

2019 ASHRAE Winter Conference

January 12th – January 16th, 2019



<https://www.ashrae.org/atlanta>

The Technical Program along with Committee meetings, Registration, the Bookstore and Speakers Lounge will be at the Omni CNN Center and the Georgia World Congress Center.

Updated August 17, 2018

Sunday, January 13

Sunday, January 13, 8:00 a.m. - 9:00 a.m.

Debate (Basic)

Should Sex Sell HVAC Equipment?

Track: HVAC&R Fundamentals and Applications

Sponsor: 7.6 - Building Energy Performance

Sex sells, but should it? Thanks to grassroots efforts from groups like ASHRAE, the demographic of the HVAC industry is becoming more diverse. However, marketing practices do not appear to be changing along with the industry's demographics. Some businesses in the HVAC industry use 'booth babes' and other provocative marketing strategies to promote their brands and sell their equipment. What is the most effective way for these businesses to draw the eyes of their customers?

1. **Pam Duffy, P.E.**, Lennox International, Dallas, TX
2. **Jessica Mangler, P.E.**, Affiliated Engineers, Inc., Seattle, WA
3. **William P Bahnfleth, Ph.D., P.E.**, Penn State, University Park, PA
4. **Ronald Jarnagin**, Pacific Northwest National Lab
5. **Alyse Falconer, P.E.**, Point Energy Innovations, San Francisco, CA
6. **Carrie Anne Monplaisir**, Virginia Beach, VA

Sunday, January 13, 8:00 a.m. - 9:00 a.m.

Conference Paper Session (Intermediate)

Energy Modeling Simulations

Track: HVAC&R Fundamentals and Applications

Several programs and methodologies exist for energy modeling. Three case studies will be presented using different techniques for energy modeling and how to apply them.

1. Challenges of Creating a Verifiable Building Energy Model

Ali Razban

2. HMAT Extension for EnergyPlus Encompasses Moisture Sources Due to Air Leakage

Florian Antretter

3. Accuracy of a Crude Approach to Urban Multi-Scale Building Energy Models Compared to 15-min Electricity Use

Eric Garrison

Sunday, January 13, 8:00 a.m. - 9:00 a.m.

Conference Paper Session (Intermediate)

Examples of Cost Saving Initiatives

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

Different methods can be used to provide cost savings in the built environment. This session contains three papers on different methods. First is a feasibility study, then a commissioning tool and last is a program to optimize and existing system.

1. Economic Feasibility of Combined Cooling, Heating, and Power Systems

Hyeunguk Ahn

2. Field Demonstration of an Automated Building Commissioning Tool

Hayden Reeve

3. Optimization of Condenser Water Loop Control in Hot and Humid Climates

Lei Wang

Sunday, January 13, 8:00 a.m. - 9:00 a.m.

Seminar (Intermediate)

Advances in Hybrid HVAC Efficiency and Performance

Track: Systems and Equipment

Sponsor: 5.7 - Evaporative Cooling

Hybrid HVAC equipment takes advantage of climate appropriate strategies to achieve outstanding efficiencies and reductions in peak power demand. These benefits are realized without compromising performance or impacting building occupants or operators. A number of efforts are converging to increase the adoption of hybrid approaches. This seminar highlights advances in energy simulation/analysis and real world implementation of evaporative/DX hybrids needed to rise to the challenges being placed on 21st century HVAC systems.

1. New Hybrid HVAC Modeling Capability in EnergyPlus Building Energy Simulation

Spencer Dutton, Ph.D.

2. Hybrid Indirect Evaporative/DX Capacity Modeling

Steven Slayzak

3. RTU Optimization: Fixed Compressor Speed Reduction and Condenser-air Pre-cooling

Caton Mandé

3. Growing the Pre-Cooling Market with Pre-Sold Maintenance

Steve Short

Sunday, January 13, 8:00 a.m. - 9:00 a.m.

