy Management

Track: High Efficiency Design and Operation

Room: Orange B

Sponsor: 7.9 Building Commissioning

Chair: Wade Conlan, P.E., BCXP, CPMP, Member, Hanson Professional Services, Maitland, FL

1. Touch and Go: Commissioning Issues for Large Airport Expansion

Robert Knoedler, P.E., Member, *Hanson Professional Services, Raleigh, NC*

2. Energy and Sustainability Management for Aviation Facilities

Davin Ruohomaki, *Greater Orlando Aviation Authority, Orlando, FL*

8:00 AM–9:00 AM

Seminar 4 (Intermediate)

Moving BAS for Hospitals into the Future

Track: High Efficiency Design and Operation

Room: Orange F

Sponsor: 1.4 Control Theory and Application, 9.6 Health-care Facilities

Chair: James Coogan, P.E., Associate Member, Siemens Building Technologies, Chicago, IL

1. Creating Smart Hospitals: Giving Patients Control, Improving Patient and Staff Experiences and Improving Operating Results

Jerry Folsom, *Siemens Building Technologies, Chicago, IL*

2. Achieving the Impossible: A Case Study of How to Stay Fully Operational while Evolving into a "Hospital of the Future"

Michelle Shadpour, Associate Member, *SC Engineers, Inc., San Diego, CA*

8:00 AM–9:00 AM

Seminar 5 (Intermediate)

Solar Assisted Air Conditioning: How Solar Energy Can Cool Down your Building

Track: Systems and Equipment

Room: Orange G

Sponsor: 6.7 Solar Energy Utilization, 8.3 Absorption and Heat Operated Machines

Chair: Veronique Delisle, Ph.D., CanmetENERGY, Varennes, QC, Canada

1. Solar Site Assessment: Know-When

Khalid Nagidi, BEAP, Member, *Energy Management Consulting Group, Wantagh, NY*

2. Solar Assisted Air Conditioning: Know-How

Constantinos A. Balaras, Ph.D., Fellow ASHRAE, *Institute for Environmental Research & Sustainable Development, NOA, Athens, Greece*

3. Solar Cooling: Know-What
Tim Merrigan, Life Member, *Energy Information Services, Denver, CO*

8:00 AM–9:00 AM

Seminar 6 (Basic)

NY PDH TP G

Updates and Lessons Learned from Recent Room Load Calculation Research
Track: HVAC&R Fundamentals and Applications
Room: Orange C
Sponsor: 4.1 Load Calculation Data and Procedures
Chair: Rachel Spitler, Associate Member, Cyntergy, Tulsa, OK

1. A Research Update on RP-1778 Heat and Moisture Loading from Commercial Dishroom Appliances and Equipment
Denis Livchak, P.E., Associate Member, *Frontier Energy, San Ramon, CA*

2. Fundamentals of Cooling Loads for Radiant Systems: Room vs. System Loads
Atila Novoselac, Ph.D., Associate Member*, University of Texas at Austin, Austin, TX*

3. Role of Surface Boundary Condition on the Room Convective and Radiative Loads
Ardeshir Moftakhari, Student Member, *University of Texas, Austin, TX*

9:45 AM–10:45 AM

Debate 1 (Intermediate)

Tech Program

Does Building Energy Efficiency Matter in a 100% Renewable Grid?
Track: High Efficiency Design and Operation
Room: Orlando VI
Moderator: ***Jim Edelson, Associate Member,*** *New Buildings Institute, Portland, OR*
Panelists: Randall Higa, P.E., Member, Southern California Edison, Rosemead, CA, Adam Hinge, P.E., Fellow ASHRAE, Sustainable Energy Partnerships, Tarrytown, NY, Jon McHugh, P.E., Member, McHugh Energy Consultants Inc., Fair Oaks, CA and Alexi Miller, P.E., Associate Member, New Buildings Institute, Portland, OR

9:45 AM–10:45 AM

Paper Session 2 (Intermediate)

NY PDH TP G

Cutting Edge Approaches to Heat Generation
Track: Cutting Edge Approaches
Room: Orange C
Chair: Davide Ziviani, Ph.D., Member, Purdue University, West Lafayette, IN

1. Smart Control for Residential Fuel Switching between Natural Gas and Electricity (OR-20-C003)
Farzin M.Rad, Ph.D., P.E., Member, *Nima Alibabaei, Ph.D. and Tom Grochmal, Ph.D., P.E., Enbridge Gas Inc., Toronto, ON, Canada*

2. Project Shoes: Secondary Heat Opportunities from Electrical Substations (OR-20-C004)
James Bowman, *RHB Partnership LLP, Winchester, United Kingdom*

3. Preliminary Study of a Solar Assisted Heating System (OR-20-C005)
Gareth Davies, Ph.D.[1], *John Blower*[2], *Richard Hall, Ph.D.*[2], *Soma Mohammadi, Ph.D.*[2] *and Graeme Maidment, Ph.D., P.E.1, (1) London South Bank University, London, United Kingdom, (2) Energy Transitions Ltd, Cardiff, United Kingdom*

9:45 AM–10:45 AM

Paper Session 3 (Intermediate)

NY PDH TP G

Ventilation for Multi-Unit and High-Rise Buildings

Track: Ventilation, IAQ and Air Distribution Systems
Room: Orange A
Chair: Ahmed Elatar, Ph.D., Oak Ridge National Laboratory, Oak Ridge, TN

1. A New Look at Elevator Pressurization (OR-20-C006)
John Klote, P.E., Fellow Life Member[1] *and Paul Turnbull, Member*[2], *(1) John Klote Fire and Smoke Consulting, Leesburg, VA, (2) Siemens Building Technologies, Inc., Buffalo Grove, IL*

2. Investigating the Impact of Sweeps and Weather Stripping on Suite Door Air Tightness in Multi-Family Buildings (OR-20-C007)
Xinxiu Tian, Student Member, *Jamie Fine, Ph.D., Associate Member and Marianne Touchie, Ph.D., Member, University of Toronto, Toronto, ON, Canada*

3. Ventilation and IAQ Perceptions in a Post-War Multi-Unit Residential Building (OR-20-C008)
Jamie Fine, Ph.D., Associate Member *and Marianne Touchie, Ph.D., Member, University of Toronto, Toronto, ON, Canada*

9:45 AM–10:45 AM

Seminar 7 (Basic)

NY PDH TP G

ASHRAE Conference Crash Course

Track: HVAC&R Fundamentals and Applications
Room: Orange E
Sponsor: YEA Committee
Chair: Rachel Romero, P.E., Member, National Renewable Energy Laboratory, Golden, CO

1. The Ins and Outs of ASHRAE
Jessica Errett, Member, *Energy Studio, Inc, Omaha, NE*

2. Make the Most of Your Conference Experience
Madison Schultz, P.E., Member, *OK BeCo, Oklahoma City, OK*

9:45 AM–10:45 AM

Seminar 8 (Intermediate)

Cold Climate Building Design for Oil and Gas Applications

Track: Standards, Guidelines and Codes

Room: Orlando V

Sponsor: 9.2 Industrial Air Conditioning, TRG 9 Cold Climate Building Design

Chair: Erich Binder, Life Member, Erich Binder Consulting Limited, Calgary, AB, Canada

1. Design Considerations, Code and Hazardous Space Requirements
Erik Ostberg, P.E., CPMP, Member, *ASHRAE, Anchorage, AK*

2. Cold Climate Specific HVAC Systems Design
Mak Kampen, P.E., Member, *Erich Binder Consulting Limited, Calgary, AB, Canada*

9:45 AM–10:45 AM

Seminar 9 (Intermediate)

Cutting Edge Approaches to a 21st Century Learning Environment

Track: Cutting Edge Approaches

Room: Orange F

Sponsor: 9.1 Large Building Air-Conditioning Systems, 9.8 Large Building Air-Conditioning Systems

Chair: Bill Artis, BCXP, BEAP, BEMP, Member, Energy Project Consulting LLC, NEW HYDE PARK, NY

1. The Transformation of Marston Hall: Creating a 21st Century Learning Environment within a 19th Century Structure
Lincoln Pearce, P.E., BEAP, Member, *IMEG Corp, Des Moines, IA*

2. You Can Teach a Historic School of Architecture New Tricks
Kelley Cramm, P.E., Member, *Henderson Engineers, Lenexa, KS*

9:45 AM–10:45 AM

Seminar 10 (Intermediate)

Cutting-Edge Japanese Technologies SHASE Award for Renovation Project in 2019

Track: High Efficiency Design and Operation

Room: Orange B

Sponsor: SHASE

Chair: Makoto Koganei, Ph.D., Yamaguchi University, Yamaguchi, Japan

1. Energy Conservation in Heat-Source Plants with Renovation of a Large Complex Station Building Introducing Commissioning
Harunori Yoshida, Ph.D., Member, *Non-Profit Organization Building Services Commissioning Association, Osaka, Japan*

2. Continuously Improved Energy Performance of Medium-Sized Building in a Cool Area
Noriyuki Toyohara, *TAISEI Corporation, Tokyo, Japan*

9:45 AM–10:45 AM

Seminar 11 (Intermediate)

Smart Thermostats, Energy Savings and Equipment Performance

Track: Big Data and Smart Controls

Room: Orange G

Sponsor: 6.3 Central Forced Air Heating and Cooling Systems

Chair: Lawrence Brand, Member, Frontier Energy, Davis, CA

1. How ASHRAE Standard 103 Uses Thermostat Cycling
Paul Haydock, Associate Member, *United Technologies Carrier, Indianapolis, IN*

2. How Smart Thermostats Save Energy
Will Baker, *Google Nest, Chicago, IL*

3. Cold Climate Utility Incentives and Energy Savings for Smart Thermostats
Eric Johansen, Member*, CenterPoint Energy, Minneapolis, MN*

11:00 AM–12:30 PM

Paper Session 4 (Intermediate)

Indoor Environmental Quality with an Emphasis on Thermal Comfort

Track: Ventilation, IAQ and Air Distribution Systems

Room: Orange A

Chair: Ahmed Elatar, Ph.D., Oak Ridge National Laboratory, Oak Ridge, TN

1. Indoor Environmental Quality Evaluation of an Institutional Building (OR-20-C009)
Lexuan Zhong, Ph.D., P.E., Member*, University of Alberta, Edmonton, AB, Canada*

2. Indoor Heat Stress Index Based on the Predicted Heat Strain Model and Its Application (OR-20-C010)
Yue Zou, Ph.D., P.E., CPMP, Member *and Yang Li, Donghua University, Shanghai, China*

3. Spatially Uniform Comfort from Ceiling Fans Blowing in the Upwards Direction (OR-20-C011)
Thomas C. Parkinson, Ph.D.*, Paul Raftery, Ph.D., Member and Elaina Present, University of California Berkeley, Berkeley, CA*

4. Investigating the Impact of External Solar Screens on Occupant Thermal Comfort and Pleasure: An Observational Field Study (OR-20-C012)
Niyati Naik, Student Member *and Ihab Elzeyadi, Ph.D., HBDP and BEMP, Member, University of Oregon, Eugene, OR*

5. Investigating the Impact of Plant Phytoremediation on Indoor Air Quality in Work Environments: A Meta-Analysis (OR-20-C013)
Hooman Parhizkar, Student Member *and Ihab Elzeyadi, Ph.D., HBDP and BEMP, Member, University of Oregon, Eugene, OR*

11:00 AM–12:30 PM

Paper Session 5 (Intermediate)

NY PDH TP G

Cutting Edge Modeling and Optimization

Track: Cutting Edge Approaches

Room: Orange C

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

1. Modelling of Thermally Active Walls for Building Energy Reduction (OR-20-C014)
***Brandon Field, Ph.D., Associate Member**, University of Southern Indiana, Evansville, IN*

2. On the Use of Reanalysis in ASHRAE Applications (RP-1745) (OR-20-002)
***Michael Roth, Ph.D., Member**, Klimaat, Guelph, ON, Canada*

3. Quantifying Risk with Selection of the Natural Gas Maximum Daily Quantity (OR-20-003)
***Matthew Swanson**, U.S. Army Engineer Research & Development Center, Champaign, IL*

4. Gradient Descent Approach with a Unified Metric to Find a Cohesive Optimal Solution for Optimal Fenestration Sizes (OR-20-C015)
***Sara Motamedi, Ph.D.**, Interface Engineering, San Francisco, CA*

5. Cost-Optimal Sizing and Operation of a Hybrid Heat Pump System Using Numerical Simulation (OR-20-C016)
***Noah Rauschkolb, Student Member**, Vijay Modi, Ph.D. and Patricia Culligan, Ph.D., P.E., Columbia University, New York, NY*

11:00 AM–12:30 PM

Paper Session 6 (Intermediate)

NY PDH TP G

Novel Refrigerant Lubricants and Systems

Track: Refrigeration and Refrigerants

Room: Orange B

Chair: Gurunarayana Ravi, Lennox International, Frisco, TX

1. Two-Phase Flow Boiling Heat Transfer Model for R410A and Nanolubricant Mixtures in a Smooth Tube (OR-20-C017)
***Pratik Deokar, Student Member** and Lorenzo Cremaschi, Ph.D., Member, Auburn University, Auburn, AL*

2. 125 Years of ASHRAE: What I Have Learned in the Last 35 Years Regarding Refrigerants and Lubricant Chemistry and Interactions (OR-20-C018)
***Joseph Karnaz, Member**, Shrieve Chemical Products, Inc, The Woodlands, TX*

3. Development of a Multi-Stage Two-Evaporator Transcritical Carbon Dioxide Cycle for Experimental Comparisons of Expansion Work Recovery Technologies (OR-20-C019)
***Riley B. Barta, Student Member**, Davide Ziviani, Ph.D., Member and Eckhard Groll, Dr.Ing., Fellow ASHRAE, Purdue University, West Lafayette, IN*

4. Numerical Enhancement Analyses of Refrigerator Vortex Tubes Cooling Performance (OR-20-C020)
***Essam Khalil, Ph.D., P.E., Fellow ASHRAE**, Mahmoud AbdelGhafar, P.Eng., Karam Beshay, Ph.D., P.E., and Gamal ElHarriri, Ph.D., P.E., Cairo University, Cairo, Egypt*

11:00 AM–12:30 PM

Seminar 12 (Intermediate)

NY PDH TP G

Cannabis Grow Facilities: Challenges for HVAC Design, Equipment Selection and Operation, Part 2
Track: HVAC&R Fundamentals and Applications
Room: Orange G
Sponsor: 1.5 Computer Applications, 2.2 Plant and Animal Environment
Chair: Stephen Roth, P.E., Member, Carmel Software Corp., San Rafael, CA

1. HVAC Load Calculations for Cannabis Grow Facilities
***Nadia Sabeh, P.E., Associate Member**, Dr. Greenhouse, Inc., Sacramento, CA*

2. Why Selection Software Is Essential for Sizing Equipment for Grow Facilities
***Stephen Roth, P.E., Member**, Carmel Software Corp., San Rafael, CA*

3. HVAC Equipment Selection for Cannabis Grow Facilities
***Daniel Dettmers, Member**, Quest Dehumidifiers, Madison, WI*

11:00 AM–12:30 PM

Seminar 13 (Intermediate)

NY PDH TP G

Current Practices of Grid Interactive Building Applications
Track: Cutting Edge Approaches
Room: Orlando V
Sponsor: 7.5 Smart Building Systems
Chair: Christie Kjellman, Member, Kliewer & Associates, Aliso Viejo, CA

1. Improving Net Load through Model Predictive Control of Buildings
***Greg Pavlak, Ph.D., Member**, Penn State, University Park, PA*

2. Retail Subscription Transactive Tariffs for Grid Interactive Buildings
***Ed Cazalet, Ph.D.**, Temix Inc., Los Altos, CA*

3. Unlocking Value with Grid Interactive Flexible Building Loads
***Ari Halberstadt**, Extensible Energy, Berkeley, CA*

4. The Importance of IoT for the Smart Grid
***Michel Kohanim**, Universal Devices, Inc., Encino, CA*

5. A Grid Interactive Neighborhood: Case Study
***Michael Starke, Ph.D.**, Oak Ridge National Laboratory, Oak Ridge, TN*

11:00 AM–12:30 PM

Seminar 14 (Intermediate)

Measured Stack Effect Impact on Tall, Super Tall and Mega Tall Buildings

Track: HVAC&R Fundamentals and Applications

Room: Orange F

Sponsor: 9.12 Tall Buildings

Chair: Dennis Wessel, P.E., Fellow Life Member, Retired, Cleveland, OH

1. Measured Temperature and Pressure Effects on Tall Structures.
***Duncan Phillips, Ph.D., P.E., Associate Member**, RWDI, Guelph, ON, Canada*

2. Design Basis Variations to Counteract Stack Effect in New Tall Buildings
***Mehdi Jalayerian, P.E., Member**, Environmental Systems Design, Inc., Chicago, IL*

3. Lessons Learned from Stack Effect Problems in an Existing Building
***John Carter, Member**, CPP, Fort Collins, CO*

11:00 AM–12:30 PM

Seminar 15 (Intermediate)

Overview of the New Chapter 65 in 2019 HVAC Applications Handbook: Occupant-Centric Sensing and Controls

Track: Big Data and Smart Controls

Room: Orange E

Sponsor: MTG.OBB Occupant Behavior in Buildings

Chair: Tianzhen Hong, Ph.D., Member, Lawrence Berkeley National Laboratory, Berkeley, CA

1. Collecting Real-Time Occupancy and Occupant Comfort Feedback
***Jared Langevin, Ph.D.**, Lawrence Berkeley National Laboratory, Berkeley, CA*

2. Integrating Occupant Feedback into HVAC Control Schemes
***Bing Dong, Ph.D.**, Syracuse University, Syracuse, NY*

3. Modeling and Evaluating Occupant-Centric HVAC Control Systems
***Tianzhen Hong, Ph.D., Member**, Lawrence Berkeley National Laboratory, Berkeley, CA*

11:00 AM–12:30 PM

Seminar 16 (Intermediate)

Watch Out for the Unforeseen When Designing Green

Track: High Efficiency Design and Operation

Room: Orlando VI

Sponsor: 2.8 Building Environmental Impacts and Sustainability

Chair: Janice Means, P.E., Life Member, Lawrence Technological University, Southfield, MI

1. Breathe Deeply, or Don't: Energy Conservation, Indoor Air Quality, Health and Productivity...and Legal Liability
***James Newman, BEAP, OPMP, Life Member**, Newman Consulting Group, Farmington Hills, MI*

2. Controlling Opportunistic Pathogen Growth While Achieving Energy and Water Conservation
***William J. Rhoads, Ph.D., Member**, Amy Pruden, Ph.D. and Marc A. Edwards, Ph.D., Virginia Tech, Blacksburg, VA*

3. Impacts of Sustainable Design Choices on Noise Control
***Mandy Kachur, P.E., Member**, Soundscape Engineering, Plymouth, MI*

4. Considerations When Going Green with a Historic Building
***Janice K. Means, P.E., Life Member**, Lawrence Technological University, Southfield, MI*

1:30 PM–3:00 PM

Paper Session 7 (Basic)

NY PDH TP G

Commemorating ASHRAE's 125th Anniversary: Progress of Key Industries

Track: HVAC&R Fundamentals and Applications

Room: Orange A

Sponsor: Historical Committee

Chair: Jeff Haberl, Ph.D., Fellow ASHRAE, Texas A & M University, College Station, TX

1. History of Filtration in the 20th Century: A Review of Significant Advances and Related Influences in the Advancement of the Art and Science of Filtration and Air Cleaning (OR-20-004)
Update author list to look like this:
***Marilyn A Listvan**[1], H Burroughs[2] and Brian Krafthefer, P.E., Fellow Life Member[3], (1)Listvan & Assoc, Edina, MN, (2)Building Wellness Consultancy, Inc, Atlanta, GA, (3)BCK Consulting, LLC, Stillwater, MN*

2. The History of Food Freezing (OR-20-005)
***Donald Cleland, Ph.D., Fellow ASHRAE**, Massey University, Palmerston, New Zealand*

3. The Evolution of ASHRAE's Electronic Communications and Publication Technology (OR-20-006)
***Jeff Haberl, Ph.D., BEMP, Fellow ASHRAE**[1], Art Hallstrom, P.E., BEMP, Fellow ASHRAE[2] and Steve Comstock[3], (1) Texas A & M University, College Station, TX, (2) AD Hall and Associates, Lexington, KY, (3) ASHRAE, Atlanta, GA*

1:30 PM–3:00 PM

Paper Session 8 (Intermediate)

NY PDH TP G

Utilizing Waste Heat and Thermal Management

Track: Systems and Equipment

Room: Orange B

Chair: Gurunarayana Ravi, Lennox International, Frisco, TX

1. Assessing the Performance of District Heating Networks Utilizing Waste Heat: A Review (OR-20-C021)
***Henrique R. P. Lagoeiro**, Akos Revesz, Ph.D., Affiliate, Graeme Maidment, Ph.D., P.E. and Gareth Davies, Ph.D., London South Bank University, London, United Kingdom*

2. Survey of an Exhaust Ventilation System in Combination with a Drain Water Heat Recovery for Social Housing (OR-20-C022)
Elisabeth Wieder*, *Michael Bayer, *Markus Leeb and Thomas Reiter, Dr.Ing., FH Salzburg, Puch/Salzburg, Austria*

3. Experimental and Numerical Investigation on a Novel Polymer Heat Exchanger for Pouch-Type Battery Thermal Management System (OR-20-C023)
Uk Min Han*[1] *and Hoseong Lee*[2]*, (1)Korea University, Seoul, Korea, Republic of (South), (2)Korea university, Seoul, Korea, Republic of (South)

4. Absorption Cooling for Data Centers Powered by Solid Oxide Fuel Cell Waste Heat (OR-20-C024)
Alejandro Lavernia, Student Member, *Maryam Asghari and Jacob Brouwer, Ph.D., Advanced Power and Energy Program at University of California Irvine, Irvine, CA*

5. Study on a Cooling System with Power Usage Effectiveness of 1.02x for Server Rooms (OR-20-C025)
Naoki Aizawa, BEAP, *Takasago Thermal Engineering Co.,Ltd., Kanagawa, Japan*

1:30 PM–3:00 PM

Seminar 17 (Intermediate)

NY PDH TP G

Aircraft Cabin Air Quality, Airborne Disease Exposures and Ventilation Controls
Track: Ventilation, IAQ and Air Distribution Systems
Room: Orange F
Sponsor: 4.10 Indoor Environmental Modeling, 9.3 Transportation Air Conditioning
Chair: Liangzhu (Leon) Wang, Ph.D., P.E., Member, Concordia University, Montreal, QC, Canada

1. A New Personalized Ventilation System for Airliner Cabins
Qingyan Chen, Ph.D., Life Member, *Purdue University, West Lafayette, IN*

2. Airborne Disease Exposure and Tracer Data in Aircraft Cabin
James Bennett, Ph.D., Member, *National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, U.S. DHHS, Cincinnati, OH*

3. Transient Airflow and Particle Transmission from Aircraft Lavatories
Tengfei Zhang, *Dalian University of Technology, Dalian, China*

4. Experimental Measurements and Large Eddy Simulation of Particle Deposition Distribution Around Aircraft Cabin Supply Air Nozzles
Chun Chen, Ph.D., Associate Member, *The Chinese University of Hong Kong, Hong Kong, China*

5. Analyzing the Symmetry of Airborne Pathogens Dispersion in Airplane Cabins
M.H. Hosni, Ph.D., Fellow ASHRAE, *Kansas State University, Manhattan, KS*

1:30 PM–3:00 PM

Seminar 18 (Intermediate)

Brilliant Execution of Smart Labs: How to Employ Smart Labs to Improve Safety, Reduce Energy and Make Labs Sustainable

Track: High Efficiency Design and Operation

Room: Orlando V

Sponsor: 9.10 Laboratory Systems, 7.6 Building Energy Performance, 4.3 Ventilation Requirements and Infiltration

Chair: Brad Cochran, P.E., Member, CPP Wind Engineering & Air Quality Consultants, Fort Collins, CO

1. Smart Labs Toolkit: A Guide to Enable Labs of the Future
***Rachel Romero, P.E., Member**, National Renewable Energy Laboratory, Golden, CO*

2. Advanced Technologies Used in Smart Labs to Improve Safety and Reduce Energy Consumption
***Tom Smith, Member**, 3Flow, Cary, NC*

3. Integrated Laboratory Airflow Management
***Deidre Carter, P.E.**, Lawrence Berkeley National Laboratory, Berkley, CA*

1:30 PM–3:00 PM

Seminar 19 (Intermediate)

Cutting-Edge Japanese Technologies SHASE Award for ZEB in 2019

Track: Cutting Edge Approaches

Room: Orange E

Sponsor: SHASE

Chair: Ryozo Ooka, Ph.D., Member, University of Tokyo Institute of Industrial Science, Tokyo, Japan

1. Design and Performance Verification of Green Buildings with the Aid of TABS
***Hiroshi Muramatsu**, Nikken Sekkei Ltd., Tokyo, Japan*

2. Medium-Sized Offices in Urban Areas Tackling Energy Consumption Reduction and Targeting ZEB
***Akihiko Ota**, Shimizu Corporation, Osaka, Japan*

3. Environmental Systems and Equipment Design in ZEB City Halls in Cold Regions
***Satoki Hoshino**, Nihon Sekkei, Inc., Tokyo, Japan*

1:30 PM–3:00 PM

Seminar 20 (Intermediate)

Occupant-Centric Building Design and Operation: State of the Art and Challenges, Part 2

Track: Big Data and Smart Controls

Room: Orange C

Sponsor: MTG.OBB Occupant Behavior in Buildings

Chair: Bing Dong, Ph.D., Member, Syracuse University, Syracuse, NY

1. A True Smart Home Is a Healthy Home: Curated Sleep Environment as an Example
***Jie Zhao**, Delos LLC, New York, NY*

2. Data-Driven Modelling and Research on Occupant Presence and Actions
***Bing Dong, Ph.D., Member**, Syracuse University, Syracuse, NY*

3. How Occupant Data and Assumptions Are Used in Design Calculations and Code Compliance?
***Tianzhen Hong, Ph.D., Member**, Lawrence Berkeley National Laboratory, Berkeley, CA*

4. What Do Occupants Want? Let's Ask Them
***Clayton Miller, Ph.D.**, National University of Singapore, Singapore, Singapore*

1:30 PM–3:00 PM

Seminar 21 (Intermediate)

NY PDH TP G

Putting People First: The Healing Power of Indoor Air
Track: Ventilation, IAQ and Air Distribution Systems
Room: Orlando VI
Sponsor: 5.11 Humidifying Equipment, Environmental Health
Chair: Stephanie Taylor, M.D., Member, Harvard Medical School, Infection Control Consultant, Boston, MA

1. Putting People First: The Healing Power of Indoor Air
***Stephanie Taylor, M.D., Member**, Harvard Medical School, Infection Control Consultant, Boston, MA*

2. Low Ambient Humidity Impairs Barrier Function and Innate Resistance Against Influenza Infection
***Eriko Kudo, Ph.D.**, Yale Immunobiology Laboratory, New Haven, CT*

3. Operating and Intensive Care Room Hospital Acquired Infection Prevention Safety Surveillance System
***Damon Greeley, P.E., HFDP** and Jennifer Wagner, Ph.D., OnSite-LLC, Indianapolis, IN*

1:30 PM–3:00 PM

Seminar 22 (Basic)

NY PDH TP G

Yay! For YEA! Refrigerants and Refrigeration Concepts for YEA Members, by YEA Members
Track: HVAC&R Fundamentals and Applications
Room: Orange G
Sponsor: 3.2 Refrigerant System Chemistry, 3.1 Refrigerants and Secondary Coolants, TC 3.3, TC 3.4
Chair: Christopher Seeton, Ph.D., Member, Shrieve, The Woodlands, TX

1. Refrigerant System Chemistry for Current and Future Refrigerants
***Elyse Sorenson, Associate Member**, Trane, Ingersoll Rand, La Crosse, WI*

2. A World of Choices: How to Use the Handbook to Analyze New Refrigerants for Retrofits and New Construction
***Ivan Rydkin, Member**, Daikin-America, Orangeburg, NY*

3. Refrigerants for Current and Futures Systems: New Builds
Sarah Kim, Ph.D., Member, *Arkema, Inc., King of Prussia, PA*

4. Lubrication for Current and Future Refrigerants
Jessica Jude*, The Lubrizol Corporation, Midland, MI*

3:00 PM–4:00 PM

Seminar (BOD) (Basic)

OPEN SESSION – No Badge Required
The New ASHRAE Headquarters Renovation Project – A Case Study
Track: HVAC&R Fundamentals and Applications
Room: Orange B
Sponsor: ASHRAE HQ Renovation Committee
Chair: M. Ginger Scoggins, PE, Member, Engineered Designs, Cary, NC
M. Ginger Scoggins[1], PE, Member, *Greg Walker[2] and Eric Sowers[3], LEED AP, (1)Engineered Designs, Inc., Cary, NC, (2) Houser Walker Architecture, Atlanta, GA, (3) Integral Consulting Engineering, Atlanta, GA*

3:15 PM–4:45 PM

Seminar 23 (Advanced)

NY PDH TP G

The Great Energy Predictor Shootout III
Track: HVAC&R Fundamentals and Applications
Room: Orlando VI
Sponsor: 1.5 Computer Applications, 4.7 Energy Calculations
Chair: Jeff Haberl, Ph.D., Fellow ASHRAE, Texas A & M University, College Station, TX

1. Organization of the Predictor Shootout III
Krishnan Gowri, Ph.D., Fellow ASHRAE*, BIM2BEM Solutions, Bothell, PA*

2. Value of the Predictor Shootout III Competition
Chris Balbach, P.E., BEMP, Associate Member*, Performance Systems Development, Ithaca, NY*

3. Data Collection and Result Analysis for the Predictor Shootout III
Clayton Miller, Ph.D.*, National University of Singapore, Singapore, Singapore*

Monday, February 3

8:00 AM–9:30 AM

Paper Session 9 (Basic)

NY PDH TP G

Commemorating ASHRAE's 125th Anniversary: The Evolution of Energy Modeling

Track: HVAC&R Fundamentals and Applications

Room: Orange B

Sponsor: Historical Committee

Chair: Jeff Haberl, Ph.D., Fellow ASHRAE, Texas A & M University, College Station, TX

1. 25 Year Evolution of a Worldwide Building Energy Simulation and Compliance Software Tool (OR-20-007)
***Liam Buckley, CEng, BEMP, Member**, IES Ltd., Oakland, CA*

2. History of TRANE's Trace Software (Technical OR-20-008)
***John Sustar**, TRANE, Atlanta, GA*

3. Carrier HAP and the Evolution of Energy Modeling Tools (Technical OR-20-009)
***James Pegues, Member**, Carrier UTC, Syracuse, NY*

8:00 AM–9:30 AM

Paper Session 10 (Intermediate)

NY PDH TP G

CFD Modeling for Ventilation

Track: Ventilation, IAQ and Air Distribution Systems

Room: Orange A

Chair: Hyojin Kim, Ph.D., Member, New Jersey Institute of Architecture and Design, Newark, NJ

1. CFD Application to Improve Infection Control in Office Rooms (OR-20-C026)
***Essam Khalil, Ph.D., P.E., Fellow ASHRAE**[1], Ahmed ElDegwy, Ph.D., P.E.[1], and Mohammed Sobhi, Ph.D.[2], (1) Cairo University, Cairo, Egypt, (2) Madina Higher Institute for Engineering and Technology, Cairo, Egypt*

2. Experimentally Validated CFD Analysis on the Optimal Sensor Location for the CO2-based Demand Controlled Ventilation (OR-20-C027)
***Gen Pei, Student Member** and Donghyun Rim, Ph.D., (1) Pennsylvania State University, University Park, PA, State College, PA*

3. The Effect of Boundary Conditions on Transient Airflow Patterns: A Numerical Investigation of Door Operation (OR-20-C028)
***Ehsan Mousavi, Ph.D., Associate Member** and Arup Bhattacharya, Clemson University, Clemson, SC*

4. Design Optimization for Dairy Barns Using Computational Fluid Dynamics (OR-20-C029)
***Thomas M. Thibault, Affiliate**[1], Bernardo J. Majano, P.Eng.[1], Natasha M. Lee, P.Eng.[1], Murray P. Amirault, P.Eng.[2] and Donnie Anderson[3], (1)R.V. Anderson Associates Limited, Toronto, ON, Canada, (2)R.V. Anderson Associates Limited, Moncton, NB, Canada, (3)Quality Milk Management, Sussex, NB, Canada*

8:00 AM–9:30 AM

Paper Session 11 (Intermediate)

Occupancy Sensing and Occupant Wellbeing

Track: Big Data and Smart Controls

Room: Orange C

Chair: Jon Cohen, Member, ChemTreat, Inc., Richmond, VA

1. Wi-Fi Based Occupancy Forecasting Using Clustering and Motif Identification: A Case Study (OR-20-C030)

Brodie W. Hobson, Student Member[1], *H. Burak Gunay, Ph.D., Associate Member*[1], *Araz Ashouri, Ph.D., Associate Member*[2] *and Guy Newsham, Ph.D.*[2], *(1) Carleton University, Ottawa, ON, Canada, (2) National Research Council Canada, Ottawa, ON, Canada*

2. Occupancy Sensing in Buildings through Social Media from Semantic Analysis (OR-20-C031)

Xing Lu, Student Member, *Fan Feng, Student Member and Zheng O'Neill, Ph.D., P.E., Member, University of Alabama, Tuscaloosa, AL*

3. Nationwide Energy Saving Potential Evaluation for Office Buildings with Occupant-Based Building Controls (OR-20-C032)

Zhihong Pang, Student Member[1], *Zheng O'Neill, Ph.D., P.E., Member*[2], *Yan Chen*[3], *Jian Zhang, Ph.D., Member*[4], *Bing Dong, Ph.D., Associate Member*[5], *and Hwakong Cheng, P.E., Member, Taylor Engineering LLC, Alameda, CA (1)The University of Alabama, Tuscaloosa, AL, (2)University of Alabama, Tuscaloosa, AL, (3)The Pennsylvania State University, University Park, PA, (4)Pacific Northwest National Laboratory, Richland, WA, (5)University of Texas at San Antonio, San Antonio, TX*

4. Visual Environmental Parameters Associated with Visual Satisfaction in Multiple Office Buildings (OR-20-C033)

Young Joo Son[1], *Azizan Aziz*[1], *Vivian Loftness*[1] *and Linhao Li*[2], *(1) Center for Building Performance and Diagnostics, School of Architecture, Carnegie Mellon University, Pittsburgh, PA, (2) Delos Living LLC, New York, NY*

8:00 AM–9:30 AM

Seminar 24 (Advanced)

Advances in Ground Heat Exchanger Modeling

Track: Systems and Equipment

Room: Orange F

Sponsor: Pub. & Ed. Council

Chair: Jeffrey Spitler, Ph.D., P.E., Fellow ASHRAE, Oklahoma State University, Stillwater, OK

1. Thermal Resistances of Double U-Tube Ground Heat Exchangers

Saqib Javed, Ph.D., Member, *Lund University, Lund, Sweden*

2. Long-Term Temperature Predictions in Fields of Series-Connected Boreholes Using the Analytical Finite Line Source Solution

Massimo Cimmino, *École Polytechnique de Montréal, Montréal, QC, Canada*

3. Universal Short Time g*-Functions: Generation and Application

Michel Bernier, Ph.D., Fellow ASHRAE, *Polytechnique Montréal, Montréal, QC, Canada*

8:00 AM–9:30 AM

Seminar 25 (Intermediate)

NY PDH TP G

ASHRAE Guidelines: The Path to Optimization of HVAC&R Systems and Equipment

Track: High Efficiency Design and Operation

Room: Orange G

Sponsor: 7.3 Operation and Maintenance Management, 7.9 Building Commissioning

Chair: Mina Agarabi, P.E., Member, Agarabi Engineering PLLC, New York, NY

1. Building Operations and Maintenance Training for the HVAC&R Commissioning Process

***Walter Grondzik, P.E., Fellow Life Member**, Ball State University, Muncie, IN*

2. Guideline 32: Management for High Performance Operations and Maintenance

***Orvil Dillenbeck, P.Eng., Member**, Canadian Nuclear Laboratories, Chalk River, ON, Canada*

3. Review of Training Requirements for the O&M of High-Performance Buildings

***Jaya Mukhopadhyay, Ph.D., Member**, Gilbert Kalonde and Loras O'Toole, P.E., Member, Montana State University, Bozeman, MT*

8:00 AM–9:30 AM

Seminar 26 (Intermediate)

NY PDH TP G

ASHRAE/REHVA Guidebook Towards Zero Energy Hospital Buildings

Track: Standards, Guidelines and Codes

Room: Orange E

Sponsor: 9.6 Healthcare Facilities

Chair: David Eldridge Jr., P.E., Member, Grumman/Butkus Associates, Evanston, IL

1. Guidebook Overview

***Wim Maassen**, HaskoningDHV Nederland B.V., Rotterdam, Netherlands*

2. Guidebook Approach to Zero Energy Healthcare Buildings

***Francis Mills, Member**, Frank Mills Consulting, Leyland, United Kingdom*

3. Case Studies Supporting the Zero Energy Healthcare Building Effort

***Heather Burpee, Member**, University of Washington Integrated Design Lab, Seattle, WA*

4. An Owner's Perspective on Designing for Operations

***Travis English, P.E., Member**, Kaiser Permanente, Anaheim, CA*

5. Guidebook Strategy 1

***Maya Salabasheva, P.E., Member,** Kaiser Permanente, Oakland, CA*

8:00 AM–9:30 AM

Seminar 27 (Intermediate)

Black, Grey and Almost Clean: Energy Recovery with GSHPs

Track: Cutting Edge Approaches

Room: Orlando V

Sponsor: 6.8 Geothermal Heat Pump and Energy Recovery Applications

Chair: Roshan Revankar, Melink Solar and Geo, Milford, OH

1. Case Studies of Water Source Heat Pump Systems Using Unconventional Sources
***Xiaobing Liu, Ph.D., Member**, Oak Ridge National Laboratory, Oak Ridge, TN*

2. Does Black + Grey = Green Energy?
***Stephen Hamstra, P.E., HBDP, Member**, Melink Solar and Geo, Milford, OH*

3. Recycled Water as Source Water for Geothermal Heat Pumps
***Lisa Meline, P.E., Member**, Meline Engineering Corporation, Sacramento, CA*

8:00 AM–9:30 AM

Seminar 28 (Intermediate)

Emerging Refrigerants: New Additions to the Industry

Track: Refrigeration and Refrigerants

Room: Orlando VI

Sponsor: 3.1 Refrigerants and Secondary Coolants

Chair: Ivan Rydkin, Member, Daikin-America, Orangeburg, NY

1. ASHRAE Standard 34 Additions and Evaluation of R-468A LGWP A2L for Commercial Refrigeration
***Ivan Rydkin, Member**, Daikin-America, Orangeburg, NY*

2. Very Low GWP Refrigerant R-516A for Commercial Refrigeration
***Kristopher Crosby**[1] and Sarah Kim, Ph.D., Member[2], (1)Arkema, Inc., Calvert City, KY, (2)Arkema, Inc., King of Prussia, PA*

3. Novel Nonflammable Refrigerant with GWP Less than 10
***Barbara Minor, Member**, The Chemours Company, Wilmington, DE*

4. Reduced GWP Refrigerant for Residential and Commercial Air Conditioning Systems
***Ankit Sethi, Associate Member**, Honeywell International, Buffalo, NY*

5. Designing for the Troublesome Pure Refrigerants in Standard 34
***Christopher Seeton, Ph.D., Member**, Shrieve, The Woodlands, TX*

9:45 AM–10:45 AM

Panel 2 (Basic)

Why I do Standards; and Why You Should, Too

Track: Standards, Guidelines and Codes

Room: Orlando VI

Sponsor: Standards Committee

Chair: Walter Grondzik, P.E., Fellow Life Member, ASHRAE, Atlanta, GA

1. Moderator
Walter Grondzik, P.E., Fellow Life Member[1], *Gerald J Kettler, P.E., Life Member*[2], *Richard Hall, P.E., Life Member*[3], *Meghan McNulty, P.E., Associate Member*[4] *and Sara Persily*[5], *(1)Ball State University, Muncie, IN, (2)AIR Engineering and Testing, Dallas, TX, (3)Hall Consultants LLC, Worthington, OH, (4) Servidyne, LLC, Atlanta, GA, (5)BCER Engineering, Arvada, CO*

9:45 AM–10:45 AM

Paper Session 12 (Intermediate) NY PDH TP G

Assessing Window Designs, Building Energy Benchmarking and Loads

Track: Standards, Guidelines and Codes

Room: Orange A

Chair: Parag Rastogi, Member, arbnco Ltd., Glasgow, United Kingdom

1. A Novel Simulation Framework for Comfort-Based Assessments of Window Designs (OR-20-C034)
Shengbo Zhang[1], *Jamie Fine, Ph.D., Associate Member*[1], *Marianne Touchie, Ph.D., Member*[1] *and Liam O'Brien, Ph.D.*[2], *(1) University of Toronto, Toronto, ON, Canada, (2) Carleton University, Ottawa, ON, Canada*

2. Raising the Bar: Comparing Building Energy Benchmarking Methods (OR-20-C035)
Jamie Kono, P.E., Affiliate*, Meghan McNulty, P.E., Associate Member and Barry Abramson, P.E., CPMP and BEAP, Member, Servidyne, Atlanta, GA*

3. Codes for Loads: A Path Forward (OR-20-C036)
Jim Edelson, Associate Member*, Alexi Miller, P.E., Associate Member and Kevin Carbonnier, Ph.D., New Buildings Institute, Portland, OR*

Tech Program

9:45 AM–10:45 AM

Seminar 29 (Advanced) NY PDH TP G

Assessing the Materials Chemistry of Next Generation Refrigeration Technologies

Track: Refrigeration and Refrigerants

Room: Orlando V

Sponsor: 3.2 Refrigerant System Chemistry, 3.3 Refrigerant Contaminant Control

Chair: Brad Boggess, Member, Emerson Climate Technologies, Sidney, OH

1. Microchannel Heat Exchangers: Which Manufacturing Issues Can Lead to Contamination of the HVAC System?
Bill Morton, Member*, Circle-Prosco, Bloomington, IN*

2. Metalworking Fluid Compatibility and Miscibility with Low GWP Refrigerants Compared to Legacy Refrigerants
Casey Scruggs, Associate Member*, Metalloid Corporation, Jacksonville, TX*

9:45 AM–10:45 AM

Seminar 30 (Intermediate)

NY PDH TP G

Fire Safety Challenges for Green Building Features

Track: Ventilation, IAQ and Air Distribution Systems

Room: Orange F

Sponsor: 5.6 Control of Fire and Smoke, 5.9 Enclosed Vehicular Facilities

Chair: Peter McDonnell, P.E., Member, McLure Engineering, St. Louis, MO

1. Fire Safety Challenges for Green Building Features
***Yoon Ko, Ph.D., Member**, National Research Council Canada, Ottawa, ON, Canada*

2. Smoke Control for Sustainable Buildings
***Dahai Qi, Ph.D.**, Université de Sherbrooke, Sherbrooke, QC, Canada*

3. The Study of Future Climate Change Impacts and Smart City Design
***Liangzhu Wang**, Concordia University, Montreal, QC, Canada*

9:45 AM–10:45 AM

Seminar 31 (Intermediate)

NY PDH TP G

Mitigating Uncertainty with Adaptable and Agile HVAC&R Design and Operation

Track: High Efficiency Design and Operation

Room: Orange C

Sponsor: CIBSE ASHRAE Liaison Committee

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

1. Uncertainty, Adaptability, Agility
***Lynne Jack, CEng**, Heriot-Watt University Malaysia, Putrajaya, Malaysia*

2. Industry Efforts to Ensure the Safe Application of Low GWP Flammable Refrigerants
***Thomas Watson, P.E., Presidential Fellow ASHRAE**, Daikin Applied, Staunton, VA*

3. Reducing Uncertainty in the Prediction of Building Performance Using AI Driven, Asset-Operational Hybrid Systems
***José Ortiz**, Building Research Establishment, Garston, United Kingdom*

9:45 AM–10:45 AM

Seminar 32 (Intermediate)

NY PDH TP G

Surviving Natural Disasters

Track: Standards, Guidelines and Codes

Room: Orange E

Sponsor: 2.7 Seismic and Wind Resistant Design

Chair: James Tauby, P.E., Fellow ASHRAE, Mason Industries, New York, NY

1. Flooding
***James Carlson, Fellow ASHRAE**, Seismic Source International, Omaha, NE*

2. Wind
***Panos Papavizas, Member**, Baltimore Aircoil Company, Jessup, MD*

3. Design to Survive the Next Earthquake
***Robert Simmons, P.E., Member**, Petra Seismic Design, Houston, TX*

9:45 AM–10:45 AM

Forum 1

Cybersecurity, Artificial Intelligence and HVAC?
Track: Cutting Edge Approaches
Room: Orange B
Sponsor: 1.4 Control Theory and Application
Chair: Frank Shadpour, P.E., Fellow ASHRAE, SC Engineers, Inc., San Diego, CA

9:45 AM–10:45 AM

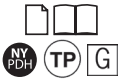
Workshop 1 (Intermediate)

IEEE/ASHRAE Guideline 21: Guide for the Ventilation and Thermal Management of Batteries for Stationary Applications
Track: Standards, Guidelines and Codes
Room: Orange G
Sponsor: 9.2 Industrial Air Conditioning
Chair: Eileen Jensen, P.E., Member, Bonneville Power Administration, Vancouver, WA

1. IEEE/ASHRAE Guideline 21, Guide for the Ventilation and Thermal Management of Batteries for Stationary Applications
***Deep Ghosh, P.E., Fellow ASHRAE**, Southern Company, Birmingham, AL*

11:00 AM–12:00 PM

Paper Session 13 (Intermediate)



Heating: Hot Water and Air
Track: Systems and Equipment
Room: Orange A
Chair: Ming Qu, Ph.D., Associate Member, Purdue University, West Lafayette, IN

1. Right-Sizing Heat Pump and Auxiliary Heating for Residential Heating Systems Based on Measured Performance Associated with Climate Zone (OR-20-C037)
***Alejandro Baez Guada, Member**[1], Paul Glanville, P.E., Associate Member[2] and Tim Kingston, Member[2], (1) Gas Technology Institute, Chicago, IL, (2) Gas Technology Institute, Des Plaines, IL*

2. Integrated Gas-Fired Heat Pump Water Heaters for Homes: Results from Field Demonstrations and System Modeling (OR-20-C038)
***Paul Glanville, P.E., Associate Member**[1], Alex Fridlyand, Ph.D., Associate Member[1], Michael Mensinger Jr.[1], Merry Sweeney[1] and Chris Keinath, Ph.D., Member[2], (1) Gas Technology Institute, Des Plaines, IL, (2) Stone Mountain Technologies, Inc., Johnson City, TN*

3. Space Heating Boiler System Performance in Post-War High-Rise Multi-Family Buildings (OR-20-C039)
***Helen Stopps, Student Member**, Marianne Touchie, Ph.D., Member, University of Toronto, Toronto, ON, Canada*

11:00 AM–12:00 PM

Paper Session 14 (Intermediate)

NY PDH TP G

Optimal HVAC Chillers and Compressors
Track: Systems and Equipment
Room: Orange B
Chair: David Yashar, Member, NIST, Gaithersburg, MD

1. Effect of Water Consumption on Optimal Control of Chiller Plants with Variable Speed Cooling Tower Fan (OR-20-010)
***Peter Armstrong, Ph.D., P.E., Fellow ASHRAE,** Omer Qureshi, Ph.D. and Khalifa University of Science and Technology, Masdar City, United Arab Emirates*

2. Optimizing Condenser Water Supply Temperature to Minimize Energy Usage (OR-20-C040)
***Melody Baglione, Ph.D.**, Andrew Chin, Andrew Mosin, Oliver Zhang, Cristian Lacey, Robert Faddoul and John Rundell, P.E., The Cooper Union, New York City, NY*

3. Analytical Model for a 10 Cylinder Swash Plate Electric Compressor (OR-20-C041)
***Mohammad Arqam**, Dzung Dao and Peter Woodfield, Griffith University, GOLD COAST, QLD, Australia*

11:00 AM–12:00 PM

Seminar 33 (Intermediate)

NY PDH TP G

Advances in Mechanical System Vibration Isolation
Track: Systems and Equipment
Room: Orlando V
Sponsor: 2.6 Sound and Vibration
Chair: Erik Miller-Klein, P.E., Member, A3 Acoustics, LLP, Seattle, WA

1. Application of Recycled Rebonded Crumb Rubber for Housekeeping Pads and Floating Floors
***Matthew Golden, Affiliate**, Pliteq Inc., Toronto, ON, Canada*

2. Using Elastomeric Foams for Mechanical System and Building Vibration Isolation
***Jessica Scarlett**, Getzner USA, Charlotte, NC*

3. Impedance Approach to Vibration Isolation Modeling: Beyond Static Deflection
***Greg Meeuwsen, Member**, Trane, La Crosse, WI*

11:00 AM–12:00 PM

Seminar 34 (Intermediate)

NY PDH TP G

Control of District Energy and Cogeneration Systems

Track: Systems and Equipment

Room: Orange C

Sponsor: 1.4 Control Theory and Application

Chair: Chad Moore, P.E., Member, Engineering Resource Group, Jackson, MS

1. Control Strategies for a Campus Cogeneration Plant with On-Site Renewable Energy Production and Thermal Energy Storage

***Charlotte Dean, P.E.**, P2S Engineering, Long Beach, CA*

2. Evaluation and Adaptation: Control and Operation of a Campus Cogeneration Plant

***Christopher Benson, P.E., Member**, The University of Utah, Salt Lake City, UT*

11:00 AM–12:00 PM

Seminar 35 (Intermediate)

NY PDH TP G

HEPA Filters and Healthcare Cleanroom Design for Compounding and Operating Room Spaces

Track: HVAC&R Fundamentals and Applications

Room: Orange G

Sponsor: 9.11 Clean Spaces

Chair: Vincent Sakraida, P.E., BR+A Consulting Engineers, St. Louis, MO

1. HEPA Filter Capture Mechanism and HEPA Type Application

***Sama Fakhimi, Ph.D.**, American Air Filters, Jeffersonville, IN*

2. Hospital USP 797 and UPS 800 Compounding HVAC Design

***Michael Prentice**, BR+A Consulting Engineers, St. Louis, MO*

3. Cleanroom Design for Operating Rooms

***Vincent Sakraida, P.E.**, BR+A Consulting Engineers, St. Louis, MO*

11:00 AM–12:00 PM

Seminar 36 (Intermediate)