Seminar (Intermediate)

Steps toward Net Zero for the Marine Corps Logistics Base at Albany GA

Track: Building Integrated Renewables and Natural Systems

Sponsor: 9.1 - Large Building Air-Conditioning Systems, 6.8 - Geothermal Heat Pump and Energy Recovery Applications, 6.7 - Solar and other Renewable Energies

The Marine Base at Albany, GA has been moving toward the aspect of Net Zero operations in steps of varied methods and this seminar is a recap of some of those elements. Step 1 is the addition of Sustainable Power by installation of a 31 MW PV Facility in cooperation with Georgia Power. Step 2 is the application of BTES system and application of Ground Source Heat Pump technology to improve energy efficiency in replacement of HVAC at the Base. Step 3 is the use of Retro Commissioning to review existing facility operations and make modifications for minimizing energy consumption.

1. “Step One: Addition of 31 MW PhotoVoltaic Facility at MCLB Albany”

William Houser, P.E.

2. “Step Two: Installation of BTES system at MCLB Albany”

Chuck Hammock, P.E.

3. “Step Three: Maximizing by Retro-Commissioning”

Robert Bucey, P.E.

Sunday, January 13, 8:00 a.m. - 9:00 a.m.

Seminar (Intermediate)

Tales from the Crypt

Track: Common System Issues and Misapplications

Sponsor: 7.7 - Testing and Balancing, 7.9 - Building Commissioning

So much of what is presented at the ASHRAE conferences is highly technical and related to new ideas, procedures and equipment. We all learn from our mistakes, this is called experience. The theme of this program is sharing. The purpose in sharing our experiences is to help others (younger and possibly less experienced) in their decision making process and possibly eliminate the mistakes others have made in the past.

1. Tales from the Crypt

Thomas Schlachter, P.E.

2. Tales from the Crypt

Donald Prather

Sunday, January 13, 8:00 a.m. - 9:00 a.m.

Seminar (Intermediate)

Thermal Energy Storage in the Cold Chain

Track: HVAC&R Fundamentals and Applications

Sponsor: 6.9 - Thermal Storage

Thermal Energy Storage (TES) technology provides energy flexibility and efficiency particularly in high-consuming refrigeration applications (grocery stores and distribution centers). Low-temperature cold storage facilities require the highest energy demand

per cubic foot of any industrial electricity load. TES provides significant operational and financial benefits to cold storage operators, grocers, and utilities challenged to manage the peak loads of the electrical grid. In a 93,000 square foot low-temp facility TES reduced peak period consumption by 43% and peak demand by 29% while maintaining 50% more stable temperatures. In a 320 square foot grocery freezer peak period run time was reduced 60%.

1. Thermal Energy Storage in the Cold Chain

Collin Coker

2. Thermal Energy Storage in the Cold Chain

John Lerch

Sunday, January 13, 8:00 a.m. - 9:00 a.m.

Workshop (Intermediate)

Track 4 Construction, Operation, and Maintenance of High Performance Systems of Large Central Plants and Distribution Systems

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

Sponsor: 7.3 - Operation and Maintenance Management, 6.2 - District Energy

The recent case studies regarding natural disasters has impacted the way we operate and maintain Large Central Plant(s) distribution systems, during emergency power outages and system restoration. Large Central Plants operating on emergency power and its reliability is vital to businesses IT infrastructure, research, healthcare facilities, and mission critical systems. Power Plant Engineers and Operations and Maintenance staff maintaining Municipalities, Colleges, Hospitals, Research Institutes, and Military Installations must become more knowledgeable of emergency management teams roles and responsibilities.

1. Track 4 Construction, Operation, and Maintenance of High Performance Systems of Large Central Plants and Distribution Systems

Terrence Rollins

2. Track 4 Construction, Operation, and Maintenance of High Performance Systems of Large Central Plants and Distribution Systems

Tim Anderson, P.E.

3. Track 4 Construction, Operation, and Maintenance of High Performance Systems of Large Central Plants and Distribution Systems

Sonya Pouncy

4. Track 4 Construction, Operation, and Maintenance of High Performance Systems of Large Central Plants and Distribution Systems

Mitchell Swann, P.E.