NY PDH TP G

Residential Refrigerators with A3 Flammable Refrigerants Coming Soon to Your Home

Track: Refrigeration and Refrigerants

Room: Orange F

Sponsor: 8.9 Residential Refrigerators and Food Freezers

Chair: Michael Pate, Ph.D., Life Member, Texas A&M University, College Station, TX

1.Flammability Considerations of Residential Refrigerators Charged with Isobutane

***Peter Sunderland, Ph.D.**, University of Maryland, College Park, MD*

2.Servicing Home Refrigerators Operating with Flammable Refrigerants

***George Yaeger, P.E., Member**, Transform Sears Home Services, Hoffman Estates, IL*

3.Effects on Home Refrigerator Performance as Isobutane Replaces R-134a
***Michael Pate, Ph.D., Life Member**, Texas A&M University, College Station, TX*

11:00 AM–12:00 PM

Seminar 37 (Intermediate)

NY PDH TP G

Show Me the Money! Cost-Based Control of Supply Air Temperature
Track: Big Data and Smart Controls
Room: Orlando VI
Sponsor: 1.4 Control Theory and Application, 7.5 Smart Building Systems
Chair: Taraneh Shoorideh, P.E., Member, P2S Inc, Long Beach, CA

1.Field Evaluation of Cost-Responsive Supply Air Temperature Reset in a Large Office Building
***Paul Raftery, Ph.D., Member**, University of California, Berkeley, CA*

2.Simulation Analysis of Cost-Based Supply Air Temperature Reset in Multiple Buildings
***Hwakong Cheng, P.E., Member**, Taylor Engineering LLC, Alameda, CA*

11:00 AM–12:00 PM

Seminar 38 (Intermediate)

NY PDH TP G

The Surprising Effects of Outdoor Coil Fouling on Heat Transfer and Frost Formation Rate
Track: Systems and Equipment
Room: Orange E
Sponsor: 8.4 Air-to-Refrigerant Heat Transfer Equipment, 8.11 Unitary and Room Air Conditioners and Heat Pumps
Chair: Hugh Henderson Jr., P.E., Member, Frontier Energy, Cazenovia, NY

1. Air Cooled Condenser Fouling: Real World Effects
***David Yuill, Ph.D., P.E., Member**, University of Nebraska–Lincoln, Omaha, NE*

2. A Method for Simulating Real Air Side Fouling Based on Field Sample Analysis
***David Yuill, Ph.D., P.E., Member**, University of Nebraska–Lincoln, Omaha, NE*

3. How Does Fouling Affect Frost Formation and Heat Exchanger Performance on Residential Heat Pumps?
***Yifeng Hu, Student Member**, University of Nebraska Lincoln, Lincoln, NE*

11:00 AM–12:30 PM

AHR Expo Session 1 (Advanced)

State-of-the-Art Refrigeration Technologies with Lower Environmental Impact, Part 1

Track: Refrigeration and Refrigerants

Room: W311D, OCCC-West

Sponsor: 10.7 Commercial Food and Beverage Refrigeration Equipment, MTG.LowGWP Lower Global Warming Potential Alternative Refrigerants, REF, 3.1, 8.1, 10.5,10.6

Chair: Georgi Kazachki, Ph.D., Fellow ASHRAE, Dayton Phoenix Group, Inc., Dayton, OH

1. Use of Natural Refrigerants Has Benefits
***Eric M. Smith, P.Eng., Member**, IIAR, Alexandria, VA*

2. Sustainable Supermarket Refrigeration with HFOs: Reducing Emissions without Sacrificing Energy Efficiency
***Gustavo Pottker, Ph.D., Member**, Honeywell, Buffalo, NY*

3. Performance Properties of Ultralow GWP Refrigerants, High Efficiency A2L's below GWP 300 for Commercial Refrigeration
***Ivan Rydkin, Member**, Daikin-America, Orangeburg, NY*

4. Use of R-290 in Display Cases
***Timothy Anderson, Member**, Hussmann, Bridgeton, MO*

11:00 AM–12:30 PM

AHR Expo Session 2 (Basic)

Topics for Multifamily Building Performance

Track: Residential mini-track

Room: W311E, OCCC-West

Chair: Gayathri Vijayakumar, Steven Winter Associates, Inc., Norwalk, CT

1.ASHRAE Design Guide for Multifamily Residential Buildings
***Sean Denniston**, New Buildings Institute, Portland, OR*

2.Integrated Hpwh's in Multifamily Buildings
***Robb Aldrich, P.E.**, Steven Winter Associates, Norwalk, CT*

3.Central Hpwh's in Multifamily Buildings
***Shawn Oram, P.E., Member**, Ecotope, Inc., Seattle, WA*

1:00 PM–2:30 PM

AHR Expo Session 3 (Basic)

Service Practices and Design Consideration for Contaminant and Leak Control

Track: Refrigeration and Refrigerants

Room: W311D, OCCC-West

Sponsor: 3.3 Refrigerant Contaminant Control, 3.8 Refrigerant Containment

Chair: Angel Mendez, The Lubrizol Corporation, Midland, MI

1. System Reliability Is Not Fiction, It Is Simply Achievable
***Glen Steinkoenig**, Sporlan Division of Parker Hannifin, Washington, MO*

2. Observations on the Behavior of R-410A Leaks
***Daniel J. Miles, Ph.D., Associate Member**, Vacuum Technology Incorporated, Oak Ridge, TN*

3. ANSI/ASHRAE Standard 147-2015 Overview
***Danny Halel, Member**, ACCA, Arlington, VA*

4. Review of Lubricants in Refrigeration Applications and Best Practices for Avoiding System Contamination
***Amber Saylor**, The Lubrizol Corporation, Midland, MI*

1:00 PM–2:30 PM

AHR Expo Session 4 (Intermediate)

Unlocking the Potential of Mini-Split Heat Pumps: Maximizing Energy Savings through Selection, Installation and Controls
Track: Residential mini-track
Room: W311E, OCCC-West
Sponsor: Residential Building Committee
Chair: Jon Winkler, National Renewable Energy Lab, Golden, CO

1. Maximizing the Use of Ductless Mini-Split Heat Pumps in Homes with Existing HVAC Systems
***Eric Martin**, Florida Solar Energy Center, Cocoa, FL*

2. Getting the Most from Inverter Air-Source Heat Pumps
***Robb Aldrich, P.E.**, Steven Winter Associates, Norwalk, CT*

3. Implications of the Northeastern Ductless Revolution
***Dana Fischer**, University of Illinois at Urbana-Champaign, Champaign, IL*

2:15 PM–4:15 PM

Workshop 2 (Basic)

NY PDH G

Best Practices of the Mentor-Mentee Relationship
Track: HVAC&R Fundamentals and Applications
Room: Orlando VI
Sponsor: College of Fellows, YEA Committee
Chair: Vanessa Freidberg, P.E., Member, Siemens, Austin, TX

1. Best Practices of the Mentor-Mentee Relationship
***Ralph Kison, Member**, Growth Through Learning Inc., Vancouver, BC, Canada*

3:00 PM–4:30 PM

AHR Expo Session 5 (Intermediate)

Beyond Energy and Comfort and toward Healthy Homes
Track: Residential mini-track
Room: W311E, OCCC-West
Sponsor: Residential Building Committee
Chair: Paul Francisco, Member, University of Illinois at Urbana-Champaign, Champaign, IL

1. Residential Indoor Air Quality Guide: Best Practices for Home Design, Construction, Operation and Maintenance

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

2. Healthy Homes and the HVAC&R and Related Industries
***Paul Francisco, Member**, University of Illinois at Urbana-Champaign, Champaign, IL*

3. How Low Can We Go? How Close Can We Get?
***Gary Klein, Associate Member**, Gary Klein and Associates, Inc., Rancho Cordova, CA*

3:00 PM–4:30 PM

AHR Expo Session 6 (Advanced)

State-of-the-Art Refrigeration Technologies with Lower Environmental Impact, Part 2
Track: Refrigeration and Refrigerants
Room: W311D, OCCC-West
Sponsor: 10.7 Commercial Food and Beverage Refrigeration Equipment, 3.1 Refrigerants and Secondary Coolants, Refrigeration Committee, 8.1, 10.5, 10.6
Chair: Georgi Kazachki, Ph.D., Fellow ASHRAE, Dayton Phoenix Group, Inc., Dayton, OH

1. How to Design and Apply a CO2 Transcritical System in North America?
***Shitong Zha, Ph.D., Member**, Heatcraft, Stone Mountain, GA*

2. Applying A2L Refrigerants in Commercial Refrigeration Systems
***Stephen Spletzer, Member**, The Chemours Company, Wilmington, DE*

3. Design and Performance Validation of CO2 Chiller with Parallel Compression and Adiabatic Cooling in Ice Rink Application
***Adam Ciesielski**, Zero Zone, Ramsey, MN*

4. Two-Phase Ejectors to Improve Efficiency of Applications Using Low-GWP Refrigerants
***Stefan Elbel, Dr.Eng, Member**, University of Illinois at Urbana-Champaign, Urbana-Champaign, IL*

Tuesday, February 4

8:00 AM–9:30 AM

Paper Session 15 (Intermediate) NY PDH TP G

Air Handling and Ventilation Systems
Track: Ventilation, IAQ and Air Distribution Systems
Room: Orange A
Chair: Hyojin Kim, Ph.D., Member, New Jersey Institute of Architecture and Design, Newark, NJ

1. Analysis of Wind Speed Influence on Heat Recovery Efficiency of Local Decentralized Alternating Ventilation Units (OR-20-C042)
***Jurgis Zemitis, Dr.Ing.** and Anatolijs Borodinecs, Dr.Ing., Member, Riga Technical University, Riga, Latvia*

2. Arrange Your Air-Handling Unit Components Wisely (OR-20-C043)
***Stephen W. Duda, P.E., HBDP, BEAP and HFDP, Fellow ASHRAE**, Ross & Baruzzini, Saint Louis, MO*

3. Experimental Study on Particle Depositions for Different Ventilation System during Vacuuming (OR-20-C044)
Walid M. Chakroun, Ph.D., Fellow ASHRAE[1], *Sorour Alotaibi, Ph.D., Associate Member*[2], *Kamel Aboughali*[3] *and Nesreen Ghaddar, Ph.D., Member*[4], *(1) Kuwait University, Kuwait City, Kuwait, (2) Kuwait University, Kuwait, Kuwait, (3) Mechanical Engineering Department, American University of Beirut, Beirut, Lebanon, (4) American University of Beirut, Beirut, Lebanon*

4.Specifics of Modern Tunnel Ventilation System in Delhi Mass Rapid Transit System (OR-20-011)
Rajesh Kumar Jain, Member *and Ashok Garg, Delhi Metro Rail Corp. Limited, New Delhi, India*

8:00 AM–9:30 AM

Paper Session 16 (Intermediate) NY PDH TP G

Better Building Models for Energy and Economics

Track: High Efficiency Design and Operation

Room: Orange B

Chair: Jon Cohen, Member, ChemTreat, Inc., Richmond, VA

1. A Case Study for District Cooling Plant with Different Green Resources Scenarios to Reach an Optimized Energy Model (OR-20-C045)
Mohamed Heider Sr., BEMP, Member[1], *Hesham Mohamed Safwat Osman, Ph.D., Member*[2] *and Ahmed Elbaz, Ph.D.*[2], *(1) British University in Egypt, Cairo, Egypt, (2) British University in Egypt (B.U.E), Cairo, Egypt*

2. Enhanced Life Cycle Cost Analysis of Sustainable Office Buildings (OR-20-12)
Michael Zhivov, *AECOM, San Diego, CA*

3. Impact of Design Factors and Environmental Condition on the Energy Saving of HVAC Scheduling Techniques in Residential Buildings (OR-20-C046)
Ehsan Kamel, Ph.D., Associate Member*, New York Institute of Technology (NYIT), Old Westbury, NY*

4. Home Envelope Performance Evaluation Using a Data Driven Method (OR-20-013)
Junke Wang, Student Member*, Choon Yik Tang, Ph.D. and Li Song, Ph.D., P.E., Member, University of Oklahoma, Norman, OK*

5. Minimize Building Energy Use by Never Running Boilers and Cooling Towers Simultaneously (OR-20-C047)
Richard Franseen, P.E., Member*, Semi-retired Consultant, Charlotte, NC*

8:00 AM–9:30 AM

Paper Session 17 (Intermediate) NY PDH TP G

Machine Learning and Advanced Algorithms for Building Management and Control

Track: Big Data and Smart Controls

Room: Orange C

Chair: Parag Rastogi, Member, arbnco Ltd., Glasgow, United Kingdom

1. Cooling Load Disaggregation for Smart Buildings Based on Artificial Neural Network (OR-20-C048)
***Wenjie Gang, Ph.D.**, Ziwei Xiao, Ying Zhang, Jiaqi Yuan, Chong Zhang, and Xinhua Xu, Huazhong University of Science and Technology, Wuhan, China*

2. Applying Machine Learning Based Data-Driven Approach in Commercial Building Energy Prediction (OR-20-C049)
***Xi Cheng, P.E., HBDP, Associate Member**, AECOM, New York, NY*

3. A Cyber-Security Framework for Wireless-Based Controlled Smart Buildings I: Two-Position Control (OR-20-C050)
***Ming Qu, Ph.D., Associate Member** and Feng Wu, Student Member, Purdue University, West Lafayette, IN*

4. RL-HEMS: Reinforcement Learning-Based Home Energy Management System for HVAC Energy Optimization (OR-20-C051)
*Olivera Kotevska, Ph.D.[1], **Kuldeep Kurte, Ph.D.[1]**, Jeffrey Munk, Member[1], Travis Johnston, Ph.D.[1], Evan McKee[2], Kalyan Perumalla, Ph.D.[1] and Helia Zandi, Member[1], (1) Oak Ridge National Laboratory, Oak Ridge, TN, (2)University of Tennessee, Knoxville, TN*

5. Ensemble Method for Short-Term Load Forecasting Using Lstm, Svr, and Fnn and Taking into Account Seasonal Dependency (OR-20-C052)
***Hannah Fontenot, Student Member**, Vishnu Prakash, Student Member, Asad Khan, Bing Dong, Ph.D., Associate Member and Miltos Alamaniotis, Ph.D., University of Texas at San Antonio, San Antonio, TX*

8:00 AM–9:30 AM

Seminar 39 (Intermediate)

NY PDH TP G

Tech Program

Cold Climate Building Design Guide 2020 Update
Track: Standards, Guidelines and Codes
Room: Orlando V
Sponsor: TRG9 Cold Climate Building Design
Chair: Erich Binder, Member, Erich Binder Consulting Limited, Calgary, AB, Canada

1. Updates to Orginal Chapters: Cold Climate Building Design Guide
***David Lima, Member**, Aqua Air, Calgary, AB, Canada*

2. Sustainability in Cold Climates
***Frank Mills, P.E., Member**, Low-Carbon Design, Preston, United Kingdom*

3. Residential: Cold Climate Design
***Robert Bean, P.L.(Eng.), Member**, Indoor Climate Consultants Inc., Calgary, AB, Canada*

4. Cold Climate: Operations and Maintenance
***William Dean, P.Eng., Life Member**, National Research Council of Canada, Saskatoon, SK, Canada*

8:00 AM–9:30 AM

Seminar 40 (Intermediate)

NY PDH TP G

De-Mystifying Direct-Expansion Dedicated Outdoor Air Systems Performance

Track: Systems and Equipment

Room: Orange E

Sponsor: 8.10 Mechanical Dehumidification Equipment and Heat Pipes

Chair: Onieluan Tamunobere, Ph.D., Associate Member, Heat Pipe Technology, Tampa, FL

1. Updates in DX-DOAS Standards
***Eric Erdman, Associate Member**, Greenheck Fan Corporation, Schofield, WI*

2. Specifying DX-DOAS Performance and Code Compliance
***Kevin Muldoon**, KCC International, Louisville, KY*

3. DX-DOAS Applications and Equipment Variations
***Craig Burg, Member**, Desert Aire Corp, Germantown, WI*

8:00 AM–9:30 AM

Seminar 41 (Intermediate)

NY PDH TP G

Energy vs. Resilient Design Considering the Climate in the Design of HVAC&R

Track: Cutting Edge Approaches

Room: Orlando VI

Sponsor: 2.5 Global Climate Change, 2.7 Seismic and Wind Resistant Design , TC2.10 Resilience & Security

Chair: Scott Sherwood, Eco Care Corporation, New York, NY

1. Cybersecurity during a Disaster
***Carol Lomonaco, Member**, Johnson Controls, Milwaukee, WI*

2. Design Considerations for Flooding and Wildfires
***Amy Macdonald,** Thornton Tomasetti, New York, NY*

3. Climate Change Fundamentals
***Scott Sherwood**, Eco Care Corporation, New York, NY*

8:00 AM–9:30 AM

Seminar 42 (Intermediate)

NY PDH TP G

The Rise of Building EQ: Educational Facility Case Studies in Central Florida

Track: HVAC&R Fundamentals and Applications

Room: Orange F

Sponsor: 7.6 Building Energy Performance, 7.3 Operation and Maintenance Management, Building Energy Quotient Committee; Student Activities Committee; Young Engineers in ASHRAE Committee

Chair: John Constantinide, P.E., Member, Alpha MRC Architects Engineers, Merritt Island, FL

1. First Steps: Building EQ Pilot Program for Brevard Public Schools
***Bruce Lindsay, P.E., Member**, Brevard Public Schools, Viera, FL*

2. Giant Leaps: Building EQ's Application at the University of Central Florida
***Nathaniel Boyd, P.E., BEAP, Member**, University of Central Florida, Orlando, FL*

3. Lessons Learned: Training Engineering Students with Building EQ
***Hamidreza Najafi, Ph.D., Member**, Florida Institute of Technology, Melbourne, FL*

8:00 AM–9:30 AM

Seminar 43 (Intermediate)

NY PDH TP G

Ventilation Effectiveness Metrics, Part 1: Humans
Track: Ventilation, IAQ and Air Distribution Systems
Room: Orange G
Sponsor: 4.10 Indoor Environmental Modeling, MTG.ACR
Chair: Malcolm Cook, Member, Loughborough University, Loughborough, United Kingdom

1. A CFD Study Modelling Ventilation Effectiveness for Mechanical and Natural Ventilation
***Benjamin Simpson**, Loughborough University, Loughborough, United Kingdom*

2. Ventilation Performance of a Hybrid Underfloor/Chilled Sail System in an Open Office
***Mike Koupriyanov, P.E., Associate Member**, Price Industries Limited, Winnipeg, MB, Canada*

3. Ventilation Effectiveness as a Design Tool for Healthcare Ventilation
***Duncan Phillips, Ph.D., P.E., Associate Member**, RWDI, Guelph, ON, Canada*

4. Computational Fluid Dynamics Approach for Evaluation of Ventilation Effectiveness
***Kishor Khankari, Ph.D., Fellow ASHRAE**, AnSight LLC, Ann Arbor, MI*

9:45 AM–10:45 AM

Seminar 44 (Advanced)

NY PDH TP G

Advancements in Transcritical CO2: Refrigeration and Compression
Track: Refrigeration and Refrigerants
Room: Orange G
Sponsor: 8.1 Positive Displacement Compressors
Chair: Joe Sanchez, Member, Bitzer US, Inc., Flowery Branch, GA

1. Novel Testing Method for Comparison of Common Modifications to Transcritical CO2 Cycles
***Riley Barta**, Purdue University, West Lafayette, IN*

2. Advancements in Transcritical CO2 Compressors
***Alessandro Silva**, Bitzer US, Inc., Flowery Branch, GA*

9:45 AM–10:45 AM

Seminar 45 (Intermediate)

NY PDH TP G

BACnet Secure Connect: What You Need to Know!

Track: Big Data and Smart Controls

Room: Orange E

Sponsor: 1.4 Control Theory and Application, 7.5 Smart Building Systems, SSPC 135

Chair: Carol Lomonaco, Member, Johnson Controls, Milwaukee, WI

1. Introduction to BACnet/SC

***Michael Osborne, P.Eng., Member**, Reliable Controls Corporation, Victoria, BC, Canada*

2. BACnet/SC

***Bernhard Isler, Member**, Siemens Switzerland Ltd Building Technologies Division, Zug, Switzerland*

9:45 AM–10:45 AM

Seminar 46 (Intermediate)

NY PDH TP G

Cutting Edge Approaches to Integrating Modern HVAC&R Systems with Modern CHP Systems and IoT

Track: Cutting Edge Approaches

Room: Orange A

Sponsor: 1.10 Cogeneration Systems

Chair: Blake Ellis, P.E., Member, Burns & McDonnell, Kansas City, MO

1. The Cutting Edge: Optimizing Integrated HVAC&R and CHP Operations Using Iot

***Gearoid Foley, Member**, Integrated CHP Systems Corp., Princeton, NJ*

2. The Cutting Edge: Using Iot to Reduce Risk: Introducing the U.S. Department of Energy's Packaged CHP System Catalog

***Richard Sweetser, Life Member**, Exergy Partners Corp., Herndon, VA*

3. The Cutting Edge: New Micro-CHP Systems Are Changing Commercial Enterprises

***Michael Alfano**, Yanmar America Corp., Adairsville, GA*

9:45 AM–10:45 AM

Seminar 47 (Intermediate)

NY PDH TP G

Effective Control of Active Chilled Beam Systems

Track: Systems and Equipment

Room: Orange C

Sponsor: 5.3 Room Air Distribution

Chair: Kenneth Loudermilk, P.E., Member, Titus, Plano, TX

1. Overview of Active Beam Systems

***Kenneth Loudermilk, P.E., Member**, Titus, Plano, TX*

2. Airside Control of Active Beam Systems

***Hugh Crowther, Member**, Swegon North America, Inc., Markham, ON, Canada*

3. Water Side and Condensation Control of Active Beam Systems

***Nick Searle, Member**, Titus, Plano, TX*

9:45 AM–10:45 AM

Seminar 48 (Basic)

NY PDH TP G

Fuel in a Renewable Future

Track: Cutting Edge Approaches

Room: Orlando V

Sponsor: 6.10 Fuels and Combustion

Chair: Alex Fridlyand, Ph.D., Associate Member, Gas Technology Institute, Des Plaines, IL

1. Renewable Natural Gas for GHG Emission Reduction in the Built Environment

***Alex Fridlyand, Ph.D., Associate Member**, Gas Technology Institute, Des Plaines, IL*

2. Liquid Renewable Fuels

***Thomas Butcher, Ph.D., Fellow ASHRAE**, Brookhaven National Laboratory, Upton, NY*

3. Growth of the Use of Biomass Solid Fuels: Technologies

***Rebecca Trojanowski**, Brookhaven National Laboratory, Upton, NY*

4. Growth of the Use of Biomass Solid Fuels: Emissions

***Patricia Fritz, Member**, New York State Department of Health, Albany, NY*

9:45 AM–10:45 AM

Seminar 49 (Intermediate)

NY PDH TP G

Linking Standard 100 with Latest Standard 90.1: Energy Efficiency in Existing and New Buildings

Track: Standards, Guidelines and Codes

Room: Orange B

Sponsor: SSPC 90.1

Chair: Chonghui Liu, P.E., Member, Popli Design Group, Syracuse, NY

1. Energy Efficiency Measures from Standard 100 to Latest Standard 90.1

***Chonghui Liu, P.E., Member**, Popli Design Group, Syracuse, NY*

2. Latest Standard 90.1 and Energy Efficiency Practices

***Jeff Boldt, P.E., HBDP, Fellow ASHRAE**, IMEG Corp, Madison, WI*

9:45 AM–10:45 AM

Seminar 50 (Intermediate)

NY PDH TP G

“Why Did I Take Thermodynamics?” Practical Applications to HVAC&R Equipment

Track: HVAC&R Fundamentals and Applications

Room: Orlando VI

Sponsor: 8.1 Positive Displacement Compressors

Chair: Alex Schmig, Member, Trane, La Crosse, WI

1. Compressor Design Acceleration Using Comprehensive Modeling Techniques

***Craig Bradshaw, Ph.D., Member**, Oklahoma State University, Stillwater, OK*

2. Advanced Modeling of Fin-and-Tube Heat Exchangers
***Omer Sarfraz, Student Member**, Oklahoma State University, Stillwater, OK*

3. Mechanistic Modeling of Vapor Compression Cycles
***Davide Ziviani, Ph.D., Member**, Purdue University, West Lafayette, IN*

9:45 AM–10:45 AM

Seminar 51 (Basic)

NY PDH TP G

Why Isn't My Fan Working? The Complex World of Fan/System Interactions

Track: Ventilation, IAQ and Air Distribution Systems

Room: Orange F

Sponsor: 5.1 Fans, 5.9 Enclosed Vehicular Facilities

Chair: Jaime Yeh, P.E., Associate Member, Twin City Fan Companies, Ltd., Minneapolis, MN

1. Fan and System Curve Basics and Intro to System Effects
***Brent Fullerton**, Loren Cook Company, Springfield, MO*

2. A Note to My Younger Self: What a New Engineer Should Know about System Effects
***Jay Eldridge, Member**, Daikin Applied, Minneapolis, MN*

3. Stability and System Interactions with Axial Fans
***Michael Feuser, P.E., Member**, Twin City Clarage, Inc., Pulaski, TN*

11:00 AM–12:30 PM

Paper Session 18 (Intermediate)

NY PDH TP G

Energy Savings Under Real-World Operation

Track: Cutting Edge Approaches

Room: Orange C

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

1.Optimize a Chilled Water Plant with Magnetic-Bearing Variable Speed Chillers (OR-20-014)
***Lei Wang, Ph.D., P.E., Member**[1], Yasuko Sakurai[1] and David Claridge, Ph.D., P.E., Fellow ASHRAE[2], (1) Utilities & Energy Services, Texas A&M University, College Station, TX, (2) Texas A&M University, College Station, TX*

2.Potential Building Reheat Energy Saving Determination in Hot and Humid Climates (OR-20-015)
***Xiaoli Li** and Juan Carlos Baltazar, Texas A&M University, College Station, TX*

11:00 AM–12:30 PM

Paper Session 19 (Intermediate) NY PDH TP G

Creating Better IEQ through Ventilation

Track: Ventilation, IAQ and Air Distribution Systems

Room: Orange A

Chair: Lorenzo Cremaschi, Ph.D., Member, Auburn University, Auburn, AL

1. Mass Balance Analysis of Air Change Rate and Space Volume on Contaminant Dilution (OR-20-C055)
***Kishor Khankari, Ph.D., Fellow ASHRAE**, AnSight LLC, Ann Arbor, MI*

2. Restroom Ventilation Schemes: Energy Implications (OR-20-C057)
***Travis English, P.E., Member**, Kaiser Permanente, Anaheim, CA*

3. Investigation of Quantitative Relationships between Occupant Satisfaction and Ventilation-Related Household Characteristics in California Homes (OR-20-C058)
***Yang-Seon Kim, Ph.D., Member**[1], Brett Singer, Ph.D., Member[2], Wanyu Chan, Ph.D.[2] and Iain Walker, Ph.D., Fellow ASHRAE[3], (1) Wichita State University, Wichita, KS, (2) Lawrence Berkeley National Laboratory, Berkeley, CA*

4. Investigating How Occupancy and Ventilation Mode Influence the Dynamics of Indoor Air Pollutants in an Office Environment (OR-20-C059)
***Jinglin Jiang, Student Member**[1], Tianren Wu, Student Member[1], Danielle Wagner, Student Member[1], Philip Stevens, Ph.D.[2], Heinz Huber, Ph.D.[3], Antonios Tasoglou, Ph.D.[3] and Brandon Boor, Ph.D., Associate Member[1], (1) Purdue University, West Lafayette, IN, (2) Indiana University, Bloomington, IN, (3) RJ Lee Group, Monroeville, PA*

Tech Program

11:00 AM–12:30 PM

Paper Session 20 (Intermediate) NY PDH TP G

Heat Pumps and Hybrid Systems

Track: Systems and Equipment

Room: Orange B

Chair: Ming Qu, Ph.D., Associate Member, Purdue University, West Lafayette, IN

1. Energy, Environmental, Economic Evaluation of Residential Building with Micro-CHP in South Korea (OR-20-C060)
***Yujun Jung** and Hoseong Lee, Korea university, Seoul, Korea, Republic of (South)*

2. Opportunities for Hybrid Systems: Natural Gas Furnace + Air Source Heat Pump + Smart Switching Controls (OR-20-C061)
***Jeremy Sager**, Natural Resources Canada, Ottawa, ON, Canada*

3. Initial Assessment of a 5th Generation District Energy Network in Central London (OR-20-C062)
***Akos Revesz, Ph.D., Affiliate**[1], Catarina Marques, Ph.D.[1], Gareth Davies, Ph.D.[1], Rodrigo Matabuena[2], Phil Jones, Ph.D.[3], Chris Dunham[4] and Graeme Maidment, Ph.D., P.E.[1], (1)London South Bank University, London, United Kingdom, (2)Islington Council, London, United Kingdom, (3)Building Energy Solutions, London, United Kingdom, (4)Carbon Descent, London, United Kingdom*

4. Dynamic Modelling and Performance Evaluation of a Chemisorption Heat Pump for Cold Climate (OR-20-C063)
Zhiyao Yang, Student Member[1], *Ming Qu, Ph.D., Associate Member*[1] *and Kyle Gluesenkamp, Ph.D., Associate Member*[2], *(1) Purdue University, West Lafayette, IN, (2) Oak Ridge National Laboratory, Oak Ridge, TN*

5. Optimization of Design Solutions for Surplus Heating and Cooling System in Combination with Ground Source Heat Pump/Chillers (OR-20-C064)
Trond Thorgeir Harsem, P.Eng., Member[1], *Merethe Cecilie Lind, CEng, Affiliate*[1], *Karoline Husevåg Kvalsvik, P.Eng.*[1], *Annette Fagerhaug Stephansen, Dr.Ing., P.Eng.*[2] *and Jan Kocbach, Dr.Ing.*[3], *(1)Norconsult AS, Sandvika, Norway, (2)Norconsult AS, Bergen, Norway, (3)Christian Michelsen Research, Bergen, Norway*

11:00 AM–12:30 PM

Seminar 52 (Intermediate) NY PDH TP G

How Big Are the Climate Variations Within a City and How Much Do They Impact Building Energy Use?

Track: HVAC&R Fundamentals and Applications

Room: Orange G

Sponsor: 4.2 Climatic Information

Chair: Yu Joe Huang, Member, White Box Technologies, Inc., Moraga, CA

1. Generating High-Resolution Urban Microclimate Data for Building Energy Simulation at a City Scale
Evyratar Erell, Ph.D.*, Ben Gurion University, Beer Sheva, Israel*

2. Impacts of Urban Morphology on Microclimate and Building Energy Use
Melissa Allen-Dumas*, Oak Ridge National Laboratory, Oak Ridge, TN*

3. Comparison of Meso-Scale Modeling Simulations to Measurements of Urban Climate Variations
Joe Huang, BEMP, Member*, White Box Technologies, Inc., Moraga, CA*

4. The Impact of Trees on Passive Survivability during Extreme Heat Events in Warm and Humid Regions
Ulrike Passe, AIA, Associate Member*, Iowa State University, Ames, IA*

11:00 AM–12:30 PM

Seminar 53 (Intermediate) NY PDH TP G

Impact of Revised Standards an HRV/ERV

Track: Standards, Guidelines and Codes

Room: Orlando VI

Sponsor: 5.5 Air-to-Air Energy Recovery

Chair: Marc Tardif, P.Eng., Member, Innergytech Inc., Drumminville, QC, Canada

1. What Changed in Standard 90.1 When It Comes to ERV?
Adam Fecteau, Member*, Aldes, Saint-Léonard-d'Aston, QC, Canada*

2. Latest Developments in ASHRAE Standard 84, Method of Testing Air-to-Air Heat/Energy Exchangers
***Mathew Friedlander, P.Eng., Associate Member**, RenewAire LLC, Waunakee, WI*

3. Latest Developments in Standard 62.1, Ventilation and Indoor Air Quality
***Mo Afshin, P.Eng., Member**, CORE Energy Recovery Solutions, Vancouver, BC, Canada*

11:00 AM–12:30 PM

Seminar 54 (Advanced)

NY PDH TP G

Lubricants and Lubrication: What Is Important for Lower GWP Refrigerants?

Track: Refrigeration and Refrigerants

Room: Orange F

Sponsor: 3.4 Lubrication, 8.1 Positive Displacement Compressors, 3.2 System Chemistry;3.3 Refrigerant Contaminant Control; MTG Low GWP

Chair: Joseph Karnaz, Member, Shrieve Chemical Products, Inc, The Woodlands, TX

1. The Chemistry of Refrigeration Lubricants for Low GWP Refrigerants
***Edward Hessell, Ph.D., Member**, Lanxess Solutions US, Inc., Naugatuck, CT*

2. Lubricant Strategies for Lower GWP Refrigerants
***Joseph Karnaz, Member**, Shrieve Chemical Products, Inc, The Woodlands, TX*

3. Revisiting the Chemical Stability of Refrigerants and Lubricants
***Julie Majurin, Member**, CPI Fluid Engineering, Midland, MI*

4. Effects of the Low GWP Refrigerants on Screw Compressor Lubrication Systems
***Kevin Hughes**, Ingersoll Rand Trane Commercial HVAC, La Crosse, WI*

11:00 AM–12:30 PM

Seminar 55 (Intermediate)

NY PDH TP G

The Future of Data Center Infrastructure Management Tools

Track: Big Data and Smart Controls

Room: Orange E

Sponsor: 9.9 Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment

Chair: Nick Gangemi, Life Member, Primary Integration, Rochester, NY

1. The State of Modern Data Center Infrastructure Management Tools
***Christian Pastrana, P.E., Associate Member**, Digital Realty | Consultant, New York, NY*

2. ASHRAE DCIM Compliance for IT Equipment
***Dustin Demetriou, Ph.D., Member**, IBM, Poughkeepsie, NY*

3. Getting DCIM to Talk through Metrics: Bursting the Data Bubble
***Mark Seymour, Member**, Future Facilities, London, United Kingdom*

11:00 AM–12:30 PM

Seminar 56 (Intermediate)

The Magical Powers of Integration: An Introduction to the New and Improved Handbook Chapter on Integrated Project Delivery

Track: HVAC&R Fundamentals and Applications

Room: Orlando V

Sponsor: 7.1 Integrated Building Design, 7.2 HVAC&R Construction & Design Build Technologies, TC 7.9

Chair: Rachel Romero, P.E., Member, National Renewable Energy Laboratory, Golden, CO

1. Why IPD, What's the Alternative?
***Rachel Romero, P.E., Member**, National Renewable Energy Laboratory, Golden, CO*

2. What Do You Know When You 'Don't Know Anything' about Integrated Project Delivery?
***Stephen Pope**, CSV Architects, Ottawa, ON, Canada*

3. Stirring up the Enchanting Principles and Practices of Integrated Project Management
***Lianne Cockerton, P.Eng.**, Martin Roy et Associés, Montreal, QC, Canada*

4. The Charms of Your Team in an Integrated Project
***David Allen**, Allen Consulting, Chelmsford, MA*

1:30 PM–3:00 PM

Debate 2 (Advanced)

College of Fellows Debate: Designers Have No Obligation to Make Maintenance and Operations an Important Consideration in Design

Track: Systems and Equipment

Room: Orlando VI

Sponsor: 1.7 Business, Management & General Legal Education, 7.3 Operation and Maintenance Management, College of Fellows

Chair: Larry Spielvogel, P.E., Fellow Life Member, Consulting Engineer

Panelists: Bala Cynwyd, PA, E. Mitchell Swann, P.E., Member, MDCSystems, Paoli, PA, Mina Agarabi, P.E., Member, Agarabi Engineering PLLC, New York, NY, Don Beaty, P.E., Fellow ASHRAE, DLB Associates, Eatontown, NJ and Wade Conlan, P.E., BCXP, CPMP, Member, Hanson Professional Services, Maitland, FL

3:15 PM–4:45 PM

Seminar 57 (Intermediate) NY PDH TP G

The History of the Use of Air Changes per Hour in HVAC Codes, Standards and Guidelines

Track: Ventilation, IAQ and Air Distribution Systems

Room: Orlando VI

Sponsor: MTG.ACR, TC 9.6, TC 9.11, SSPC 62.1

Chair: Roger Lautz, P.E., Member, Affiliated Engineers, Inc., Madison, WI

1. The History of Health Care Ventilation
***Travis English, P.E., Member**, Kaiser Permanente, Anaheim, CA*

2. The History of Cleanroom Air Change Rates
***Phil Naughton, Member**, Applied Materials Inc, Austin, TX*

3. Ventilation Metrics in Standard 62 over the Years
***Andrew Persily, Ph.D., Fellow Life Member**, National Institute of Standards and Technology, Gaithersburg, MD*

4. The History of Ventilation Terminology
***Clifford Cooper, Member**, Cooper Associates, Kingston, NY*

Wednesday, February 5

8:00 AM–9:30 AM

Paper Session 21 (Intermediate) NY PDH TP G

Airflow Measurement in Ducts and Fans

Track: Ventilation, IAQ and Air Distribution Systems

Room: Orange A

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

1. Pressure Loss Measurements in Typical Flexible and Sheet Metal Light-Commercial Duct Systems (OR-20-016)
***Stephen Idem, Ph.D., Member**, Chaitanya Kodali and Avinash Paruchuri, Tennessee Tech University, Cookeville, TN*

2. A Simple Airflow and Power Model of Fan Coil Units with Permanent Split Capacitor Motors (OR-20-017)
***Dennis O'Neal, Ph.D., P.E., Fellow ASHRAE**[1] and Peng Yin, Ph.D., Associate Member[2], (1) Baylor University, Waco, TX, (2)University of Louisiana at Lafayette, Lafayette, LA*

3. Laboratory Performance Measurement of Blowers with Electronically Commutated Motors in Horizontal Low-Profile Fan Coil Units (RP-1741) (OR-20-018)
***Peng Yin, Ph.D., Associate Member**[1], Beau Derouen[1], Albert McBride[1] and Dennis O'Neal, Ph.D., P.E., Fellow ASHRAE[2], (1) University of Louisiana at Lafayette, Lafayette, LA, (2) Baylor University, Waco, TX*

4. Loss Coefficients for Internal Reinforcements Installed in a Phenolic Duct System (RP-1764) (OR-20-019)
***Stephen Idem, Ph.D., Member** and Avinash Paruchuri, Tennessee Tech University, Cookeville, TN*

8:00 AM–9:30 AM

Paper Session 22 (Intermediate)

Energy Master Planning Concept and Case Studies

Track: Cutting Edge Approaches

Room: Orange B

Chair: Alexander Zhivov, Ph.D., US Army Engineer Research and Development Center, Champaign, IL

1. Energy Master Planning: Applying Framing Goals and Constraints to Scope Your Solution Options (OR-20-020)
***Terry Sharp, P.E.**, Oak Ridge National Laboratory, Oak Ridge, TN*

2. Integration of Resilience Goals into Energy Master Planning Framework for Communities (OR-20-021)
***Amanda Wachtel**, Sandia National Laboratories, Albuquerque, NM*

3. Energy Master Planning for Resilient Public Communities: Best Practices from U.S. Military Installations (OR-20-022)
***Angela Urban** and Alexander Zhivov, Ph.D., US Army Engineer Research and Development Center, Champaign, IL*

3. Net Zero Energy Strategies and Planning Support Tools for Campuses and Residential Neighborhoods in Germany (OR-20-023)
***Karin Schakib-Ekbatan**[1] and Ruediger Lohse, P.Eng.[2], (1)The Institute for Resource Efficiency and Energy Strategies, Karlsruhe, Germany, (2)Leiter Contracting, Karlsruhe, Baden-Württembe, Germany*

8:00 AM–9:30 AM

Seminar 58 (Intermediate)

Best Practices for Ceiling Fan Comfort Cooling

Track: High Efficiency Design and Operation

Room: Orlando V

Sponsor: 2.1 Physiology and Human Environment, 5.1 Fans, SPC-216P, SSPC-55

Chair: Gwelen Paliaga, P.E., Member, TRC Advanced Energy Services, Oakland, CA

1. Publicly Available Ceiling Fan Design Guide and Tool
***Paul Raftery, Ph.D., Member**, University of California, Berkeley, CA*

2. Staging Ceiling Fans and Air Conditioning for Energy Savings and Comfort
***Dana Miller, Student Member**, Center for the Built Environment, Berkeley, CA*

3. Human Interactions with Ceiling Fans and Smart Thermostats: Learnings from Case Studies in Office Buildings
***Sonja Salo**, University of California Berkeley Center for the Built Environment, Berkeley, CA*

4. Selecting Ceiling Fans Based on ASHRAE Standard 216 Performance Metrics
***Christian Taber, Member**, Big Ass Fans, Lexington, KY*

5. Application and Design Consideration for Ceiling Fan and HVAC Integration
***Stet Sanborn, AIA**, Smith Group, San Francisco, CA*

8:00 AM–9:30 AM

Seminar 59 (Intermediate)

Considerations for Low Charge Ammonia Systems

Track: Refrigeration and Refrigerants

Room: Orange G

Sponsor: 10.1 Custom Engineered Refrigeration Systems

Chair: Tom Wolgamot, P.E., Member, DC Engineering, Missoula, MT

1. Design Applications of Low Charge Package Systems
***John Gallaher**, Guentner, US, Atlanta, GA*

2. Use of Remote Distributed Units
***Bruce Griffith**, Frick Industrial Refrigeration, Waynesboro, PA*

3. Advancements in Ammonia Chiller and Separator Designs
***Grecia Ayala**, Alfa Laval, Scarborough, ON, Canada*

4. Low Charge Ammonia Retrofit Lessons Learned
***Doug Scott, Member**, VaCom Technologies, La Verne, CA*

8:00 AM–9:30 AM

Seminar 60 (Intermediate)

Control for Grid Interactive Buildings: A Look Toward the Future

Track: Big Data and Smart Controls

Room: Orange E

Sponsor: 7.5 Smart Building Systems, 1.4 Control Theory and Application

Chair: Michael Brambley, Ph.D., Fellow ASHRAE, Pacific Northwest National Laboratory, Richland, WA

1. Implementation of Dynamic Load Control to Maximize Renewable Penetration
***Teja Kuruganti, Ph.D.**, Oak Ridge National Laboratory, Oak Ridge, TN*

2. Transactive Control and Coordination for Commercial Building Systems
***Srinivas Katipamula, Ph.D., Fellow ASHRAE**, Pacific Northwest National Laboratory, Richland, WA*

3. Demystifying Transactive Energy Systems from a Control Perspective: Glossary, Principle and Application
***Jianming (Jamie) Lian, Ph.D.**, Pacific Northwest National Laboratory, Richland, WA*

4. Home Energy Automation for Energy Efficiency and Demand Response
***Dane Christensen, Ph.D., Member**, National Renewable Energy Laboratory, Golden, CO*

8:00 AM–9:30 AM

Seminar 61 (Advanced)

NY PDH TP G

Outliers Detection Techniques and their Benefits in Data-Driven Modeling

Track: Big Data and Smart Controls

Room: Orange C

Sponsor: 4.7 Energy Calculations

Chair: Bass Abushakra, Ph.D., Member, United States Military Academy, West Point, NY

1. Overview of Outlier Detection Techniques with Applications to HVAC&R
***T. Agami Reddy, Ph.D., Fellow ASHRAE*, Arizona State University, Tempe, AZ**

2. A Case Study on the Outliers Detection and Rejection in Data-Driven Baseline Modeling of Building Energy Performance
Bass Abushakra, Ph.D., Member, *United States Military Academy, West Point, NY*

3. Whole Building Energy Data Quality Assurance through an Energy Balance Loads Approach
Juan-Carlos Baltazar, Ph.D., BEMP, Member, *Texas A&M University, College Station, TX*

4. Machine Learning for Anomaly Detection in Subjective Thermal Comfort Votes
Zhe Wang, Ph.D., *Lawrence Berkeley National Laboratory, Berkeley, CA*

8:00 AM–9:30 AM

Seminar 62 (Basic)

NY PDH TP G

REAL Alternatives 4 LIFE: Refrigerant Emissions, Leakage and Good Practice Training Program for Low GWP Alternative Refrigerants

Track: Refrigeration and Refrigerants

Room: Orange F

Chair: Didier Coulomb, Institute of Refrigeration, Paris, France

1. Opportunities and Barriers to the Adoption of Low GWP Refrigerants
Graeme Maidment, Ph.D., P.E., *London South Bank University, London, United Kingdom*

2. Why Real Alternatives
Raluca Sisiu, *Institute of Refrigeration, Carshalton, United Kingdom*

3. Skills Needs and Training
Marco Buoni, *AREA and ATF, Alessandria Area, Italy*

4. Elearning Demonstration
Miriam Rodway, *Institute of Refrigeration, Carshalton, United Kingdom*

5. Introduction from the International Institute of Refrigeration
Didier Coulomb, *Institute of Refrigeration, Paris, France*

8:00 AM–9:30 AM

Seminar 63 (Intermediate)

Ventilation Effectiveness Metrics, Part 2: Equipment

Track: Ventilation, IAQ and Air Distribution Systems

Room: Orlando VI

Sponsor: 4.10 Indoor Environmental Modeling, 9.9 Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment

Chair: Malcolm Cook, Member, Loughborough University, Loughborough, United Kingdom

1. Ventilation Effectiveness Is Inappropriate for Data Centers, True or False?

***Mark Seymour, Member**, Future Facilities, London, United Kingdom*

2. The Capture Index Cooling-Performance Metric for Data Centers

***James W. VanGilder, P.E., Member**, Schneider Electric, Andover, MA*

3. Air Distribution and Cooling in a Battery Storage Facility

***Mike Koupriyanov, P.E., Associate Member**, Price Industries Limited, Winnipeg, MB, Canada*

4. Using Computational Fluid Dynamics to Model Capture Efficiency of Domestic Range Hoods

***Sammy Meleika**, Texas A&M University, College Station, TX*

9:45 AM–10:45 AM

Paper Session 23 (Intermediate)

Cooling Towers and Water Energy Designs

Track: Cutting Edge Approaches

Room: Orange B

Chair: Yunho Hwang, Ph.D., Fellow ASHRAE, University of Maryland, College Park, MD

1. Legionella Intervention: Water Security and Resilience in Building Systems (OR-20-C065)

***Richard Benkowski, Member**[1], Kurt Steenhoek[2], Gregory Ballay[3], Chris Carter[4] and Scott Hamilton[5], (1)United Association Department of Education, Annapolis, MD, (2)United Association, Annapolis, MD, (3)Allegheny Valley Hospital, Natrona Heights, PA, (4)Murphy Company, St. Louis, MO, (5)ASSE, Mokena, IL*

2. A Water-Energy Nexus Approach to Integrated Design and Operation of Water Streams in Commercial Buildings (OR-20-C066)

*Caroline Menard, Amirreza Heidari and **Dolaana Khovalyg, Ph.D., Associate Member**, Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland*

3. Measurements of Spray Water Evaporation Rates for an Inflatable Fabric Duct Cooling Tower (OR-20-24)

***Steve Idem, Ph.D., Member**[1], Steven Duong[2], Robert Craven[3] and Steve Garner[3], (1)Tennessee Tech University, Cookeville, TN, (2) Nissan Inc., Smyrna, TN, (3)LTA Projects, Cookeville, TN*

9:45 AM–10:45 AM

Paper Session 24 (Intermediate)

Heat Transfer and Heat Exchangers

Track: HVAC&R Fundamentals and Applications

Room: Orange A

Chair: Paul A. Torcellini, Ph.D., Member, National Renewable Energy Laboratory, Golden, CO

1. Temperature Measurement Correction for the Determination of the Effectiveness of Fixed-Bed Regenerators for HVAC Applications (OR-20-C067)

***Hadi Ramin**, University of Saskatchewan, Saskatoon, SK, Canada*

2. Development of New Accelerated Corrosion Test(s) for All-Aluminum Microchannel and Tube and Fin Heat Exchangers, Part 1: Comprehensive Literature Review (Technical OR-20-025)

***Seifollah Nasrazadani**, University of North Texas, Denton, TX*

3. Numerical Study on the Effect of Low Frequency Vibration and Gravity on the Bubble Detachment (OR-20-C068)

***Kai Han, Ph.D., P.E., Member**, IngersollRand, Tyler, TX*

9:45 AM–10:45 AM

Seminar 64 (Intermediate)

Building Energy Modeling Software Accuracy Testing with ASHRAE Standard 140: Methodology, Overview and Recent Developments

Track: Standards, Guidelines and Codes

Room: Orange C

Sponsor: 4.7 Energy Calculations, SSPC140

Chair: Ralph Muehleisen, Ph.D., P.E., Member, Argonne National Laboratory, Lemont, IL

1. ANSI/ASHRAE Standard 140 Method of Test for the Evaluation of Building Energy Analysis Computer Programs: Overview and Methodology

***Ron Judkoff, Member**, National Renewable Energy Laboratory, Golden, CO*

2. New Standard 140 Airside HVAC Equipment Modeling Test Cases

***Joel Neymark, P.E., Member**, J. Neymark & Associates, Golden, CO*

9:45 AM–10:45 AM

Seminar 65 (Intermediate)

Climate Adaptation: Project Risk Assessments and Solutions

Track: Cutting Edge Approaches

Room: Orlando V

Sponsor: 2.10 Resilience and Security

Chair: Jason DeGraw, Ph.D., Member, Oak Ridge National Laboratory, Oak Ridge, TN

1. Designing with Projected Climatic Data

***Lisa Matthiessen**, HGA, Los Angeles, CA*

2. Resilient Engineering Design Is Flexible and Adaptive
***Sean Lawler, P.E.**, AEI, Seattle, WA*

3. The Reli Resilient Design Rating System
***Douglas Pierce AIA**, Perkins+Will, Minneapolis, MN*

9:45 AM–10:45 AM
Seminar 66 (Basic)

NY PDH TP G

Do Not Be Stumped by Pumps!
Track: Systems and Equipment
Room: Orange F
Sponsor: 6.1 Hydronic and Steam Equipment and Systems
Chair: Jessica Mangler, P.E., Member, Affiliated Engineers, Inc., Seattle, WA

1. Pump Issues? Let's Clear the Water
***Stan Kutin, Member**, Xylem Bell & Gossett, Morton Grove, IL*

2. Is Your Pump Knowledge Leading or Lagging?
***David Lee, P.Eng., Member**, Armstrong Fluid Technology, Toronto, ON, Canada*

9:45 AM–10:45 AM
Seminar 67 (Intermediate)