Sunday, January 13, 9:45 a.m. - 10:45 a.m.

Technical Paper Session (Intermediate)

ASHRAE Research on Ductwork

Track: The Convergence of Comfort, IAQ, and Energy Efficiency Building

Understanding noise propagation in ductwork is an essential component when designing ventilation systems. These three papers discuss current ASHRAE sponsored research on characterizing noise propagation and insertion loss in ducts.

1. A Review of Prior ASHRAE Research Efforts to Characterize Noise Propagation in Ducts

David Herrin

2. The Effect of Length on the Insertion Loss of Fiberglass Lined Sheet Metal Ducts, Part I: Rectangular Duct

Michael Schwob

3. The Effect of Length on the Insertion Loss of Fiberglass Lined Sheet Metal Ducts, Part II: Round Duct

Michael Schwob

Sunday, January 13, 9:45 a.m. - 10:45 a.m.

Conference Paper Session (Intermediate)

Using Buildings to Improve Hydronic Efficiency

Track: Building Integrated Renewables and Natural Systems

Thermo active building systems use the concrete in buildings to improve hydronic system efficiency. Building on this technology, three papers are presented on the application of these systems or modifications based on the same principal. Come experience new energy efficient strategies.

1. Surface Condensation Control for Concrete Control Systems Utilizing Model Predictive Control

Deok-Oh Woo

2. Hybrid GEOTABS: System Concept, Individual Modules, and Interfaces

Dolaana Khovalyg

3. Applying TABS to a Publishing Company Headquarters Using Integrated Design

Kosuke Sato

Sunday, January 13, 9:45 a.m. - 10:45 a.m.

Seminar (Basic)

ASHRAE Conference Crash Course

Track: HVAC&R Fundamentals and Applications

Sponsor: 7.6 - Building Energy Performance

First time at an ASHRAE Conference? Been coming for years, but still confused? What is a TC? What is a Standing Committee? Who can attend what? What is the AHR Expo? And why is all this happening at once? This crash course provides all attendees with an introduction to all the ASHRAE Conference activities, explains how you can get involved, and allows you to ask questions to experienced attendees.

1. The Ins and Outs of ASHRAE

Rachel Romero, P.E.

2. Make the Most of Your Conference Experience

Madison Schultz, P.E.

Sunday, January 13, 9:45 a.m. - 10:45 a.m.

Seminar (Intermediate)

Condensing High-Efficiency Boilers and Their Proper Operation and Maintenance

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

Sponsor: 6.1 - Hydronic and Steam Equipment and Systems, 6.10 - Fuels and Combustion

The seminar will review the various building mechanical components that influence the low temperature operating range that will provide return water temperature to allow a condensing boiler to operate in condensing mode and optimize its operating efficiency, while minimizing the operating cost to heat the building. It will also address common installation, operation, maintenance, and control pitfalls that may reduce operating efficiency in high efficiency condensing boiler systems. Proper selection of equipment, water chemistry, and pumping strategies will also be discussed.

1. The Design Factors that Go into Providing a High Efficiency Condensing Boiler Heating System and Having the System Perform as Intended Once Installed and Throughout its Life

Thomas Neill

2. High Efficiency Boiler Operation, Maintenance, and Control for Efficient Operation

Ted Duffy, P.E.

Sunday, January 13, 9:45 a.m. - 10:45 a.m.

Seminar (Intermediate)

Critical Mobile Food Refrigeration Systems Using Low-GWP Refrigerants

Track: Refrigeration

Sponsor: 10.6 - Transport Refrigeration

While we typically think of commercial food refrigeration as being associated with grocery stores or over-the-road transport, there are a number of critical applications for refrigeration needed in support of deployed military personnel. These presentations address novel system designs using low-GWP refrigerants supporting both field and submarine personnel. These refrigeration systems can provide for food storage above and below freezing and must operate satisfactorily under extreme design conditions. The success of these systems indicate that low-GWP refrigerants can be successfully used for food refrigeration in even the most demanding applications.

1. Design of a Refrigerated Transport Container Using CO₂ (R744) as a Refrigerant

Neal Lawrence, Ph.D.

2. Mission Critical Submarine Food Refrigeration System Using R1234ze as a Refrigerant

Augusto San Cristobal

Sunday, January 13, 9:45 a.m. - 10:45 a.m.

Seminar (Intermediate)

The Doctor is In! Diagnosing Common System Issues and Misapplications in Building Automation Systems

Track: Common System Issues and Misapplications

Sponsor: 1.4 - Control Theory and Application

A building automation system is the central nervous system of the HVAC system, but most engineers tasked to run a facility through these systems see them only as black boxes. Designed and configured correctly, they become a force multiplier for operations personnel. Configured sub-optimally, they become a liability and create additional problems to distract facility operators from their primary responsibilities. But how can anyone determine the proper configuration of a system built with proprietary software and programming language? This seminar presents proven methods for non-controls technicians to identify and address common issues present in existing building automation systems.

1. Assessment Tools and Techniques for Existing Building Automation Systems

Joseph Kilcoyne, P.E.

2. Simple Misapplications of Control Systems in Hospitals and How to Avoid Them

Daniel Farrow

Sunday, January 13, 9:45 a.m. - 10:45 a.m.

Seminar (Intermediate)

Sustainable Building Operation via Standard 189.1 & Lessons Learned

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

Sponsor: MTG.EBO - Effective Building Operations

This session illustrates how using ASHRAE Standard 189.1 can provide the foundation of Sustainable Building Operation for Higher Performance of building owner expectations through a roadmap of mandatory maintenance procedures and documentation. This presentation will also illustrate lessons learned through direct experience with high performance buildings as to the owner expectations for sustainable operation.

1. Sustainable Building Operation via Standard 189.1

Douglas Zentz

2. Lessons Learned for Sustainable High Performance Building Operation

Stephen Hamstra, P.E.

Sunday, January 13, 9:45 a.m. - 10:45 a.m.

Seminar (Basic)

What's New in Cybersecurity

Track: Systems and Equipment

Sponsor: 1.5 - Computer Applications

As with mechanical building systems, the requirements to stay current in Cybersecurity are constantly evolving. These seminars will provide updated information relating to Cybersecurity and a some of the speakers' experiences in the field.

1. Building Automation Systems + Cybersecurity

Levi Tully

2. SmartBuilding Technology – In The Hacker’s Crosshairs

Fred Gordy

Sunday, January 13, 11:00 a.m. - 12:30 p.m.

Conference Paper Session (Intermediate)

Modeling HVAC Systems

Track: HVAC&R Fundamentals and Applications

CFD and numerical tools have advanced in recent years and are currently used for enhancing design. These papers highlight some of these methods and illustrate their use.

1. Toward Machine Learning-based Prognostics for Heating Ventilation and Air-Conditioning Systems

Chunsheng Yang

2. Model-based and Data-driven Anomaly Detection for Heating and Cooling Demands in Office Buildings

Araz Ashouri

3. Optimizing Building Performance using Stochastic Occupant Models

Mohamed Ouf

4. Computational Fluid Dynamics (CFD) Modeling of Indoor Chemical Reactions Under Varied HVAC Operating and Lighting Conditions

Youngbo Woo

Sunday, January 13, 11:00 a.m. - 12:30 p.m.

Seminar (Intermediate)

The Best of "Engineer's Notebook" 3rd Edition

Track: Common System Issues and Misapplications

Sponsor: 9.1 - Large Building Air-Conditioning Systems

The “Engineer’s Notebook” series in ASHRAE Journal was established in its current form in 2013, with four authors contributing monthly articles on a rotating basis. All four authors are ASHRAE Fellows and senior consulting engineers with many years of practical experience, and the concept of the recurring column is to share with peers what they have learned (sometimes the hard way) and experienced in the course of their careers, along with helpful design tips and tools. In this seminar, each of the four has chosen another of their favorite columns to date, and has adapted it for presentation.