NY PDH TP G

Innovative Technologies and Design for Shell and Tube Heat Exchangers
Track: Systems and Equipment
Room: Orange G
Sponsor: 8.5 Liquid-to-Refrigerant Heat Exchangers, 1.3 Heat Transfer and Fluid Flow
Chair: Kashif Nawaz, Ph.D., Associate Member, Oak Ridge National Laboratory, Oak Ridge, TN

1. Advances in Heat Transfer Using Enhanced Chiller Tubes
***Andreas Knoepfler, Associate Member**, Wieland-Werke AG, Ulm, Germany*

2. An Axial Resistance-Varying Method for Improved Quantification of Enhanced Surface Condenser Tube Performance
***Cameron Nelson, Associate Member**, Johnson Controls Inc, New Freedom, PA*

3. Boiling of Ammonia in a Vertical Enhanced Tube Bundle Under Annular Flow
***Adnan Ayub, P.E., Member**, Isotherm, Inc., Arlington, TX*

9:45 AM–10:45 AM
Seminar 68 (Intermediate)

NY PDH TP G

Reducing Duct Leakage: An Overview of Materials, Methods and Expectations
Track: Ventilation, IAQ and Air Distribution Systems
Room: Orange E
Sponsor: 5.2 Duct Design
Chair: Bob Reid, Spiral Pipe of Texas, Spring, TX

1. Duct Sealants
***Tim Eorgen, Member**, Carlisle Hardcast, Wylie, TX*

2. How to Seal Ducts
***Randy Young, Member**, Northern California Joint Apprenticeship Training Program, Sacramento, CA*

3. What to Expect from Sealed Duct Systems
***Chris Ruch, Member**, National Energy Management Institute (NEMI), Fairfax, VA*

11:00 AM–12:30 PM

Paper Session 25 (Intermediate) NY PDH TP G

Approaches to Increase Building Efficiency and Operation

Track: High Efficiency Design and Operation

Room: Orange A

Chair: Paul A. Torcellini, Ph.D., Member, National Renewable Energy Laboratory, Golden, CO

1.Existing Building Commissioning at a Community College (OR-20-026)
***Luke Madden**[1], Carlos Yagua, P.E.[1], Fred Schroeder[2], Juan-Carlos Baltazar, Ph.D., P.E., BEMP, Member[3], David Claridge, Ph.D., P.E., Fellow ASHRAE[3], Walter Williams, P.E.[4] and David Hoelke[4], (1) Texas A&M Engineering Experiment Station, College Station, TX, (2)HHS Associates, Irving, TX, (3)Texas A&M University, College Station, TX, (4)Tarrant County College District, Fort Worth, TX*

2. An Environmental Building Design Using Natural Energy and the Thermal Storage Capacity of a Building Mass (OR-20-C069)
***Masatoshi Kuboki, Member**, Nikken Sekkei Ltd., Tokyo, Japan*

3. Method for Tuning a Chiller Power Estimation Model with a Very Limited Part Load Performance Data Set (OR-20-C071)
***Vladimir Suslov, Ph.D.** and Marcelo Acosta, P.Eng., Member, Armstrong Fluid Technology, Toronto, ON, Canada,*

4. Comparison of Fixed and Variable Speed Compressor Efficiency and Energy Consumption in a Residential Home (OR-20-C072)
***Jonathan Ore, Student Member**, Nicholas Salts, Student Member and Eckhard Groll, Dr.Ing., Fellow ASHRAE, Purdue University, West Lafayette, IN*

5. Use of Solar Thermal Collectors and a Horizontal Underground Loop in a Multi-Source Heat Pump System for Thermal Energy Storage (OR-20-C073)
***Yao Yu, Ph.D., BEMP and BEAP, Associate Member**[1], Rui Miao, Student Member[1], Gaylord Olson[2], Doug Selby[3] and Laurie Catey, P.E.[4], (1) North Dakota State University, Fargo, ND, (2) Seasonal Storage Technologies, Princeton, NJ, (3) Meadowlark Design+Build, Ann Arbor, MI, (4) L.L. Catey Engineering Services, Royal Oak, MI*

11:00 AM–12:30 PM

Seminar 69 (Intermediate)

NY PDH TP G

Current Products and Development in Absorption and Heat Operated Machines

Track: Cutting Edge Approaches

Room: Orange G

Sponsor: 8.3 Absorption and Heat Operated Machines

Chair: Kyle Gluesenkamp, Oak Ridge National Laboratory, Oak Ridge, TN

1. Residential Space and Water Heating with Gas Absorption Heat Pumps
***Chris Keinath, Ph.D., Member**, Stone Mountain Technologies, Johnson City, TN*

2. Restaurant Demonstration of Water and Space Heating with an Absorption Heat Pump Water Heater
***Chris Smith, P.E., Member**, Energy 350, Portland, OR*

3. A Thermal Compression Heat Pump for Complete Building HVAC
***David Parks, Ph.D.**, ThermoLift, Stony Brook, NY*

4. Gas Heat Pumps for Integrated Commercial Hot Water and Air Conditioning in Restaurants
***Isaac Mahderekal, Ph.D., Member**, Gas Technology Institute, Davis, CA*

11:00 AM–12:30 PM

Seminar 70 (Intermediate)

NY PDH TP G

Tech Program

Leveraging Computational Models to Make Smart Controls

Track: Big Data and Smart Controls

Room: Orange B

Sponsor: 4.10 Indoor Environmental Modeling, 7.5 Smart Building Systems

Chair: Duncan Phyfe, Associate Member, Alden Research Laboratory, Holden, MA

1. Smart Control Algorithms for Natural Ventilation and Mechanical Cooling Systems
***Charalampos Angelopoulos**, Loughborough University, Loughborough, United Kingdom*

2. Data Center Controls Are Simple: Why Use Modeling?
***Mark Seymour, Member**, Future Facilities, London, United Kingdom*

3. Applying Equation-Based Modeling for Energy Efficient Data Center Cooling Operation
***Wangda Zuo**, University of Colorado Boulder, Boulder, CO*

4. Using a Physics-Based Model to Control Cooling Airflow in Data Centers
***James VanGilder, Member**, Schneider Electric, Andover, MA*

5. Smart Ventilation for High-Rise Institutional Buildings
***Liangzhu (Leon) Wang, Ph.D., P.E., Member**, Concordia University, Montreal, QC, Canada*

11:00 AM–12:30 PM

Seminar 71 (Intermediate)

NY PDH TP G

Nexus of Resilience and Energy Efficiency in Buildings

Track: Cutting Edge Approaches

Room: Orlando VI

Sponsor: 2.10 Resilience and Security

Chair: Jared Langevin, Ph.D., Lawrence Berkeley National Laboratory, Berkeley, CA

1. Effects of Resilient, Energy-Efficient Buildings on Occupants
***Clinton Andrews, Ph.D., P.E., Member**, Rutgers University, New Brunswick, NJ*

2. How Do Energy Efficiency Measures Influence Resilience? A Case Study of a Nursing Home in Florida
***Kaiyu Sun, Member**, Lawrence Berkeley National Laboratory, Berkeley, CA*

3. Natural Resilience Tall Building: How They Can Perform Better in Both Normal and Emergency Time
***Luke Leung, P.E., Member**, Skidmore, Owings, & Merrill LPP, Chicago, IL*

4. Building Science-Based Metrics for Energy Resilience in Non-Residential Buildings
***Paul Mathew, Ph.D., Member**, Lawrence Berkeley National Laboratory, Berkeley, CA*

11:00 AM–12:30 PM

Seminar 72 (Basic)

NY PDH TP G

Radiant System Design and Operation: Optimizing Energy Usage and Thermal Comfort in Residential and Commercial Applications

Track: High Efficiency Design and Operation

Room: Orlando V

Sponsor: 6.5 Radiant Heating and Cooling, Residential Building Committee

Chair: Theresa Weston, Ph.D., Member, DuPont, Richmond, VA

1. Radiant Cooling at Home: A Case Study
***Peter Simmonds, Ph.D., Fellow ASHRAE**, Building and Systems Analytics LLC, Emneth, CA, United Kingdom*

2. Integrated Design for Achieving IEQ and Efficiency
***Robert Bean, P.L.(Eng.), Member**, Indoor Climate Consultants Inc., Calgary, AB, Canada*

3. Radiant Cooling at Work: Lessons Learned after a Decade of Operation
***Shanti Pless**, National Renewable Energy Laboratory, Golden, CO*

11:00 AM–12:30 PM

Seminar 73 (Intermediate)

NY PDH TP G

Refrigerants and Refrigeration with Ground Source Heat Pumps

Track: Refrigeration and Refrigerants

Room: Orange E

Sponsor: 6.8 Geothermal Heat Pump and Energy Recovery Applications

Chair: Brendan Hall, P.E., Member, CHA Consulting, Syracuse, NY

1. Minimizing Flammable Refrigerant Charge in Residential GSHPs

***Björn Palm**, KTH Royal Institute of Technology, Stockholm, Sweden*

2. Impact of Refrigerant Options upon Unitary Equipment for Commercial Buildings

***Steve Kavanaugh, Ph.D., Fellow ASHRAE**, University of Alabama, Tuscaloosa, AL*

3. Refrigeration Heat Recovery

***Ed Lohrenz**, GEOptimize Inc., Winnipeg, MB, Canada*

4. Measurements and Energy Analysis for a Prototype Carbon Dioxide Ground Source Heat Pump

***Harrison Skye, Ph.D., Member**, National Institute of Standards and Technology, Gaithersburg, MD*

11:00 AM–12:30 PM

Seminar 74 (Intermediate)

NY PDH TP G

Smart Is as Smart Does: Case Studies from Intelligent Florida Buildings, Campuses and Cities

Track: Big Data and Smart Controls

Room: Orange F

Sponsor: 1.4 Control Theory and Application, 7.5 Smart Building Systems, 7.3, 7.9

Chair: Chariti Young, Member, Automated Logic Corp., Kennesaw, GA

1. Are Smart Buildings a Solution in Search of a Problem, or a Means to an End?

***Chariti Young, Member**, Automated Logic Corp., Kennesaw, GA*

2. A Smart Campus Infrastructure Doesn't Manage Itself

***Nathaniel Boyd, P.E., BEAP, Member**, University of Central Florida, Orlando, FL*

3. Smart City Transformation: What's Required for Success?

***Michael Hess, P.E.**, City of Orlando, Orlando, FL*

4. Why Smart Cities Are Good Business

***Ian Lahiff, P.E.**, City of Orlando, Orlando, FL*

11:00 AM–12:30 PM

Seminar 75 (Intermediate)

NY PDH TP G

Solving Duct System Performance Problems: Acoustics Effects, Air Leakage and Capture Hood Flow Measurement

Track: Ventilation, IAQ and Air Distribution Systems

Room: Orange C

Sponsor: 5.2 Duct Design, 1.2 Instruments and Measurements

Chair: Stephen Idem, Ph.D., Member, Tennessee Tech University, Cookeville, TN

1. Acoustics Considerations in Duct Design: Will It be Too Annoying in the Room?

***Jeff Boldt, P.E., HBDP, Fellow ASHRAE**, IMEG Corp, Madison, WI*

2. A Novel Duct Leakage Measurement Technique Based on Relative Humidity Measurement

***Mark Modera, Ph.D., P.E., Fellow ASHRAE**, University of California, Davis, CA*

3. Accuracy of Residential Capture Hoods

***Steven Rogers, Member**, The Energy Conservatory, Minneapolis, MN*

4. Capture Hood Errors Associated with Commercial Diffuser Types

***Robert Moss, Member**, Dwyer Instruments, Michigan City, IN*

notes

COMMITTEE MEETINGS SCHEDULE

In the listing below floor levels and venue names are indicated in parenthesis and subcommittees are indented. 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 (power strips on tables) ordered will be listed. If AV and power are not ordered in advance there is no guarantee it will be available onsite.

Meeting Space Floor and Venue Key

All committee meetings will take place at the **Hilton Orlando**. Any events located at the Orange County Convention Center will be marked with "OCCC-West" after the Floor number.

Symbol	Description
(L)	Lobby of Hilton Orlando
(LL)	Lower Level of Hilton Orlando
(3) OCCC-West	Level 3 of Orange County Convention Center, **West Concourse**

The "Schedule" section in the ASHRAE 365 app lets you create your own schedule as well as filter committee meetings by date, time, room and committee type (Standing, Technical, Project).

Society Standing Committees

AEDG Steering Committee (8/5) Electric
Monday (2/3) 2:15 pm – 5:00 pm Sand Lake (L)

Appointments Roadmap (24/0) Screen/Electric
Sunday (2/2) 7:00 am – 8:00 am Lake Nona A (L)

ASHRAE/AIA Liaison Committee (10/10)
Saturday (2/1) 1:00 pm–3:00 pm Spring Lake (L)

ASHRAE Foundation (30/10) Screen/Electric
Monday (2/3) 7:30 am–9:30 am Lake Florence A (L)

ASHRAE Foundation Executive Committee (10/5) Electric
Saturday (2/1) 1:30 pm–3:00 pm Lake Concord A (L)

ASHRAE/AHRI Joint Exposition Policy Committee (25/10) Electric
Sunday (2/2) 9:00 am–11:00 am Lake Nona A (L)

ASHRAE Associate Society Alliance (70/70) Screen
Monday (2/3) 2:30 pm–6:00 pm Orlando III (LL)

ASHRAE Associate Society Alliance Subcommittee (40/15) Screen
Sunday (2/2) 1:30 pm–4:30 pm Lake Sheen (L)

Board of Directors (33/75) Screen/Electric
Sunday (2/2) 1:30 pm–5:30 pm Orlando I/II (LL)
Wednesday (2/5) 2:00 pm–6:00 pm Orlando I/II (LL)

Building Energy Quotient Committee (12/10) Screen/Electric
Sunday (2/2) 8:30 am–11:30 am Spring Lake (L)

bEQ Methodology (10/5) Electric
Saturday (2/1) 11:00 am–12:45 pm Sand Lake (L)

bEQ Business Development (10/5) Electric
Saturday (2/1) 1:15 pm–3:00 pm Sand Lake (L)
Building EQ Portal Demonstration (3/50) Screen
Sunday (2/2) 4:00 pm–5:00 pm Orange C (LL)

Buildings XIV Committee (25/0) screen
Sunday (2/2) 9:00 am–11:00 am Lake Florence (L)

Certification (14/12) Screen/Electric
Saturday (2/1) 8:00 am–12:00 pm Clear Lake (L)

Chapter Technology Transfer Committee (30/15) Screen/Electric
Friday (1/31) 8:00 am–12:00 pm Lake Florence (L)
Saturday (2/1) 9:00 am–12:00 pm Lake Lucerne (L)
Chapter Technology Transfer Member Services (12/15) Screen
Friday (1/31) 1:00 pm–5:00 pm Lake Monroe B (L)
Chapter Technology Transfer Operations (12/15) Screen
Friday (1/31) 1:00 pm–5:00 pm Lake Monroe A (L)
Chapter Technology Transfer Distinguished Lecturer Mixer (75/0) Screen
Friday (1/31) 5:15 pm–6:30 pm Lake Sheen (L)
Chapter Technology Transfer Executive Subcommittee (5/0) Screen
Saturday (2/1) 8:00 am–9:00 am Lake Lucerne (L)

CIBSE/ASHRAE Liaison (25/10) Electric
Wednesday (2/5) 10:00 am–12:30 pm Lake Lucerne (L)

College of Fellows (25/35) Screen
Sunday (2/2) 10:00 am–12:00 pm Lake Highland B (L)
College of Fellows: Advisory Committee (15/5)
Sunday (2/2) 9:00 am–10:00 am Lake Highland B (L)

Communications Committee (12/10) Screen/Electric
Saturday (2/1) 11:00 am–3:00 pm Lake Virginia A (L)
Communications Committee Subcommittees (12/10)
Saturday (2/1) 8:00 am–11:00 am Lake Virginia A (L)

Conferences and Expositions Committee (30/10) Screen/Electric
Saturday (2/1) 8:00 am–3:00 pm Orlando V (LL)
Conferences and Expositions Executive (30/5)
Friday (1/31) 1:00 pm–3:30 pm Lake Florence (L)
Conferences and Expositions Annual and Winter Meetings (30/5)
Friday (1/31) 3:45 pm–6:00 pm Lake Florence (L)

Development Committee (24/15) Screen/Electric
Monday (2/3) 9:45 am–11:45 am Lake Florence A (L)

DRCs/RMCRs (30/25)
Friday (1/31) 4:00 pm–6:00 pm Lake Mizell B (L)
Wednesday (2/5) 12:00 pm–2:00 pm Lake George (L)

Directors-At-Large Meeting (10/0)
Wednesday (2/5) 12:00 pm–2:00 pm Lake Concord B (L)

Environmental Health Committee (20/20) Screen
Monday (2/3) 2:15 pm–6:15 pm Lake Highland A (L)
Environmental Health Executive (20/20) Screen
Monday (2/3) 9:00 am–10:00 am Lake Highland A (L)
Environmental Health Handbook/Policy (20/20) Screen
Monday (2/3) 10:00 am–11:00 am Lake Highland A (L)
Environmental Health Program/Research (20/20) Screen
Monday (2/3) 11:00 am–12:00 pm Lake Highland A (L)

Environmental Tobacco Smoke Position Document (10/0) Screen
Monday (2/3) 7:00 am–8:00 am Lake Highland A (L)

Executive Committee (10/25) Screen/Electric
Saturday (2/1) 8:30 am–1:00 pm Lake Concord A (L)
Wednesday (2/5) 7:30 am–9:00 am Lake Concord A (L)
Thursday (2/6) 7:30 am–11:00 am Bay Hill (L)

Finance Committee (12/20) Electric
Friday (1/31) 8:00 am–12:00 pm Lake Mizell A (L)
Finance Investment Subcommittee (4/0)
Thursday (1/30) 4:00 pm–6:00 pm Key West D (LL)

Finance Planning Subcommittee (8/8) Electric
Thursday (1/30) 4:00 pm–6:00 pm Key West C (LL)

Government Affairs Committee (35/32) Screen/Electric
Saturday (2/1) 8:00 am–12:30 pm Lake Florence (L)
GAC: Policy and Programs Subcommittee (15/12) Screen/Electric
Friday (1/31) 8:00 am–9:00 am Lake Lucerne (L)
GAC: Member Mobilization Subcommittee (15/12) Screen/Electric
Friday (1/31) 9:15 am–10:15 am Lake Lucerne (L)
GAC: Global Affairs Subcommittee (15/12) Screen/Electric
Friday (1/31) 10:30 am–11:30 am Lake Lucerne (L)
GAC: Nominating Subcommittee (15/10) Screen/Electric
Friday (1/31) 11:45 am–12:45 pm Lake Lucerne (L)
GAC: Training (30/15) Screen/Electric
Friday (1/31) 2:00 pm–3:00 pm Lake Lucerne (L)
GAC Rules Subcommittee (10/10) Screen/Electric
Friday (1/31) 3:15 pm–3:45 pm Lake Lucerne (L)
GAC: Executive Subcommittee (20/15) Screen/Electric
Friday (1/31) 3:45 pm–4:45 pm Lake Lucerne (L)

Handbook Committee (30/15) Screen/Electric
Sunday (2/2) 10:30 am–1:00 pm Lake Mizell B (L)
Handbook New HBC Member Orientation (10/5)
Saturday (2/1) 12:00 pm–1:00 pm Ruby Lake (L)
Handbook Excom (5/5)
Saturday (2/1) 1:00 pm–2:00 pm Ruby Lake (L)
Handbook Strategic Planning (5/5)
Saturday (2/1) 2:00 pm–3:00 pm Ruby Lake (L)
Handbook Electronic Media (5/0)
Sunday (2/2) 8:00 am–9:00 am Lake Mizell B (L)
Handbook Functional (5/0)
Sunday (2/2) 8:00 am–9:00 am Lake Hart A (L)
Handbook Review (5/0)
Sunday (2/2) 8:00 am–9:00 am Lake Down (L)
Handbook Training Workshop (50/0) Screen
Sunday (2/2) 8:00 am–9:00 am Turkey Lake (L)
Handbook 2021 Fundamentals TCs/Volume Subcommittee (15/0)
Sunday (2/2) 9:00 am–10:00 am Lake Down (L)
Handbook 2022 Refrigeration TCs/Volume Subcommittee (15/0)
Sunday (2/2) 9:00 am–10:00 am Lake Concord A (L)
Handbook 2020 HVAC Systems and Equipment TCs/Volume Subcommittee (15/0)
Sunday (2/2) 9:00 am–10:00 am Lake Hart A (L)
Handbook Volume Subcommittees (25/0) Screen/Electric
Sunday (2/2) 10:00 am–10:30 am Lake Mizell B (L)

Historical Committee (20/0) Screen/Electric
Sunday (2/2) 8:30 am–12:00 pm Conway Lake (L)

Honors & Awards (16/5) Screen/Electric
Sunday (2/2) 1:00 pm–5:00 pm Lake Virginia B (L)
Monday (2/3) 2:15 pm–5:30 pm Clear Lake (L)

IAQ2020 (20/0) Screen/Electric
Tuesday (2/4) 1:00 pm–3:00 pm Lake Concord A (L)

Indoor Environment Quality – Global Alliance (IEQ-GA) (20/0) Screen/Electric
Tuesday (2/4) 3:15 pm–5:00 pm Lake Concord A (L)

Indoor Air Quality PD (10/0) Screen/Electric
Tuesday (2/4) 10:00 am–12:00 pm Lake Concord A (L)

Infectious Aerosols PD Committee (20/20) Screen/Electric
Monday (2/3) 6:30 pm–8:30 pm Lake Highland A (L)

Life Member Executive Board Meeting (10/0)
Tuesday (2/4) 9:00 am–11:00 am Lake George A (L)

Life Members Lunch
Tuesday (2/4) 11:30 a.m. – 1:30 p.m. Lake Hart (L)

Members Council (33/50) Screen/Electric
Tuesday (2/4) 8:15 am–12:00 pm Lake Sheen (L)
Members Council Region Operations Subcommittee (15/10) Electric
Saturday (2/1) 8:00 am–12:00 pm Spring Lake (L)
Members Council Planning Subcommittee (15/10) Electric
Sunday (2/2) 8:00 am–12:00 pm Clear Lake (L)

Membership Promotion (24/15) Screen/Electric
Saturday (2/1) 8:00 am–4:00 pm Lake Nona A (L)
Membership Promotion Subcommittees (20/10) Screen/Electric
Friday (1/31) 1:00 pm–6:00 pm Lake Louise B (L)

Nominating (49/0) Screen/Electric
Sunday (2/2) 7:30 am–12:00 pm Lake Sheen (L)

PEAC (12/15) Screen/Electric
Tuesday (2/4) 12:00 pm–2:00 pm Lake Highland A (L)

Planning (18/40) Screen/Electric
Friday (1/31) 2:30 pm–6:00 pm Lake Mizell A (L)
Implementation Subcommittee (4/0)
Friday (1/31) 1:00 pm–2:30 pm Lake Mizell A (L)
Monitoring Subcommittee
Friday (1/31) 1:00 pm-2:30 pm Lake Mizell A (L)
Procedures Subcommittee
Friday (1/31) 1:00 pm-2:30 pm Lake Mizell A (L)

Professional Development (15/15) Screen/Electric
Monday (2/3) 8:00 am–12:00 pm Pocket Lake (L)

Publications Committee (16/10) Screen/Electric
Sunday (2/2) 8:00 am–12:00 pm Lake Virginia B (L)
Publications Planning Subcommittee (5/5)
Saturday (2/1) 10:00 am–12:00 pm Ruby Lake (L)

Publishing and Education Council (35/30) Screen/Electric
Tuesday (2/4) 8:00 a.m.–12:00 p.m. Lake Nona (L)
Publishing and Education Council Fiscal (15/10) Screen
Monday (2/3) 2:00 pm–3:30 pm Lake George A (L)
Publishing and Education Council Functional (10/10) Screen
Monday (2/3) 3:30 pm–5:00 pm Lake George A (L)

Refrigeration Committee (20/40) Screen/Electric
Sunday (2/2) 8:00 am–12:00 pm Lake Mizell A (L)
Refrigeration Excom (20/20) Screen/Electric
Sunday (2/2) 7:00 am–8:00 am Lake Mizell A (L)

Region-at-Large (40/0) Screen
Monday (2/3) 2:15 pm–4:15 pm Lake Sheen (L)

REHVA ASHRAE Liaison Meeting (12/0)
Sunday (2/2) 11:00 am–12:00 pm Lake Hart A (L)

Research Administration Committee (25/20) Screen/Electric
Saturday (2/1) 8:00 am–3:00 pm Lake Highland B (L)
Wednesday (2/5) 7:00 a.m–11:00 a.m. Lake Monroe (L)

Research Advisory Panel (10/0)
Monday (2/3) 8:00 am–11:00 am Lake Monroe A (L)

Research Promotion (25/5) Electric
Saturday (2/1) 7:30 am–1:00 pm Lake Mizell A (L)
Research Promotion Executive (10/0) Electric
Friday (1/31) 2:00 pm–6:00 pm College Park (L)
Research Promotion Subcommittee (10/0) Electric
Saturday (2/1) 2:00 pm–3:00 pm Lake Mizell A (L)

Residential Building Committee (15/10) Screen/Electric
Monday (2/3) 8:30 am–11:30 am Clear Lake (L)
Residential Building Committee: External Activities Subcommittee (10/5) Electric
Sunday (2/2) 12:00 pm–2:00 pm Spring Lake (L)
Residential Building Committee: Internal Activities Subcommittee (10/5) Electric
Sunday (2/2) 2:00 pm–4:00 pm Spring Lake (L)