1. Data Centers, Cooling Towers & Thermal Storage

Daniel H Nall

2. Designing Pipe Insulation Systems

Kent W. Peterson, P.E.

3. Making VAV Great Again

Steve Taylor, P.E.

4. N+1 HVAC for IT Closets and Server Rooms

Stephen W. Duda, P.E.

Sunday, January 13, 11:00 a.m. - 12:30 p.m.

Seminar (Intermediate)

Building HVAC System Control Strategies to Interact with the Modern Electric Grid

Track: Building Integrated Renewables and Natural Systems

Sponsor: 7.5 - Smart Building Systems

From renewable energy resources to battery storage, building-grid interaction is an everyday event and HVAC designers and building operators must be able to design and operate the systems in the buildings to optimize this interaction. This seminar session focuses on the next generation of HVAC system control strategies that allows buildings to interact with solar PV/battery storage/microgrid systems and the electric grid in an innovative and efficient way. An overview of the electric grid followed by several field and laboratory examples of different HVAC system control strategies to maximize grid reliability and building cost and energy savings will be presented.

1. Demonstration of Integrated Air- and Water-side HVAC Strategies for Demand Response on a University Campus

Thomas Lawrence, Dr. Eng

2. The Feasibility, Economics and Challenges of Using HVAC Systems for Power Grid Regulation Services

Jie Cai, Ph.D.

3. Impacts of On-Site Battery Storage on HVAC and Other Facility Loads Control Strategies for Peak Load Management and Demand Response Programs

Glenn Remington

4. The Value of HVAC Control In Transforming Electric Grids

Carlos Haiad, P.E.

Sunday, January 13, 11:00 a.m. - 12:30 p.m.

Seminar (Intermediate)

Life After R-404A

Track: Refrigeration

Sponsor: 10.7 - Commercial Food and Beverage Refrigeration Equipment

This session articulates what happens when the EPA delists a refrigerant and what is involved in replacing it with an alternate. How to go about the selection process of an alternate? What regulatory considerations are there? What about using flammable A3's as alternates? This session discusses the testing aspect of replacements and cites past transition examples.

1. Using A3s (hydrocarbons) in Self-Contained Equipment

Daryl Erbs, Ph.D.

2. Regulatory/Policy Side of Refrigerant Transitions

Rajan Rajendran, Ph.D.

3. Laboratory Measurements of R407H for Commercial Refrigeration Applications

Stefan Elbel, Ph.D.

4. No Pain no Gain – Transition from R-502 to R-22 to R-404A to ???

Dave Demma

Sunday, January 13, 11:00 a.m. - 12:30 p.m.

Seminar (Intermediate)

Load-based Testing: Adapting Test Methods for Buildings' Changing Needs and/or the Equipment's Emerging Features

Track: Systems and Equipment

Sponsor: 8.11 - Unitary and Room Air Conditioners and Heat Pumps

This session focuses on the testing techniques improvements and projections for heat pumps and air conditioners. Existing index IEER and SEER fail to properly capture the dynamic effects and potential energy savings of advanced unit controls. This seminar discusses different load based testing methods in order to provide a figure of merit for air conditioners and heat pumps. Test procedures, lab requirement as well as system performance are discussed. This seminar also covers the test procedure changes in DOE Appendix M1. Overall, this seminar provides the current research development and standard change on load-based testing method of air conditioners.

1. RP-1608: Load-Based Testing as a Means for Understanding Part-load Performance of Rooftop Units

Pedro Perez

2. Approach: A Load-Based Testing Approach for HVAC Equipment using Emulation of Building Response

James Braun, Ph.D.

3. Data: Seasonal Performance Rating of Heat Pumps and Air Conditioners using Load-Based Testing

James Braun, Ph.D.

4. Test Procedure Changes in DOE Appendix M1 and Compliance with the Residential Air Conditioners and Heat Pumps Standards in 2023

Wongyu Choi

Sunday, January 13, 11:00 a.m. - 12:30 p.m.

Seminar (Intermediate)

Multiscale Building Energy Modeling, Part 10

Track: HVAC&R Fundamentals and Applications

Sponsor: 4.7 - Energy Calculations, 1.5 - Computer Applications

Development of urban- or multiscale building energy models is becoming increasingly tractable for many applications including city-wide energy supply/demand strategies, urban development planning, electrical grid stability, and urban resilience. This seminar has assembled researchers from three U.S. national laboratories with capabilities in the field of multiscale energy models to discuss an overview of the field as well as the data, algorithms, workflow, and practical challenges addressed in their applications involving creation and analysis of building energy models at the scale of a city or metropolitan area.

1. Evaluating the Impact of the Urban Context on Building Energy Modeling

Xuan Luo

2. Modeling Zero Net Energy Communities

Daniel Macumber

3. AutoBEM Capabilities for creating a Digital Twin of a Utility

Joshua New, Ph.D.

Sunday, January 13, 11:00 a.m. - 12:30 p.m.

Seminar (Intermediate)

Occupant-centric Control Technologies: Assessing Comfort, Energy Use, and Cost Tradeoffs

Track: The Convergence of Comfort, IAQ, and Energy Efficiency Building

Sponsor: MTG.OBB - Occupant Behavior in Buildings

Recent years have seen accelerated development of building technologies that enable real time direct and/or indirect occupant control of HVAC, lighting, and plug loads. Measured and simulated tests of these occupant-centric control technologies suggest that their energy savings potential may be substantial but that savings are highly uncertain and could come at the expense of reduced occupant comfort and/or higher installed cost. This seminar seeks to clarify the definition of occupant-centric control measures and explore the degree to which these measures can balance the sometimes competing objectives of occupant comfort, energy use, and cost of deployment.

1. Developing Prospective National Technology Goals for Occupant-centric Measures

Jared Langevin, Ph.D.

2. LightLearn: Reinforcement Learning for Occupant Centered Control and Controller Performance Metrics

Zoltan Nagy, Ph.D.

3. Personalized Comfort Modeling for Occupant-centric Environmental Control

Joyce Kim

4. ORK: A Platform for Building Controls Using Accurate Real-Time Occupancy and Thermal Comfort Preference Estimations

Mario Berges, Ph.D.

Sunday, January 13, 11:00 a.m. - 12:30 p.m.

Workshop (Advanced)

Turning to Old Buildings: Optimizing and Upgrading Our Existing Building Stock

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

Sponsor: 7.9 - Building Commissioning, 7.8 - Owning and Operating Costs, YEA Committee

Throughout the United States, construction costs are increasing while open land for new construction use is diminishing. How do we assist owners, developers, and school districts in making the most of existing buildings? This session will explore the financial aspect of upgrading existing buildings, explore energy reduction ideas, equipment replacement projects, and the financial calculations and incentives which assist owners in penciling out the subsequent budgets. Engineers will learn how to motivate and educate owners on how to invest in their existing portfolio stock while reducing overall building energy use.

1. Exploring the Financials: Motivating Building Owners to Upgrade Energy Systems

Alyse Falconer, P.E.

2. Barriers to Successful Building Owner Energy Savings Initiatives

Richard Danks, P.E.

3. Leveraging Utility Rebates in Offices and Multi-Family Residential Buildings

James Falconer

4. All the Design Elements We Cannot See: A Case Study of Barrington School District 220

Shona O'Dea

Sunday, January 13, 1:30 p.m. - 3:00 p.m.

Conference Paper Session (Intermediate)

Analysis of HVAC Systems for Specific Applications

Track: HVAC&R Fundamentals and Applications

Data centers and hospitals have unique requirements for their design. Data centers consume large amounts of power and generate a lot of heat. Hospitals have unique needs with respect to air movement and ventilation. This session highlights methods to simulate those environments to achieve optimal design.