Scholarship Trustees (10/3) Screen/Electric
Tuesday (2/4) 8:00 am–12:00 pm Sand Lake (L)

Society Rules (10/10) Screen/Electric
Tuesday (2/4) 2:00 pm–6:00 pm Sand Lake (L)

Standards Committee (30/20) Screen/Electric
Saturday (2/1) 8:00 am–1:00 pm Lake Sheen (L)
Wednesday (2/5) 7:30 am–10:00 am Orlando I/II (LL)

Standards: Executive Committee (10/10) Screen/Electric
Friday (1/31) 8:00 am–12:00 pm Celebration (L)

StdC Training Adhoc (10/10) Screen/Electric
Friday (1/31) 12:00 pm–1:00 pm Celebration (L)

Standards: ILS/ISAS (10/3) Screen/Electric
Friday (1/31) 1:00 pm–4:00 pm Bay Hill (L)

Standards: PPIS (6/10) Screen/Electric
Friday (1/31) 2:00 pm–6:00 pm Celebration (L)

Standards: SPLS (20/20) Screen/Electric
Friday (1/31) 2:00 pm–6:00 pm Lake Louise A (L)

Standards: Code Interaction Subcommittee (15/10) Screen/Electric
Sunday (2/2) 6:00 pm–9:30 pm Key West D (LL)

Standards PPIS (6/10) Screen/Electric
Tuesday (2/4) 11:00 am–2:00 pm Lake George A (L)

Standards SPLS (20/10) Screen/Electric
Tuesday (2/4) 2:00 pm–4:00 pm Lake George A (L)

Standards SRS (8/4) Screen/Electric
Tuesday (2/4) 5:00 pm–6:00 pm Lake George A (L)

Student Activities Committee (25/10) Screen/Electric
Saturday (2/1) 8: 00 a.m. – 3:00 p.m. Lake Monroe (L)

Student Activities Centralized Training (10/5) Screen/Electric
Friday (1/31) 9:00 am–10:00 am Lake Virginia B (L)

Student Activities K-12/STEM (20/5) Screen/Electric
Friday (1/31) 10:00 am–12:00 pm Lake Virginia B (L)

Student Activities ABET (15/5) Screen/Electric
Friday (1/31) 1:30 pm–3:30 pm Lake Virginia A (L)

Student Activities Post High (20/5) Screen/Electric
Friday (1/31) 1:30 pm–3:30 pm Lake Virginia B (L)

Student Activities Design Competition (15/5) Screen/Electric
Friday (1/31) 3:30 pm–5:30 pm Lake Virginia A (L)

Student Activities Grants (15/5) Screen/Electric
Friday (1/31) 3:30 pm–5:30 pm Lake Virginia B (L)

Student Welcome
Saturday (2/1) 1:00 p.m. – 3:00 p.m. Orlando III (LL)

Student Program
Sunday (2/2) 8:00 a.m. – 1:30 p.m. Orlando III (LL)

Student/YEA Mixer
Saturday (2/1) 5:00 p.m. – 6:30 p.m. Fountain Plaza (LL)

Student Branch Advisor Congress (30/0) Screen
Monday (2/3) 10:00 am–11:45 am Lake Down A (L)

Student Congress (30/0) Screen
Monday (2/3) 10:00 am–11:45 am Lake Down B (L)

Technical Activities Committee (25/20) Screen/Electric
Saturday (2/1) 8:00 am–3:00 pm Lake Highland A (L)
Wednesday (2/5) 7:00 am–10:00 am Lake Florence (L)

TAC ExCom with CEC (30/15) Screen/Electric
Saturday (2/1) 7:00 am–8:00 am Lake Highland A (L)

Technology Council (40/20) Screen/Electric
Wednesday (2/5) 9:00 am–12:00 pm Lake Down(L)

Technology Council Special Projects (8/5) Screen/Electric
Tuesday (2/4) 8:00 am–9:00 am Lake Down A (L)

Technology Council: Operations Subcommittee (25/15) Screen/Electric
Tuesday (2/4) 9:00 am–11:00 am Lake Down A (L)

Technology Council: Document Review Subcommittee (10/10) Screen/Electric
Tuesday (2/4) 11:00 am–12:00 pm Lake Down A (L)

TRAC Meeting (15/10) Screen/Electric
Monday (2/3) 9:00 am–11:00 am Sand Lake (L)

UNEP ASHRAE Coordinating Committee (12/6) Screen
Saturday (2/1) 5:30 pm–6:30 pm Turkey Lake (L)

Young Engineers in ASHRAE Committee (25/15) Electric
Saturday (2/1) 8:00 am–3:00 pm Lake Nona B (L)

YEA Hospitality Reception
Saturday (2/1) 4:00 pm – 6:00 pm Grande Lawn (LL)

Technical Committees

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

TC	Technical Committee
TRG	Technical Research Group
MTG	Multidisciplinary Task Group
RP	Research Project

TECHINCAL COMMITTEES (TCs)

TC/TG/MTG Chair's Breakfast (220/4) Screen
Sunday (2/2) 6:30 am–8:00 am Orlando I/II (LL)

TC/TG Chair Training Workshop (100/0) Screen
Sunday (2/2) 8:00 am–9:00 am Orlando I/II (LL)

TC Program Subcommittee Training (30/0) Screen
Tuesday (2/4) 11:15 am–12:00 pm Lake Down B (L)

Research Subcommittee Chairs (121/0) Screen
Monday (2/3) 6:30 am–9:00 am Orlando I/II (LL)

TC 1.1 Thermodynamics and Psychrometrics (21/2)
Monday (2/3) 2:15 pm–4:15 pm Orange C (LL)

TC 1.2 Instruments and Measurements (19/1)
Tuesday (2/4) 1:00 pm–3:30 pm Lake Concord B (L)

TC 1.3 Heat Transfer and Fluid Flow (28/5)
Tuesday (2/4) 1:00 pm–3:30 pm Lake Down B (L)
TC 1.3/8.5 Research Subcommittee (15/40) Screen/Electric
Sunday (2/2) 3:00 pm–7:00 pm Orange A (LL)

TC 1.4 Control Theory and Application (37/15) Screen/Electric
Tuesday (2/4) 1:00 pm–3:30 pm Orange G (LL)
TC 1.4 YEA/Education (10/20) Screen/Electric
Sunday (2/2) 2:00 pm–3:00 pm Lake Monroe A (L)
TC 1.4 Control Components and Applications (15/20) Screen/Electric
Sunday (2/2) 3:00 pm–4:00 pm Lake Monroe A (L)
TC 1.4 Programs (15/15) Screen/Electric
Sunday (2/2) 4:00 pm–5:30 pm Lake Monroe A (L)

TC 1.4 Research (15/25) Screen/Electric
Monday (2/3) 2:00 pm–4:00 pm Lake Down B (L)
TC 1.4 Handbook (8/10) Screen/Electric
Monday (2/3) 4:00 pm–6:00 pm Lake Down B (L)
TC 1.4 Executive (10/0) Screen/Electric
Tuesday (2/4) 8:30 am–9:30 am Key Largo B (LL)
TC 1.4 RP-1711 Advanced Sequences of Operation for HVAC Systems – Phase II Central Plants and Hydronic Systems (10/10) Screen/Electric
Tuesday (2/4) 9:30 am–10:30 am Key Largo B (LL)

TC 1.5 Computer Applications (19/5) Screen/Electric
Monday (2/3) 6:30 pm–9:00 pm Lake Florence A (L)
TC 1.5 1801-TRP, Standardizing and Utilizing ASHRAE Online BIM Data Exchange Protocols (6/0)
Sunday (2/2) 11:30 am–12:30 pm Bay Hill (L)
TC 1.5 Cyber Security (20/15) Electric
Sunday (2/2) 4:00 pm–5:00 pm Lake George A (L)
TC 1.5 Emerging Applications (20/15) Electric
Sunday (2/2) 5:00 pm–6:00 pm Lake George A (L)
TC 1.5 Program (10/10) Electric
Sunday (2/2) 6:00 pm–7:00 pm Lake George A (L)
TC 1.5 Research (10/10) Electric
Sunday (2/2) 7:00 pm–8:00 pm Lake George A (L)
TC 1.5 Handbook (10/10) Electric
Monday (2/3) 5:30 pm–6:30 pm Lake Florence A (L)

TC 1.6 Terminology (6/2) Screen/Electric
Monday (2/3) 8:00 am–11:00 am Thornton Park (L)

TC 1.7 Business, Management & General Legal Education (13/3)
Monday (2/3) 10:15 am–12:00 pm Lake Virginia A (L)

TC 1.8 Mechanical Systems Insulation (17/1) Screen
Monday (2/3) 4:15 pm–6:30 pm Lake Nona A (L)
TC 1.8 Handbook (16/5) Screen/Electric
Sunday (2/2) 8:00 am–10:30 am Sand Lake (L)
TC 1.8 Research (16/10) Screen/Electric
Sunday (2/2) 10:30 am–11:30 am Sand Lake (L)
TC 1.8 Program (16/10) Screen/Electric
Sunday (2/2) 11:30 am–12:00 pm Sand Lake (L)

TC 1.9 Electrical Systems (8/1)
Tuesday (2/4) 3:30 pm–6:00 pm Lake Louise B (L)

TC 1.10 Combined Heat and Power Systems (13/2)
Tuesday (2/4) 2:30 pm–4:00 pm Lake Florence A (L)
TC 1.10 PMS for the Combustion Turbine Inlet Cooling Design Guide 1762-RP (5/10) Electric
Tuesday (2/4) 12:30 pm–1:30 pm Lake Florence A (L)
TC 1.10 Handbook, Program, Research, Membership Subcommittees (20/5) Electric
Tuesday (2/4) 1:30 pm–2:30 pm Lake Florence A (L)

TC 1.11 Electric Motors and Motor Control (11/4)
Tuesday (2/4) 1:00 pm–3:30 pm Lake Louise B (L)

TC 1.12 Moisture Management in Buildings (22/11)
Saturday (2/1) 1:00 pm–3:00 pm Lake Hart A (L)
TC 1.12 Research, Program, Handbook, Standards (16/20)
Saturday (2/1) 8:00 am–12:00 pm Lake Hart A (L)

TC 1.13 Optimization (11/3)
Sunday (2/2) 1:00 pm–3:00 pm Lake Hart A (L)

TC 2.1 Physiology and Human Environment (17/6)
Tuesday (2/4) 1:00 pm–3:30 pm Pocket Lake (L)

TC 2.2 Plant and Animal Environment (18/14) Screen
Monday (2/3) 4:15 pm–6:30 pm Lake Down A (L)

TC 2.3 Gaseous Air Contaminants and Gas Contaminant Removal Equipment (28/13) Screen
Tuesday (2/4) 1:00 pm–3:30 pm Orange A (LL)

TC 2.3 Research (16/12) Screen/Electric
Sunday (2/2) 5:00 pm–7:00 pm Spring Lake (L)

TC 2.3 Handbook (16/2) Screen/Electric
Monday (2/3) 4:15 pm–6:30 pm Lake Highland B (L)

TC 2.3 Planning (16/2) Electric
Tuesday (2/4) 6:30 am–8:00 am Clear Lake (L)

TC 2.3 RP 1579 RP 1579 Testing and Evaluation of Ozone Removal Air Cleaning Devices for Improving IAQ (20/5)
Tuesday (2/4) 8:00 am–9:00 am Clear Lake (L)

TC 2.3 RP 1838 is Emerging Gas-Phase Electronic Filtration Technologies and ASHRAE 145.2 Test Standard (20/5)
Tuesday (2/4) 9:00 am–10:00 am Clear Lake (L)

TC 2.3 Programs (16/2) Electric
Tuesday (2/4) 12:00 pm–12:45 pm Clear Lake (L)

TC 2.4 Particulate Air Contaminants and Particulate Contaminant Removal Equipment (33/19) Screen/Electric
Tuesday (2/4) 3:30 pm–6:00 pm Orange A (LL)

TC 2.4 Handbook (20/10) Screen/Electric
Saturday (2/1) 1:00 pm–2:30 pm Clear Lake (L)

TC 2.4 1734-RP PMS (18/25) Screen/Electric
Sunday (2/2) 12:30 pm–1:30 pm Lake Nona A (L)

TC 2.4 1756-RP PMS (18/25) Screen/Electric
Sunday (2/2) 1:45 pm–2:45 pm Lake Nona A (L)

TC 2.4 Research (20/30) Screen/Electric
Sunday (2/2) 3:00 pm–5:00 pm Lake Nona A (L)

TC 2.4 Program (20/20) Screen/Electric
Monday (2/3) 3:15 pm–4:15 pm Conway Lake (L)

TC 2.4 Standards (18/25) Screen/Electric
Monday (2/3) 4:15 pm–5:15 pm Conway Lake (L)

TC 2.5 Global Climate Change (14/10)
Tuesday (2/4) 1:30 pm–3:30 pm Orange B (LL)

TC 2.5 Climate Change Chapter (25/10) Screen/Electric
Monday (2/3) 4:15 pm–6:30 pm Lake Lucerne (L)

TC 2.6 Sound and Vibration (28/20) Screen
Monday (2/3) 2:15 pm–4:15 pm Orange G (LL)

TC 2.6 Vibration Isolation (15/10) Electric
Sunday (2/2) 8:00 am–9:00 am Lake George B (L)

TC 2.6 Publications (15/10) Electric
Sunday (2/2) 9:00 am–10:00 am Lake George B (L)

TC 2.6 Research (15/10) Electric
Sunday (2/2) 10:00 am–11:00 am Lake George B (L)

TC 2.6 Hot Topic 1 (15/10) Electric
Sunday (2/2) 11:00 am–12:00 pm Lake George B (L)

TC 2.6 Programs (15/10) Electric
Sunday (2/2) 1:00 pm–2:00 pm Lake George B (L)

TC 2.6 Hot Topic 2 (15/10) Electric
Sunday (2/2) 2:00 pm–3:00 pm Lake George B (L)

TC 2.6 RP 1707 (15/10) Electric
Sunday (2/2) 3:00 pm–4:00 pm Lake George B (L)
TC 2.6 Executive Committee (10/0) Electric
Sunday (2/2) 4:00 pm–5:00 pm Lake George B (L)

TC 2.7 Seismic, Wind and Flood Resistant Design (25/8) Screen/Electric

Tuesday (2/4) 3:30 pm–6:00 pm Lake George B (L)
TC 2.7 Flooding (12/10) Screen
Tuesday (2/4) 10:00 am–12:00 pm Lake George B (L)
TC 2.7 Publications (12/10) Screen
Tuesday (2/4) 1:15 pm–1:45 pm Lake George B (L)
TC 2.7 Research (12/10) Screen
Tuesday (2/4) 1:45 pm–2:30 pm Lake George B (L)
TC 2.7 Programs (12/10) Screen
Tuesday (2/4) 2:30 pm–3:15 pm Lake George B (L)

TC 2.8 Building Environmental Impacts and Sustainability (20/10) Screen

Sunday (2/2) 5:30 pm–7:00 pm Pocket Lake (L)
TC 2.8 Green Guide (10/10) Electric
Sunday (2/2) 11:00 am–12:00 pm Pocket Lake (L)
TC 2.8 Water-Energy Nexus (10/10) Screen/Electric
Sunday (2/2) 1:00 pm–2:00 pm Pocket Lake (L)
TC 2.8 Existing & Future Building Challenges (10/10) Screen/Electric
Sunday (2/2) 2:00 pm–2:30 pm Pocket Lake (L)
TC 2.8 International (10/10) Screen/Electric
Sunday (2/2) 2:30 pm–3:00 pm Pocket Lake (L)
TC 2.8 Research (10/10) Screen/Electric
Sunday (2/2) 3:00 pm–4:00 pm Pocket Lake (L)
TC 2.8 Programs (10/10) Screen/Electric
Sunday (2/2) 4:00 pm–4:30 pm Pocket Lake (L)
TC 2.8 Handbook (10/10) Screen/Electric
Sunday (2/2) 4:30 pm–5:00 pm Pocket Lake (L)

TC 2.9 Ultraviolet Air and Surface Treatment (40/20)

Monday (2/3) 10:00 am–12:00 pm Lake Sheen (L)
TC 2.9 Programs (20/10) Electric
Sunday (2/2) 8:00 am–10:00 am Lake Hart B (L)
TC 2.9 Handbook (20/10) Electric
Sunday (2/2) 10:00 am–12:00 pm Lake Hart B (L)
TC 2.9 Standards (20/10) Electric
Sunday (2/2) 1:00 pm–3:00 pm Lake Hart B (L)
TC 2.9 Research (20/10) Electric
Monday (2/3) 8:00 am–10:00 am Lake Sheen (L)

TC 2.10 Resilience and Security (20/15)

Tuesday (2/4) 11:00 am–12:00 pm Lake Florence A (L)
TC 2.10 Standards (20/15)
Tuesday (2/4) 9:00 am–10:00 am Lake Florence A (L)
TC 2.10 Handbook (20/15)
Tuesday (2/4) 10:00 am–11:00 am Lake Florence A (L)

TC 3.1 Refrigerants and Secondary Coolants (31/7) Screen

Monday (2/3) 4:15 pm–6:30 pm Orange E (LL)
TC 3.1 Research (combined with 3.2, 3.3, 3.4 and 3.8 Research) (30/40) Screen/Electric
Sunday (2/2) 4:00 pm–6:00 pm Lake Florence (L)
TC 3.1 Program (Combined with 3.2, 3.3, 3.4 and 3.8 Program) (30/40) Screen/Electric
Monday (2/3) 10:30 am–12:00 pm Lake Eola A (L)

TC 3.2 Refrigerant System Chemistry (37/10) Screen
Monday (2/3) 2:15 pm–4:15 pm Orange E (LL)

TC 3.2 Research (combined with 3.1, 3.3, 3.4 and 3.8 Research) (30/40) Screen/Electric
Sunday (2/2) 4:00 pm–6:00 pm Lake Florence (L)

TC 3.2 Program (combined with 3.1, 3.3, 3.4 and 3.8 Program) (30/40) Screen/Electric
Monday (2/3) 10:30 am–12:00 pm Lake Eola A (L)

TC 3.3 Refrigerant Contaminant Control (29/8)
Tuesday (2/4) 3:30 pm–6:00 pm Lake Nona (L)

TC 3.3 Research (combined with 3.1, 3.2, 3.4 and 3.8 Research) (30/40) Screen/Electric
Sunday (2/2) 4:00 pm–6:00 pm Lake Florence (L)

TC 3.3 Program (combined with 3.1, 3.2, 3.4 and 3.8 Program) (30/40) Screen/Electric
Monday (2/3) 10:30 am–12:00 pm Lake Eola A (L)

TC 3.4 Lubrication (32/14) Screen
Tuesday (2/4) 1:30 pm–3:30 pm Lake Nona (L)

TC 3.4 Research (combined with 3.1, 3.2, 3.3 and 3.8 Research) (30/40) Screen/Electric
Sunday (2/2) 4:00 pm–6:00 pm Lake Florence (L)

TC 3.4 Program (combined with 3.1, 3.2, 3.3 and 3.8 Program) (30/40) Screen/Electric
Monday (2/3) 10:30 am–12:00 pm Lake Eola A (L)

TC 3.6 Water Treatment (24/11)
Tuesday (2/4) 1:00 pm–3:30 pm Lake Mizell (L)

TC 3.6 Handbook, Research, Program (20/20) Electric
Sunday (2/2) 3:00 pm–5:00 pm Lake Highland A (L)

TC 3.8 Refrigerant Containment (15/2)
Monday (2/3) 4:15 pm–6:30 pm College Park (L)

TC 3.8 Research (combined with 3.1, 3.2, 3.3 and 3.4 Research) (30/40) Screen/Electric
Sunday (2/2) 4:00 pm–6:00 pm Lake Florence (L)

TC 3.8 Program (combined with 3.1, 3.2, 3.3 and 3.4 Program) (30/40) Screen/Electric
Monday (2/3) 10:30 am–12:00 pm Lake Eola A (L)

TC 4.1 Load Calculation Data and Procedures (30/10)
Monday (2/3) 2:15 pm–4:15 pm Lake Nona A (L)

TC 4.1 Handbook (15/10) Electric
Sunday (2/2) 3:00 pm–4:00 pm Orange G (LL)

TC 4.1 Research (15/10) Electric
Sunday (2/2) 4:00 pm–5:00 pm Orange G (LL)

TC 4.1 Programs (15/10) Electric
Sunday (2/2) 5:00 pm–6:00 pm Orange G (LL)

TC 4.1 Standards (15/10) Electric
Sunday (2/2) 6:00 pm–7:00 pm Orange G (LL)

TC 4.2 Climatic Information (9/1) Screen/Electric
Tuesday (2/4) 1:00 pm–3:30 pm Lake Virginia B (L)

TC 4.2 1847-RP PMS (8/4) Screen/Electric
Sunday (2/2) 1:00 pm–2:00 pm Celebration (L)

TC 4.2 Program (8/4) Screen/Electric
Sunday (2/2) 2:00 pm–2:30 pm Celebration (L)

TC 4.2 Handbook (8/4) Screen/Electric
Sunday (2/2) 2:30 pm–3:30 pm Celebration (L)

TC 4.2 Research (8/4) Screen/Electric
Monday (2/3) 4:15 pm–6:30 pm Celebration (L)

TC 4.3 Ventilation Requirements and Infiltration (18/4) Screen

Monday (2/3) 4:15 pm–6:30 pm Pocket Lake (L)

TC 4.3 RP-1819 Multi-Zone VAV CO2 Demand Controlled Ventilation (8/4) Screen/Electric

Tuesday (2/4) 8:00 am–9:00 am Turkey Lake (L)

TC 4.3 RP-1823 Improved Exhaust-to-Intake Dilution Calculations PMS Meeting (8/4) Screen/Electric

Monday (2/3) 6:30 pm–7:30 pm Pocket Lake (L)

TC 4.4 Building Materials and Building Envelope Performance (27/7) Screen

Monday (2/3) 2:15 pm–4:15 pm Lake Eola B (L)

TC 4.4 PMS 1696-RP (20/10) Screen/Electric

Sunday (2/2) 10:00 am–11:30 am Lake Louise (L)

TC 4.4 PMS 1759-RP (20/10) Screen/Electric

Sunday (2/2) 11:30 am–12:30 pm Lake Louise (L)

TC 4.4 Program (30/15) Screen/Electric

Sunday (2/2) 1:00 pm–2:30 pm Lake Louise (L)

TC 4.4 Handbook (30/15) Screen/Electric

Sunday (2/2) 2:30 pm–3:30 pm Lake Louise (L)

TC 4.4 Research (30/15) Screen/Electric

Sunday (2/2) 3:30 pm–5:00 pm Lake Louise (L)

TC 4.4 Standards (30/15) Screen/Electric

Sunday (2/2) 5:00 pm–5:30 pm Lake Louise (L)

TC 4.5 Fenestration (8/2) Screen

Tuesday (2/4) 2:00 pm–4:00 pm Ruby Lake (L)

TC 4.5 Research (10/10)

Monday (2/3) 2:15 pm–3:15 pm Thornton Park (L)

TC 4.5 Program (10/10)

Monday (2/3) 3:15 pm–4:15 pm Thornton Park (L)

TC 4.5 Handbook (10/10)

Monday (2/3) 4:15 pm–5:15 pm Thornton Park (L)

TC 4.5 Calculation Methods (15/10)

Tuesday (2/4) 1:00 pm–2:00 pm Ruby Lake (L)

TC 4.7 Energy Calculations (29/13) Screen/Electric

Tuesday (2/4) 6:00 pm–8:30 pm Orange B (LL)

TC 4.7 RP 1661 PMSC (5/3) Electric

Sunday (2/2) 4:00 pm–6:00 pm Celebration (L)

TC 4.7 Simulation and Component Models (20/10) Electric

Monday (2/3) 6:00 pm–7:30 pm Conway Lake (L)

TC 4.7 Data-Driven Models (20/10) Electric

Monday (2/3) 7:30 pm–9:00 pm Conway Lake (L)

TC 4.7 Multi-scale Building Energy Modeling (20/10) Electric

Tuesday (2/4) 3:30 pm–5:00 pm Orange B (LL)

TC 4.7 Handbook (15/0) Electric

Tuesday (2/4) 5:00 pm–6:00 pm Orange B (LL)

TC 4.10 Indoor Environmental Modeling (14/10)

Monday (2/3) 2:15 pm–4:15 pm Lake Down A (L)

TC 4.10 RP-1675 PMS (10/5) Electric

Sunday (2/2) 2:00 pm–3:00 pm Lake Concord B (L)

TC 4.10 Program (20/10) Screen/Electric

Sunday (2/2) 3:00 pm–4:00 pm Lake Concord B (L)

TC 4.10 Handbook (20/10) Screen/Electric

Sunday (2/2) 4:00 pm–5:00 pm Lake Concord B (L)

TC 4.10 Research (20/10) Screen/Electric

Sunday (2/2) 5:00 pm–6:00 pm Lake Concord B (L)

TC 5.1 Fans (36/7) Screen

Monday (2/3) 4:15 pm–6:30 pm Lake Mizell A (L)

TC 5.1 Handbook (15/5) Screen
Sunday (2/2) 3:30 pm–4:00 pm Lake Concord A (L)
TC 5.1 Research (15/5) Screen
Sunday (2/2) 4:00 pm–5:00 pm Lake Concord A (L)
TC 5.1 Program (15/5) Screen/Electric
Sunday (2/2) 5:00 pm–5:30 pm Lake Concord A (L)
TC 5.1 Standards (15/5) Screen/Electric
Sunday (2/2) 5:30 pm–6:00 pm Lake Concord A (L)

TC 5.2 Duct Design (27/4) Screen/Electric
Tuesday (2/4) 3:30 pm–6:00 pm Lake Down B (L)

TC 5.3 Room Air Distribution (25/26) Screen/Electric
Tuesday (2/4) 1:00 pm–3:30 pm Orange E (LL)
TC 5.3 Handbook (20/10) Screen/Electric
Friday (1/31) 12:00 pm–5:00 pm Key West B (LL)
Saturday (2/1) 8:00 am–3:00 pm Conway Lake (L)
TC 5.3 1741-RP Understanding Fan Coil Components and How They relate to EnergyConsumption and Energy Modeling (5/10) Screen/Electric
Saturday (2/1) 11:00 am–3:00 pm Bay Hill (L)
TC 5.3 Research (25/10) Screen/Electric
Sunday (2/2) 8:00 am–10:00 am Lake Highland A (L)
TC 5.3 Programs (25/10) Screen/Electric
Sunday (2/2) 10:00 am–12:00 pm Lake Highland A (L)

TC 5.4 Industrial Process Air Cleaning (Air Pollution Control) (11/6)
Monday (2/3) 2:15 pm–4:15 pm Clermont (L)

TC 5.5 Air-to-Air Energy Recovery (20/12) Screen/Electric
Tuesday (2/4) 3:30 pm–6:30 pm Lake Monroe A (L)

TC 5.6 Control of Fire and Smoke (28/8)
Monday (2/3) 4:15 pm–6:30 pm Orange C (LL)
TC 5.6 Program/Research/Handbook (12/20)
Sunday (2/2) 3:00 pm–6:30 pm Orange F (LL)

TC 5.7 Evaporative Cooling (14/5)
Monday (2/3) 4:15 pm–6:30 pm Lake Virginia A (L)

TC 5.9 Enclosed Vehicular Facilities (22/9) Screen/Electric
Tuesday (2/4) 3:30 pm–6:00 pm Lake Monroe B (L)
TC 5.9 Research, Programs, Handbook, Standards (20/10) Screen/Electric
Tuesday (2/4) 1:30 pm–3:00 pm Lake Monroe B (L)

TC 5.10 Kitchen Ventilation (20/10) Screen/Electric
Monday (2/3) 6:00 pm–7:00 pm Lake Louise (L)
TC 5.10 RP-1778 PMS Meeting (5/10) Screen/Electric
Sunday (2/2) 2:00 pm–3:30 pm Ruby Lake (L)
TC 5.10 Handbook (20/10) Screen/Electric
Monday (2/3) 2:00 pm–3:30 pm Lake Louise (L)
TC 5.10 Program (20/10) Screen/Electric
Monday (2/3) 3:30 pm–4:30 pm Lake Louise (L)
TC 5.10 Research (20/10) Screen/Electric
Monday (2/3) 4:30 pm–6:00 pm Lake Louise (L)

TC 5.11 Humidifying Equipment (9/6) Screen
Monday (2/3) 2:15 pm–4:15 pm College Park (L)
TC 5.11 Humidifying Equipment Research/Handbook Subcommittees (10/4) Screen
Sunday (2/2) 3:00 pm–5:00 pm Conway Lake (L)

TC 6.1 Hydronic and Steam Equipment and Systems (26/6) Screen/Electric

Tuesday (2/4) 1:00 pm–3:30 pm Lake Down A (L)

TC 6.1 Handbook and Chilled Water Plant (15/25) Screen/Electric

Monday (2/3) 2:15 pm–3:15 pm Lake Highland B (L)

TC 6.1 Program and Research (15/25) Screen/Electric

Monday (2/3) 3:15 pm–4:15 pm Lake Highland B (L)

TC 6.2 District Energy (39/9) Screen/Electric

Sunday (2/2) 3:00 pm–5:00 pm Lake Mizell B (L)

TC 6.2 Programs, Research, Handbook (30/20) Screen/Electric

Sunday (2/2) 1:00 pm–3:00 pm Lake Mizell B (L)

TC 6.3 Central Forced Air Heating and Cooling Systems (24/8)

Tuesday (2/4) 1:00 pm–3:30 pm Lake Eola (L)

TC 6.5 Radiant Heating and Cooling (37/1) Screen/Electric

Monday (2/3) 2:15 pm–4:15 pm Lake Mizell A (L)

TC 6.5 Radiant Heating and Cooling: Handbook, Research, ALI and Programs (25/25) Screen/Electric

Sunday (2/2) 3:00 pm–6:00 pm Orlando V (LL)

TC 6.6 Service Water Heating Systems (29/25) Electric

Monday (2/3) 4:15 pm–6:30 pm Lake Eola A (L)

TC 6.6 Program, Research and Handbook (15/15) Electric

Monday (2/3) 2:15 pm–4:15 pm Lake Eola A (L)

TC 6.7 Solar and Other Renewable Energies (9/5) Screen

Tuesday (2/4) 1:00 pm–3:30 pm Lake Louise A (L)

TC 6.7 Research, Standards, Programs and Handbook (9/5) Screen/Electric

Monday (2/3) 4:15 pm–8:30 pm Lake George B (L)

TC 6.8 Geothermal Heat Pump and Energy Recovery Applications (18/17) Screen/Electric

Tuesday (2/4) 3:30 pm–6:00 pm Lake Highland B (L)

TC 6.8 Programs (8/4) Electric

Sunday (2/2) 5:00 pm–6:00 pm Sand Lake (L)

TC 6.8 Research (10/8) Electric

Monday (2/3) 4:15 pm–5:45 pm Maitland (L)

TC 6.8 Energy Recovery Applications (8/8) Electric

Tuesday (2/4) 8:00 am–9:00 am Ruby Lake (L)

TC 6.9 Thermal Storage (24/5)

Monday (2/3) 4:30 pm–6:00 pm Key West AB (LL)

TC 6.9 Standards/SPC 150 (40/20) Electric

Monday (2/3) 2:15 pm–2:40 pm Key West AB (LL)

TC 6.9 Programs (40/20) Electric

Monday (2/3) 2:40 pm–3:10 pm Key West AB (LL)

TC 6.9 Handbook (40/20) Electric

Monday (2/3) 3:10 pm–3:30 pm Key West AB (LL)

TC 6.9 Research (40/20) Electric

Monday (2/3) 3:30 pm–3:50 pm Key West AB (LL)

TC 6.9 Long Range Planning and Website (40/20) Electric

Monday (2/3) 3:50 pm–4:10 pm Key West AB (LL)

TC 6.10 Fuels and Combustion (14/10) Screen/Electric

Tuesday (2/4) 3:30 pm–6:00 pm Pocket Lake (L)

TC 6.10 Handbook, Research, and Program (10/5) Screen/Electric

Monday (2/3) 2:15 pm–4:15 pm Maitland (L)

TC 7.1 Integrated Building Design (9/6)

Monday (2/3) 8:15 am–10:00 am Lake George B (L)

TC 7.2 HVAC&R Construction & Design Build Technologies (16/7)

Sunday (2/2) 10:00 am–12:00 pm Ruby Lake (L)

TC 7.3 Operations and Maintenance Management (18/13) Screen/Electric

Tuesday (2/4) 1:00 pm–3:30 pm Orange C (LL)

TC 7.3 Education & Training (5/5) Electric
Sunday (2/2) 1:30 pm–3:00 pm Bay Hill (L)

TC 7.3 Standards (6/3) Electric
Monday (2/3) 2:15 pm–3:15 pm Ruby Lake (L)

TC 7.3 Program (6/3) Screen/Electric
Monday (2/3) 3:15 pm–4:15 pm Ruby Lake (L)

TC 7.3 Research (6/3) Electric
Monday (2/3) 4:15 pm–5:15 pm Ruby Lake (L)

TC 7.3 Handbook (6/3) Screen/Electric
Monday (2/3) 5:15 pm–6:15 pm Ruby Lake (L)

TC 7.4 Exergy Analysis for Sustainable Buildings (EXER) (12/1)

Sunday (2/2) 8:00 am–10:00 am Bay Hill (L)

TC 7.5 Smart Building Systems (47/42) Screen/Electric

Tuesday (2/4) 3:30 pm–6:00 pm Orange F (LL)

TC 7.5 Fault Detection & Diagnosis (30/20) Screen/Electric
Sunday (2/2) 3:00 pm–3:45 pm Lake Nona B (L)

TC 7.5 Enabling Technologies (20/20) Screen/Electric
Sunday (2/2) 3:45 pm–4:30 pm Lake Nona B (L)

TC 7.5 Smart Grid (20/15) Screen/Electric
Sunday (2/2) 4:30 pm–5:15 pm Lake Nona B (L)

TC 7.5 Handbook (15/10) Screen/Electric
Sunday (2/2) 5:15 pm–5:45 pm Lake Nona B (L)

TC 7.5 Program (10/5) Screen/Electric
Sunday (2/2) 5:45 pm–6:15 pm Lake Nona B (L)

TC 7.5 Buildings Operations and Dynamics (25/15) Screen/Electric
Monday (2/3) 4:30 pm–5:15 pm Lake Mizell B (L)

TC 7.5 Research (20/10)
Monday (2/3) 5:15 pm–6:00 pm Lake Mizell B (L)

TC 7.6 Building Energy Performance (23/10) Screen/Electric

Tuesday (2/4) 1:00 pm–3:30 pm Orlando V (LL)

TC 7.6 Federal Buildings (15/6) Screen/Electric
Saturday (2/1) 9:00 am–3:00 pm Lake George A (L)

TC 7.6 Federal Buildings (15/4) Screen/Electric
Sunday (2/2) 9:00 am–12:00 pm Lake George A (L)

TC 7.6 Research (10/4)
Sunday (2/2) 1:00 pm–2:00 pm Lake George A (L)

TC 7.6 Commercial Building Energy Audit (20/10) Screen/Electric
Sunday (2/2) 2:00 pm–3:00 pm Lake George A (L)

TC 7.6 Handbook (16/5) Screen/Electric
Sunday (2/2) 3:00 pm–4:00 pm Lake George A (L)

TC 7.6 Building Data Exchange (20/10) Screen/Electric
Monday (2/3) 8:00 am–12:00 pm Florida 1 (LL)

TC 7.6 Monitoring and Energy Performance (20/20) Screen/Electric
Monday (2/3) 2:15 pm–4:15 pm Florida 1 (LL)

TC 7.6 Energy Management (15/15) Screen/Electric
Monday (2/3) 4:15 pm–5:15 pm Florida 1 (LL)

TC 7.6 Standards and Programs (12/6) Screen/Electric
Monday (2/3) 5:15 pm–6:15 pm Florida 1 (LL)

TC 7.6 Executive (10/2)
Monday (2/3) 6:15 pm–7:00 pm Florida 1 (LL)

TC 7.7 Testing and Balancing (13/11) Screen
Monday (2/3) 2:15 pm–4:15 pm Lake George B (L)
TC 7.7 Handbook, Program, Research (8/3) Electric
Saturday (2/1) 8:00 am–10:30 am Bay Hill (L)

TC 7.8 Owning and Operating Costs (8/2)
Monday (2/3) 2:15 pm–4:15 pm Bay Hill (L)

TC 7.9 Building Commissioning (34/22) Screen
Sunday (2/2) 3:00 pm–5:00 pm Lake Mizell A (L)
TC 7.9 Handbook, Programs, Research (10/10) Electric
Saturday (2/1) 7:00 am–10:00 am Turkey Lake (L)

TC 8.1 Positive Displacement Compressors (21/12)
Tuesday (2/4) 3:30 pm–6:00 pm Orange E (LL)
TC 8.1 Research, Programs and Handbook (10/5) Electric
Sunday (2/2) 4:00 pm–6:00 pm Clear Lake (L)

TC 8.2 Centrifugal Machines (20/20) Screen
Monday (2/3) 2:15 pm–4:15 pm Lake Nona B (L)

TC 8.3 Absorption and Heat Operated Machines (18/4) Electric
Monday (2/3) 3:30 pm–6:00 pm Lake Monroe A (L)
TC 8.3 Programs, Research, Handbooks (15/15)
Monday (2/3) 2:15 pm–3:15 pm Lake Monroe A (L)

TC 8.4 Air-to-Refrigerant Heat Transfer Equipment (26/3) Screen/Electric
Tuesday (2/4) 3:30 pm–6:00 pm Lake Down A (L)
TC 8.4 Research/Standards/Handbook (10/15) Screen/Electric
Monday (2/3) 6:30 pm–8:30 pm Celebration (L)

TC 8.5 Liquid to Refrigerant Heat Exchangers (22/8) Screen
Monday (2/3) 4:15 pm–6:30 pm Lake Nona B (L)
TC 1.3/8.5 Research Subcommittee (15/40) Screen/Electric
Sunday (2/2) 3:00 pm–7:00 pm Orange A (LL)

TC 8.6 Cooling Towers and Evaporative Condensers (20/5)
Monday (2/3) 2:15 pm–4:15 pm Lake Virginia A (L)

TC 8.7 Variable Refrigerant Flow (VRF) (16/48) Screen
Monday (2/3) 4:15 pm–6:30 pm Orange G (LL)
TC 8.7 Handbook (10/10)
Monday (2/3) 9:00 am–12:00 pm Clermont (L)

TC 8.8 Refrigerant System Controls and Accessories (10/5) Screen/Electric
Tuesday (2/4) 1:00 pm–3:30 pm Clear Lake (L)

TC 8.9 Residential Refrigerators and Food Freezers (4/2)
Monday (2/3) 2:15 pm–4:15 pm Celebration (L)

TC 8.10 Mechanical Dehumidification Equipment and Heat Pipes (24/0)
Tuesday (2/4) 3:30 pm–5:00 pm Lake Florence B (L)
TC 8.10 Program/Handbook/Research/Standards (20/10) Screen/Electric
Tuesday (2/4) 1:00 pm–3:30 pm Lake Florence B (L)

TC 8.11 Unitary and Room Air Conditioners and Heat Pumps (41/15) Screen
Monday (2/3) 4:15 pm–6:30 pm Lake Sheen (L)

TC 8.11 Handbook, Program, Research (12/60) Screen/Electric
Sunday (2/2) 3:00 pm–6:00 pm Orange E (LL)

TC 8.12 Desiccant Dehumidification Equipment and Components (12/5)
Monday (2/3) 2:15 pm–4:15 pm Pocket Lake (L)

TC 9.1 Large Building Air-Conditioning Systems (18/15) Screen/Electric
Tuesday (2/4) 1:00 pm–3:30 pm Lake Virginia A (L)

TC 9.1 Handbook, Program, Research (15/4) Screen/Electric
Tuesday (2/4) 12:00 pm–1:00 pm Lake Virginia A (L)

TC 9.2 Industrial Air Conditioning and Ventilation (11/7) Screen/Electric
Tuesday (2/4) 1:00 pm–3:30 pm Lake Highland B (L)

TC 9.2 Nuclear Subcommittee (5/4)
Monday (2/3) 11:00 am–12:00 pm Thornton Park (L)

TC 9.3 Transportation Air Conditioning (11/3) Screen
Monday (2/3) 4:15 pm–5:45 pm Lake Monroe B (L)

TC 9.3/SSPC 161 Joint Research Subcommittee (30/10) Screen/Electric
Monday (2/3) 8:00 am–9:00 am Lake Florence B (L)

TC 9.3 Rail/Mass Transit Subcommittee (20/5) Screen/Electric
Monday (2/3) 2:15 pm–3:45 pm Lake Monroe B (L)

TC 9.3 Handbook Subcommittee (30/10) Screen/Electric
Monday (2/3) 3:45 pm–4:15 pm Lake Monroe B (L)

TC 9.4 Justice Facilities (12/5)
Sunday (2/2) 3:00 pm–5:00 pm Bay Hill (L)

TC 9.6 Healthcare Facilities (33/15) Screen
Sunday (2/2) 5:00 pm–7:00 pm Lake Mizell A (L)

TC 9.6 Infectious Diseases (35/25) Screen/Electric
Sunday (2/2) 10:00 am–11:30 am Lake Eola A (L)

TC 9.6 Executive Committee (15/0) Screen/Electric
Sunday (2/2) 11:30 am–12:30 pm Lake Eola A (L)

TC 9.6 Research (35/15) Screen/Electric
Sunday (2/2) 12:30 pm–2:30 pm Lake Eola A (L)

TC 9.6 Handbook (35/0) Screen/Electric
Sunday (2/2) 2:30 pm–3:00 pm Lake Eola A (L)

TC 9.6 Healthcare Energy (35/10) Screen/Electric
Sunday (2/2) 3:00 pm–3:45 pm Lake Eola A (L)

TC 9.6 Program (35/0) Screen/Electric
Sunday (2/2) 3:45 pm–4:30 pm Lake Eola A (L)

TC 9.7 Educational Facilities (15/10) Screen
Sunday (2/2) 1:00 pm–3:00 pm Clear Lake (L)

TC 9.8 Large Building Air-Conditioning Applications (11/17)
Monday (2/3) 2:15 pm–4:15 pm Lake Mizell B (L)

TC 9.8 Programs/Handbook and Publications/ Indoor Grow Facilities (13/50) Screen/Electric
Monday (2/3) 9:00 am–12:00 pm Lake Mizell B (L)

TC 9.9 Mission Critical Facilities, Data Centers, Technology Spaces And Electric Equipment (77/16) Screen/Electric
Monday (2/3) 2:15 pm–7:00 pm Orange B (LL)

TC 9.9 Programs, Handbook and Research (15/75) Screen/Electric
Sunday (2/2) 5:00 pm–7:00 pm Orange B (LL)

TC 9.9 IT Equipment Manufacturers Subcommittee Working Group (15/0) Screen/Electric
Monday (2/3) 8:00 am–12:00 pm Spring Lake (L)

TC 9.10 Laboratory Systems (38/7) Screen/Electric
Tuesday (2/4) 3:30 pm–6:00 pm Lake Sheen (L)

TC 9.10 Lab Classification (20/10) Screen/Electric
Sunday (2/2) 1:00 pm–2:00 pm Lake Monroe B (L)

TC 9.10 Program (20/10) Screen/Electric
Sunday (2/2) 2:00 pm–3:00 pm Lake Monroe B (L)

TC 9.10 Research (20/10) Screen/Electric
Sunday (2/2) 3:00 pm–4:30 pm Lake Monroe B (L)

TC 9.10 Design Guide (20/10) Screen/Electric
Tuesday (2/4) 2:00 pm–3:30 pm Lake Sheen (L)

TC 9.11 Clean Spaces (30/45) Screen
Monday (2/3) 3:00 pm–5:00 pm Orange F (LL)

TC 9.11 Cleanroom Energy Efficiency (20/20) Screen/Electric
Sunday (2/2) 4:00 pm–5:00 pm Orange B (LL)

TC 9.12 Tall Buildings (8/2) Screen
Sunday (2/2) 12:15 pm–2:00 pm Turkey Lake (L)

TC 10 Common Section Meeting (20/30)
Monday (2/3) 1:00 pm–2:00 pm Lake Sheen (L)

TC 10.1 Custom Engineered Refrigeration Systems (19/6)
Monday (2/3) 2:15 pm–4:15 pm Turkey Lake (L)

TC 10.1 Research, Program, Handbook (15/5) Electric
Sunday (2/2) 5:00 pm–7:00 pm Lake Monroe B (L)

TC 10.2 Automatic Ice Making Plants and Skating Rinks (10/4) Screen
Monday (2/3) 4:30 pm–6:30 pm Clermont (L)

TC 10.3 Refrigerant Piping, Controls and Accessories (17/7) Screen
Tuesday (2/4) 1:00 pm–3:30 pm Lake Monroe A (L)

TC 10.5 Refrigerated Processing and Storage (12/1)
Tuesday (2/4) 3:30 pm–6:00 pm Clear Lake (L)

TC 10.6 Transport Refrigeration (15/10) Electric
Monday (2/3) 4:15 pm–6:30 pm Lake Florence B (L)

TC 10.6 Handbook (5/5)
Monday (2/3) 6:30 pm–8:00 pm Lake Florence B (L)

TC 10.7 Commercial Food and Beverage Refrigeration Equipment (22/27)
Monday (2/3) 2:15 pm–4:15 pm Orange A (LL)

TC 10.7 Program (10/10) Electric
Sunday (2/2) 5:15 pm–6:00 pm Lake Nona A (L)

TC 10.7 Research (10/10) Electric
Sunday (2/2) 6:00 pm–6:45 pm Lake Nona A (L)

TC 10.7 Handbook (10/10)
Sunday (2/2) 6:45 pm–7:15 pm Lake Nona A (L)

TC 10.8 Refrigeration Load Calculations (8/0)
Sunday (2/2) 3:00 pm–5:00 pm Lake Hart A (L)

TECHNICAL RESOURCE GROUPS (TRGs)

TRG4.IAQP Indoor Air Quality Procedure Development (14/17) Screen
Sunday (2/2) 10:30 am–12:00 pm Lake Monroe B (L)

TRG9 Cold Climate Design (12/3) Screen
Wednesday (2/5) 9:00 am–11:00 am Lake Concord B (L)

MULTIDISCIPLINARY TASK GROUPS (MTGs)

MTG.ACR Air Change Rate Informal Meeting (25/0)
Monday (2/3) 9:00 pm–10:00 pm Lake Lucerne (L)

MTG.BIM Building Information Modeling (20/0) Screen
Monday (2/3) 10:15 am–12:00 pm Lake Mizell A (L)

MTG.CEA Controlled Environment Agriculture (13/40) Screen/Electric
Monday (2/3) 8:00 am–10:00 am Lake Mizell A (L)

MTG.EBO Effective Building Operations (10/0)
Tuesday (2/4) 9:00 am–10:00 am Turkey Lake (L)

MTG.HCDG Hot Climate Design Guide (10/10)
Wednesday (2/5) 9:00 am–10:30 am Lake Louise B (L)

MTG.HWBE Health and Wellness in the Built Environment (20/10) Screen/Electric
Tuesday (2/4) 10:00 am–12:00 pm Lake Concord B (L)

MTG.IAST Impact of ASHRAE Standards and Technology on Energy Savings/Performance (15/10) Screen/Electric
Saturday (2/1) 1:00 pm–3:00 pm Lake Concord B (L)

MTG.LowGWP Low GWP Refrigerants (26/36) Screen
Sunday (2/2) 5:00 pm–6:00 pm Lake Sheen (L)
Wednesday (2/5) 10:00 am–12:00 pm Lake Florence (L)

MTG.LowGWP Research Update (30/20) Screen
Sunday (2/2) 12:00 pm–1:00 pm Lake Mizell A (L)

MTG.LowGWP Codes and Standards Subcommittee (20/15) Screen/Electric
Tuesday (2/4) 1:00 pm–3:00 pm Orange F (LL)

MTG.OBB Occupant Behavior in Buildings (30/10) Screen
Monday (2/3) 8:00 am–10:00 am Lake Down A (L)

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.

Project Committees

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

SPC	Standard Project Committee
SSPC	Standing Standard Project Committee
GPC	Guideline Project Committee
SGPC	Standing Guideline Project Committee

STANDARD PROJECT COMMITTEES (SPCs) and STANDING STANDARD PROJECT COMMITTEES (SSPCs)

PC Chairs Training Breakfast (104/0) Screen
Sunday (2/2) 7:30 am–9:00 am Florida 5-7 (LL)

SSPC 15 Safety Standard for Refrigeration Systems (25/60) Screen/Electric
Sunday (2/2) 1:00 pm–5:00 pm Lake Eola B (L)

SSPC 15 Safety Standards for Refrigeration Systems Rewrite (25/60) Screen/Electric
Saturday (2/1) 1:00 pm–3:00 pm Lake Sheen (L)

SSPC 15 Safety Standards for Refrigeration Systems Ad Hoc and Rewrite (25/60) Screen/Electric
Sunday (2/2) 9:00 am–12:00 pm Lake Eola B (L)

SSPC 15 Subcommittee 15.2 Safety Standard for Refrigeration Systems in Residential Applications (20/20) Screen/Electric
Tuesday (2/4) 8:00 am–12:00 pm Pocket Lake (L)

SPC 17 Method of Testing Capacity of Thermostatic Refrigerant Expansion Valves (combined with SPC 158.1/ SPC 158.2/SPC 28) (6/2) Electric
Sunday (2/2) 5:00 pm–7:00 pm Bay Hill (L)

SPC 26 Mechanical Refrigeration and Air Conditioning Installations Aboard Ship (6/2) Screen/Electric
Monday (2/3) 10:00 am–12:00 pm Lake George B (L)

SPC 28 MOT Flow Capacity of Refrigerant Capillary Tubes (combined with SPC 158.1/SPC 158.2/SPC 17) (6/2) Electric
Sunday (2/2) 5:00 pm–7:00 pm Bay Hill (L)

SSPC 30 Method of Testing Liquid Chillers (7/7) Screen/ Electric
Monday (2/3) 8:00 am–10:00 am Maitland (L)

SSPC 33 Methods of Testing Forced-Circulation Air-Cooling and Air-Heating Coils
Monday (2/3) 8:30 pm – 9:30 pm Celebration (L)

SSPC 34 Designation and Safety Classification of Refrigerants (20/55) Screen/Electric
Monday (2/3) 6:30 pm–9:30 pm Orange E (LL)

SSPC 34 Designation and Nomenclature Subcommittee (Designation and Safety Classification of Refrigerants) (12/35) Screen/Electric

Saturday (2/1) 7:00 am–10:00 am Lake Mizell B (L)

SSPC 34 Flammability Subcommittee (Designation and Safety Classification of Refrigerants) (16/35) Screen/Electric

Saturday (2/1) 10:00 am–3:00 pm Lake Mizell B (L)

SSPC 34 Toxicity/ISO 817 MA-Toxicity (Joint Meeting) (20/25) Screen/Electric

Monday (2/3) 8:00 am – 11:00 am Lake Nona A (L)

SPC 37 MOT for Rating Electrically Driven Unitary Air-Conditioners and Heat Pump Equipment (30/20) Screen/Electric

Wednesday (2/5) 8:00 am–12:00 pm Lake George (L)

SPC 40 Methods of Testing for Rating Heat Operated Unitary Air-Conditioning and Heat-Pump Equipment (7/5) Electric

Monday (2/3) 8:00 am–10:00 am Lake Virginia A (L)

SSPC 41 Standard Methods for Measurement (21/10) Electric

Sunday (2/2) 1:00 pm–3:00 pm Lake Concord A (L)

41.3 Subcommittee, Standard Methods for Pressure Measurement (15/5) Screen/Electric

Sunday (2/2) 10:00 am–12:00 pm Lake Concord A (L)

41.13 Standard Methods for Fuel Heating Value Measurement (10/10) Screen/Electric

Monday (2/3) 8:00 am–10:00 am Turkey Lake (L)

41.6 Subcommittee, Standard Methods for Humidity Measurement (15/8) Screen/Electric

Monday (2/3) 10:00 am–12:00 pm Turkey Lake (L)

41.4 Subcommittee, Standard Methods for Proportion of Lubricant in Liquid Refrigerant Measurement (7/4) Screen/Electric

Monday (2/3) 4:15 pm–6:15 pm Turkey Lake (L)

SSPC 52.2 Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size (20/50) Screen/Electric

Saturday (2/1) 8:00 am–11:00 am Lake Eola B (L)

SSPC 55 Thermal Environmental Conditions for Human Occupancy (16/8) Screen/Electric

Saturday (2/1) 8:00 am–3:00 pm Pocket Lake (L)

Sunday (2/2) 8:00 am–12:00 pm Lake Concord B (L)

SSPC 62.1 Ventilation for Acceptable Indoor Air Quality (30/30) Screen/Electric

Saturday (2/1) 8:00 am–12:00 pm Florida 5 (LL)

Sunday (2/2) 1:00 pm–7:00 pm Lake Down(L)

SSPC 62.1 IAQ Guideline Subcommittee (15/15) Screen/Electric

Friday (1/31) 8:00 am–12:00 pm Key Largo B (LL)

SSPC 62.1 Administration Subcommittee (15/15) Screen/Electric

Friday (1/31) 1:00 pm–5:00 pm Key West D (LL)

Saturday (2/1) 1:00 pm–3:00 pm Florida 7 (LL)

SSPC 62.1 Research and Education Subcommittee (15/15) Screen/Electric

Friday (1/31) 1:00 pm–5:00 pm Key Largo B (LL)

Saturday (2/1) 1:00 pm–3:00 pm Florida 5 (LL)

SSPC 62.1 Ventilation Subcommittee (25/15) Screen/Electric

Friday (1/31) 1:00 pm–5:00 pm Florida 5 (LL)

Saturday (2/1) 1:00 pm–3:00 pm Florida 6 (LL)

SSPC 62.2 Ventilation and Acceptable IAQ in Residential Buildings (30/30) Screen/Electric

Friday (1/31) 9:00 am–2:30 pm Florida 2 (LL)
Saturday (2/1) 8:00 am–3:00 pm Florida 2 (LL)

SSPC 62.2 Envelope Subcommittee (20/20) Screen/Electric
Friday (1/31) 2:30 pm–5:00 pm Florida 2 (LL)

SSPC 62.2 IAQ Subcommittee (12/20) Screen/Electric
Friday (1/31) 2:30 pm–5:00 pm Florida 1 (LL)

SSPC 62.2 System Subcommittee (12/20) Screen/Electric
Friday (1/31) 2:30 pm–5:00 pm Key West A (LL)

SPC 70 Method of Testing the Performance of Air Outlets and Air Inlets (12/10) Screen/Electric

Monday (2/3) 8:00 am–10:00 am Lake Concord B (L)

SSPC 72 Method of Testing Open and Closed Commercial Refrigerators and Freezers (24/20) Screen/Electric

Sunday (2/2) 1:00 pm–5:00 pm Lake Highland B (L)

SPC 79 Method of Testing for Fan-Coil Units (5/10) Screen/Electric

Saturday (2/1) 8:00 am–12:00 pm Key West D (LL)

SPC 84 Method of Testing Air-to-Air Heat/Energy Exchangers (12/6) Screen/Electric

Tuesday (2/4) 1:00 pm–3:30 pm Bay Hill (L)

SSPC 90.1 Energy Standard for Buildings Except Low-Rise Residential (50/60) Screen/Electric

Saturday (2/1) 8:00 am–12:00 pm Key West AB (LL)
Sunday (2/2) 9:00 am–12:00 pm Key West AB (LL)
Monday (2/3) 8:00 am–12:00 pm Key West AB (LL)

SSPC 90.1 Envelope Subcommittee (20/30) Screen/Electric
Friday (1/31) 9:00 am–8:00 pm Florida 7 (LL)
Saturday (2/1) 1:00 pm–8:00 pm Key Largo B (LL)
Sunday (2/2) 1:00 pm–8:00 pm Key Largo B (LL)

SSPC 90.1 Lighting Subcommittee (16/10) Screen/Electric
Friday (1/31) 9:00 am–10:00 pm Key West C (LL)
Saturday (2/1) 1:00 pm–7:00 pm Key West C (LL)
Sunday (2/2) 1:00 pm–8:00 pm Ke y West C (LL)

SSPC 90.1 Mechanical Subcommittee (25/25) Screen/Electric
Friday (1/31) 9:00 am–8:00 pm Florida 6 (LL)
Saturday (2/1) 1:00 pm–7:00 pm Key West AB (LL)
Sunday (2/2) 1:00 pm–8:00 pm Key West AB (LL)

SSPC 90.1 ECB Subcommittee (12/18) Screen/Electric
Friday (1/31) 5:00 pm–9:00 pm Key West A (LL)
Saturday (2/1) 1:00 pm–5:00 pm Key West D (LL)
Sunday (2/2) 1:00 pm–6:00 pm Key West D (LL)

SSPC 90.1 Envelope Subcommittee Working Group (10/20) Screen/Electric
Friday (1/31) 5:00 pm–7:00 pm Key West D (LL)
Saturday (2/1) 4:00 pm–6:00 pm Florida 2 (LL)

SSPC 90.1 Format & Compliance Subcommittee (6/6) Electric
Friday (1/31) 5:00 pm–10:00 pm Key West B (LL)
Saturday (2/1) 1:00 pm–5:00 pm Key Largo C (LL)
Sunday (2/2) 4:00 pm–7:00 pm Key Largo C (LL)

SSPC 90.1 Renewables Working Group (20/20) Screen/Electric
Sunday (2/2) 4:00 pm–6:00 pm Key Largo D (LL)

SSPC 90.2 Energy Efficient Design of Low-Rise Residential Buildings (20/15) Screen/Electric

Monday (2/3) 2:15 pm–6:15 pm Champions Gate (L)

SSPC 90.2 Envelope (10/10) Screen/Electric
Monday (2/3) 6:30 pm–9:30 pm Maitland (L)
SSPC 90.2 Lighting (3/5) Electric
Monday (2/3) 6:30 pm–9:30 pm Clermont (L)
SSPC 90.2 Mechanical (5/10) Screen/Electric
Monday (2/3) 6:30 pm–9:30 pm Thornton Park (L)

SSPC 90.4 Energy Standard for Data Centers (20/10) Screen/Electric
Saturday (2/1) 8:00 am–12:00 pm Lake Virginia B (L)
Monday (2/3) 8:00 am–12:00 pm Key West C (LL)

SSPC 100 Energy Efficiency in Existing Buildings (20/10) Screen/Electric
Tuesday (2/4) 8:00 am–12:00 pm Lake Florence B (L)
SSPC 100 Operation and Maintenance (WG3) (5/5) Screen/Electric
Sunday (2/2) 8:00 am–10:00 am Ruby Lake (L)
SSPC 100 Alternative to EUI (WG5) (16/10) Screen/Electric
Sunday (2/2) 12:00 pm–2:00 pm Ruby Lake (L)
SSPC 100 International Target Table and Climate Zones (WG4) (5/5) Screen/Electric
Sunday (2/2) 4:00 pm–6:00 pm Ruby Lake (L)

SPC 105-2014R Standard Methods of Determining, Expressing, and Comparing Building Energy Performance and Greenhouse Gas Emissions (12/10)
Sunday (2/2) 5:00 pm–9:00 pm Lake Highland A (L)

SPC 110 Methods of Testing Performance of Laboratory Fume Hoods (20/10) Screen/Electric
Tuesday (2/4) 1:00 pm–2:00 pm Lake Sheen (L)

SPC 113 Method of Testing Room Air Diffusion (10/10) Screen/Electric
Monday (2/3) 2:00 pm–3:15 pm Key Largo B (LL)

SPC 118.1 Method of Testing for Rating Commercial Gas, Electric and Oil Service Water Heating Equipment (19/15) Screen/Electric
Sunday (2/2) 8:00 am–11:00 am Lake Monroe A (L)

SPC 118.2 Method of Testing for Rating Residential Water Heaters (15/5) Electric
Tuesday (2/4) 1:00 pm–5:00 pm Conway Lake (L)

SPC 124 MOT/Rating Combined Space-Heating & Water Heating Appliances (15/15) Screen/Electric
Tuesday (2/4) 9:00 am–12:00 pm Lake Monroe A (L)

SPC 127 Method of Testing for Rating Air Conditioning Units Serving Data Center (DC) and Other Information Technology Equipment (ITE) Spaces (12/8) Screen
Tuesday (2/4) 8:00 am–12:00 pm Lake Virginia A (L)

SPC 130 Laboratory Methods of Testing Air Terminal Units (5/20) Screen/Electric
Tuesday (2/4) 8:00 am–10:00 am Lake George B (L)

SSPC 135 BACnet (15/5) Electric

Thursday (1/30)	8:00 am–5:00 pm	Key Largo B (LL) (15/5)
Friday (1/31)	8:00 am–5:00 pm	Key Largo C (LL) (25/5)
Friday (1/31)	8:00 am–5:00 pm	Key Largo D (LL) (25/5)
Saturday (2/1)	8:00 am–5:00 pm	Lake Down(L) (40/10)
Sunday (2/2)	8:00 am–5:00 pm	Florida 1 (LL) (25/5)
Sunday (2/2)	8:00 am–5:00 pm	Florida 2 (LL) (25/5)
Monday (2/3)	8:00 am–12:00 pm	Lake Eola B (L) (40/10)

SSPC 140: Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs (15/15) Screen/Electric

Monday (2/3) 2:15 pm–6:15 pm Lake Virginia B (L)

SSPC 145 Test Method for Assessing the Performance of Gas Phase Air Cleaning Equipment (24/10) Screen/Electric

Sunday (2/2) 12:00 pm–3:00 pm Conway Lake (L)

SPC 146 Method of Testing and Rating Pool Heaters (7/5) Electric

Tuesday (2/4) 10:00 am–12:00 pm Bay Hill (L)

SSPC 147 Reducing the Release of Halogenated Refrigerants from Refrigerating and Air-Conditioning Equipment and Systems (10/10) Screen/Electric

Tuesday (2/4) 8:00 am–12:00 pm Conway Lake (L)

SPC 150-2000: Method of Testing for Performance of Cool Storage Systems/TC 6.9 Standards (30/20) Screen/Electric

Monday (2/3) 2:15 pm–2:40 pm Key West BC (LL)

SPC 152–Method of Test for Determining the Design and Seasonal Efficiencies of Residential Thermal Distribution Systems (5/5) Electric

Tuesday (2/4) 3:30 pm–5:00 pm Lake Eola (L)

SPC 153 Method of Test for Mass Flow Capacity of Four-Way Refrigerant Reversing Valves (6/5) Electric

Monday (2/3) 10:00 am–12:00 pm Celebration (L)

SSPC 154 Ventilation for Commercial Cooking Operations (15/12) Screen/Electric

Sunday (2/2) 9:00 am–1:00 pm Key Largo C (LL)

SPC 155P MOT for Rating Commercial Space Heating Boiler Systems (12/12) Screen/Electric

Sunday (2/2) 1:00 pm–5:00 pm Sand Lake (L)

SPC 158.1 MOT for Capacity of Refrigerant Solenoid Valves (combined with SPC 17/SPC 158.2/SPC 28) (6/2) Electric

Sunday (2/2) 5:00 pm–7:00 pm Bay Hill (L)

SSPC 160 Criteria for Moisture Control Design Analysis in Buildings (30/20) Screen/Electric

Tuesday (2/4) 8:00 am–12:00 pm Lake Lucerne (L)

SSPC 161 Air Quality within Commercial Aircraft (25/15) Screen/Electric

Monday (2/3) 9:00 am–12:00 pm Lake Florence B (L)

SSPC 161/TC 9.3 Joint Research (25/15) Screen/Electric

Monday (2/3) 8:00 am–9:00 am Lake Florence B (L)

SPC 164 Method of Test for Humidifiers (10/5) Screen

Monday (2/3) 10:00 am–12:00 pm Lake George A (L)

SSPC 169 Climatic Data for Building Design Standards (10/2) Electric

Monday (2/3) 10:00 am–12:00 pm Key Largo B (LL)

SSPC 170 Ventilation of Healthcare Facilities (33/40) Screen/Electric

Monday (2/3)	3:15 pm–6:15 pm	Orlando V (LL)
Tuesday (2/4)	8:00 am–12:00 pm	Lake Eola (L)

SSPC 170 Ventilation of Health Care Facilities, Natural Ventilation Work Group (15/15) Screen/Electric

Monday (2/3)	2:15 pm–3:15 pm	Orlando V (LL)

SPC 182 Method of Testing Absorption Water-Chilling and Water-Heating Packages (5/5) Electric

Monday (2/3)	10:00 am–12:00 pm	Bay Hill (L)

SSPC 185 Methods of Test to Inactivate Microorganisms in HVAC Systems with UV-C Lights (15/5) Screen

Saturday (2/1)	1:00 pm–3:00 pm	Lake George B (L)

SSPC 188 Legionellosis: Risk Management for Building Water Systems (45/12) Screen/Electric

Tuesday (2/4)	8:00 am–12:00 pm	Lake Mizell (L)
Tuesday (2/4)	3:45 pm–5:30 pm	Lake Mizell (L)
Wednesday (2/5)	8:00 am–12:00 pm	Lake Mizell (L)

SSPC 189.1 Standard for the Design of High-Performance Green Buildings except Low-Rise Residential Buildings (67/50) Screen/Electric

Tuesday (2/4)	8:00 am–10:00 am	Key West ABC (LL)
Wednesday (2/5)	8:00 am–12:00 pm	Florida 5-7 (LL)

SSPC 189.1 Working Group 6 (Water Use) (20/20) Screen/Electric

Tuesday (2/4)	10:00 am–12:30 pm	Key West D (LL)

SSPC 189.1 Working Group 7 (Energy Efficiency) (30/30) Screen/Electric

Tuesday (2/4)	10:00 am–1:00 pm	Key West ABC (LL)

SSPC 189.1 Working Group 9 (Materials and Resources) (20/20) Screen/Electric

Tuesday (2/4)	1:00 pm–3:00 pm	Key West D (LL)

SSPC 189.1 Working Group 7.5 (30/30) Screen/Electric

Tuesday (2/4)	1:30 pm–4:30 pm	Key West ABC (LL)

SSPC 189.1 Working Group 8 (IEQ) (30/30) Screen/Electric

Tuesday (2/4)	2:30 pm–4:30 pm	Florida 1 (LL)

SSPC 189.1 Working Group 5 (Site Sustainability) (20/20) Screen/Electric

Tuesday (2/4)	4:00 pm–6:00 pm	Key West D (LL)

SSPC 189.1 Working Group 10 (20/20) Screen/Electric

Tuesday (2/4)	5:00 pm–7:00 pm	Florida 1 (LL)

SSPC 189.3 Design, Construction and Operation of Sustainable High Performance Health Care Facilities (20/20) Screen/Electric

Monday (2/3)	8:00 am–12:00 pm	Lake Nona B (L)

SPC 191 Standard for the Efficient Use of Water in Building and Mechanical Systems (6/6) Screen/Electric

Monday (2/3)	9:00 am–12:00 pm	College Park (L)

SPC 195 Method of Test for Rating Air Terminal Unit Controls (6/2)

Tuesday (2/4)	10:00 am–12:00 pm	Clear Lake (L)

SPC 196 Method of Test for Measuring Refrigerant Leak Rates (7/7) Screen/Electric

Sunday (2/2)	6:00 pm–10:00 pm	Sand Lake (L)

SPC 198 Method of Test for Rating DX-Dedicated Outdoor Air Systems for Moisture Removal Capacity and Moisture Removal Efficiency (7/20) Screen/Electric
Sunday (2/2) 12:00 pm–2:00 pm Lake Highland A (L)

SPC 204P Method of Test for Rating Micro Combined Heat and Power Devices (15/5) Screen/Electric
Monday (2/3) 6:30 pm–9:00 pm Sand Lake (L)

SPC 205P Representation of Performance Data for HVAC&R and Other Facility Equipment (20/25) Screen/Electric
Tuesday (2/4) 8:00 am–12:00 pm Lake Highland B (L)

SPC 205P Representation of Performance Data for HVAC&R and Other Facility Equipment Working Groups (20/10) Screen/Electric
Sunday (2/2) 9:00 am–1:00 pm Lake Virginia A (L)

SPC 207P Laboratory Method of Test of Fault Detection and Diagnostics for Airside Economizers (23/10) Screen/Electric
Monday (2/3) 8:00 am–10:00 am Lake Concord A (L)

SPC 207P: Draft Revisions Working Group (10/10) Screen/Electric
Monday (2/3) 10:00 am–12:00 pm Lake Concord A (L)

SPC 207P: Verification Working Group (10/10) Screen/Electric
Monday (2/3) 4:30 pm–6:30 pm Lake Concord A (L)

SPC 210 Method of Testing for Rating Commercial Walk in Cooler and Freezer Equipment (8/25) Screen
Monday (2/3) 8:00 am–12:00 pm Champions Gate (L)

SPC 211P Standard for Commercial Building Energy Audits (18/15) Screen/Electric
Monday (2/3) 8:00 am–10:00 am Key Largo B (LL)

SPC 213P Method of Calculating Moist Air Thermodynamic Properties (8/5) Screen/Electric
Tuesday (2/4) 8:00 am–12:00 pm Lake Louise A (L)

SPC 217 Non-Emergency Ventilation in Enclosed Road, Rail and Mass Transit Facilities (11/9) Screen/Electric
Tuesday (2/4) 7:00 am–12:00 pm Lake Virginia B (L)

SPC 219 Method of Testing the Ability of Liquid Line Filter Driers or Absorbents to Remove Organic Acid (5/5) Screen
Monday (2/3) 8:00 am–10:00 am Bay Hill (L)

SPC 220 Method of Testing for Rating Small Commercial Blast Chillers, Chiller-Freezers, and Freezers (12/8) Screen/Electric
Monday (2/3) 4:30 pm–6:00 pm Bay Hill (L)

SPC 221P Test Method to Field-Measure and Score the Cooling and Heating Performance of an Installed Unitary HVAC System (10/15) Screen/Electric
Monday (2/3) 10:00 am–12:00 pm Conway Lake (L)

SPC 224P Standard for the Application of Building Information Modeling (11/7) Screen/Electric
Monday (2/3) 2:15 pm–6:15 pm Lake Concord B (L)

SPC 227 Passive Building Standard (27/10) Screen/Electric
Sunday (2/2) 8:00 am – 1:00 pm Key Largo B (LL)

SPC 228P Standard Method of Evaluating Net-Zero Energy Building Performance (25/20) Screen/Electric
Monday (2/3) 3:30 pm–6:30 pm Key Largo B (LL)

SSPC 300, Commissioning (20/20) Screen/Electric

Monday (2/3) 8:00 am–12:00 pm Lake Lucerne (L)

SSPC 300 Standard 230P subcommittee (10/15) Screen/Electric
Friday (1/31) 1:00 pm–3:00 pm Clermont (L)

SSPC 300 Guideline 0 subcommittee, The Commissioning Process (16/12) Screen/Electric
Saturday (2/1) 10:00 am–11:30 am Turkey Lake (L)

SSPC 300 Guideline 1.1 subcommittee, The HVAC Commissioning Process (16/12) Screen/Electric
Saturday (2/1) 12:00 pm–1:30 pm Turkey Lake (L)

SSPC 300 Standard 202 subcommittee, The Commissioning Process for Buildings and Systems (16/12) Screen/Electric
Saturday (2/1) 1:30 pm–3:00 pm Turkey Lake (L)

SSPC 300 Guideline 1.4 subcommittee, Systems Manual (10/10) Screen/Electric
Sunday (2/2) 10:00 am–12:00 pm Lake Nona B (L)

SSPC 300 Guideline 1.6 subcommittee, Data Center Commissioning (18/12) Screen/Electric
Sunday (2/2) 12:30 pm–2:30 pm Lake Nona B (L)

GUIDELINE PROJECT COMMITTEES (GPCs)

GPC 14 Measurement of Energy, Demand and Water Savings (10/4) Screen/Electric

Sunday (2/2) 6:00 pm–10:00 pm Turkey Lake (L)

GPC 22 Instrumentation for Monitoring Central Chilled Water Plants (10/10) Screen/Electric

Tuesday (2/4) 10:00 am–12:00 pm Ruby Lake (L)

GPC 23 -2016 Guideline for the Design and Application of Heating, Ventilation and Air Conditioning Equipment for Rail Passenger Vehicles (20/5) Screen

Monday (2/3) 9:15 am–12:00 pm Lake Monroe B (L)

GPC 35 Method for Determining the Energy Consumption Caused By Air-Cleaning and Filtration Devices (10/40) Screen/Electric

Monday (2/3) 8:00 am–9:30 am Florida 2 (LL)

GPC 37 Upper Room Ultraviolet Germicidal (UV-C) Devices to Control the Transmission of Airborne Pathogens (15/5) Screen

Saturday (2/1) 8:00 am–12:00 pm Lake George B (L)

STANDING GUIDELINE PROJECT COMMITTEES (SGPCs)

SGPC 10 Interaction Affecting the Achievement of Acceptable Indoor Environments (TC Seminar) (13/60) Screen/Electric

Sunday (2/2) 10:00 am–12:00 pm Lake Down(L)

SGPC 13 Specifying Building Automation Systems (10/6) Screen/Electric

Saturday (2/1) 8:00 am–12:00 pm Lake Concord B (L)

SGPC 36 High Performance Sequences of Operation for HVAC Systems (35/20) Screen/Electric

Monday (2/3) 8:00 am–12:00 pm Lake Louise (L)

SGPC 41 Design, Installation and Commissioning of Variable Refrigerant Flow Systems (18/10) Screen/Electric
Monday (2/3) 8:00 am–12:00 pm Key West D (LL)

International Standards and Misc. Committees

US TAG to ISO/TC 142 Cleaning Equipment for Air and other Gases (36/30) Screen/Electric
Saturday (2/1) 2:30 p.m. – 3:15 p.m. Lake Eola B (L)

US Tag to ISO/TC 205 and US Tag to ISO/TC 163 Thermal Performance and Energy in a Building Environment (22/12) Screen/Electric
Tuesday (2/4) 1:00 p.m. – 3:30 p.m. Lake Lucerne (L)

ISO TC86 SC8 WG7: ISO17584 (15/0)
Friday (1/31) 4:00 p.m. – 6:00 p.m. Bay Hill (L)

ISO/TC 142/WG 3 (10/40)
Monday (2/3) 9:30 a.m. – 12:00 p.m. Florida 2 (LL)
Monday (2/3) 2:15 p.m. – 4:00 p.m. Florida 2 (LL)

ISO 817 MA (23/11) Screen/Electric
Tuesday (2/4) 8:00 a.m. – 12:00 p.m. Lake Monroe B (L)

ISO 817 MA-Flammability (15/10) Screen/Electric
Sunday (2/2) 9:00 a.m. – 11:00 a.m. Pocket Lake (L)

SSPC 34 Toxicity/ISO 817 MA-Toxicity (Joint Meeting) (20/25) Screen/Electric
Monday (2/3) 8:00 a.m. – 11:00 a.m. Lake Nona A (L)

ISO 817 MA-Designation (15/10) Screen/Electric
Monday (2/3) 9:00 a.m. – 10:30 a.m. Lake Eola A (L)

gbXML Advisory Board (10/0)
Monday (2/3) 2:00 pm–3:00 pm Conway Lake (L)

USNC/IIR (20/20) Screen
Tuesday (2/4) 2:00 pm–4:00 pm Lake Highland A (L)

USNT/IEA (20/10) Screen
Tuesday (2/4) 4:00 pm–6:00 pm Lake Highland A (L)

Protocol for Evaluating Ruleset Implementation in Building Performance Modeling Software (15/15) Screen
Tuesday (2/4) 1:00 p.m. – 5:00 p.m. Key Largo B (L)

notes

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.