1. A New Fast Fluid Dynamics Model for Data-Center Floor Plenums

Wei Tian

2. Power Consumption Simulator of Data Center by using Computational Fluid Dynamics and Machine Learning

Hayato Kuwahara

3. The Effect of Forced Air Warming Devices on Surgical Site Infection

Abdel Darwich

4. Analysis of Displacement Ventilation for Hospital Patient Rooms

Kishor Khankari

Sunday, January 13, 1:30 p.m. - 3:00 p.m

Conference Paper Session (Intermediate)

Maximizing Thermal Comfort and International Design

Track: The Convergence of Comfort, IAQ, and Energy Efficiency Building

Maximizing and quantifying thermal performance is a key parameter in building design. Presented here are studies on the thermal occupant satisfaction and the impact on thermal performance on occupant satisfaction.

1. The Assumption of Equidistance in the Seven-Point Thermal Sensation Scale and a Comparison Between Categorical and Continuous Metrics

Sama Aghniaey

2. Predicting Thermal Comfort in Mixed-mode Office Building in the UK

Xiaoyan Luo

3. Maximize Thermal Comfort in Open-plan Offices by Occupant-oriented Control Based on Individual Thermal Profile

Wanni Zhang

4. Quantifying the Importance of Measured Metabolic Rates and Clothing Levels for Effectively Using a Mean Vote Model: A Global Sensitivity Analysis

Jermy Thomas

Sunday, January 13, 1:30 p.m. - 3:00 p.m

Seminar (Intermediate)

Building Integrated Renewable Fueled Natural Refrigeration Systems

Track: Building Integrated Renewables and Natural Systems

Sponsor: 8.3 - Absorption and Heat Operated Machines

This seminar will cover any absorption application, whether chillers, air conditioners, dehumidifiers, heat pumps, or heat transformers using any natural solution pair (LiBr/Water, Ammonia/Water, or Other) used in conjunction with any system fired by a renewable fuel or low grade waste heat including Case Studies, Future Planning, System analysis or policy Issues and Research Issues.

1. Biomass Power Production in Austria

Douglas Davis

2. Waste Heat Driven Cooling and Heating Technologies

Rajesh Dixit

3. Efficient Dehumidification using a Compact Membrane-based Ionic Liquid Absorption Cycle

Saeed Moghaddam, Ph.D.

Sunday, January 13, 1:30 p.m. - 3:00 p.m

Seminar (Intermediate)

“Hot Topics for Hotlanta” - Emerging Applications and Markets for UVC

Track: Systems and Equipment

Sponsor: 2.9 - Ultraviolet Air and Surface Treatment, 2.3 - Gaseous Air Contaminants and Gas Contaminant Removal Equipment

This session will inform the attendees about some of the emerging markets for UVC equipment and address hot topics like Legionella control, cannabis farming, and UVC for Healthcare. Outbreaks, crop health, and HAIs are big concerns and as some of the most common and ubiquitous pathogens develop a resistance to the most widely used antibiotics building engineers, facility managers, business owners, and home owners have turned to UVC for help in creating and maintaining a safe indoor environment. These are some of the reasons that have created new and renewed demand for UVC systems and equipment.

1. Legionella – Need Additional Tools to Control It?

Scott Sherwood

2. Cannabis – Can UV Make my Grass Grow?

Benoit Despatis, P.Eng.

3. Healthcare – Can UVC Reduce Drug Resistant Hospital Acquired Infections?

William Bahnfleth, Ph.D., P.E.

Sunday, January 13, 1:30 p.m. - 3:00 p.m

Seminar (Advanced)

Not Too Little, Not Too Much, Just Right: Standard 62.1 Demand Controlled Ventilation and RP-1747

Track: The Convergence of Comfort, IAQ, and Energy Efficiency Building

Sponsor: 4.3 - Ventilation Requirements and Infiltration

ASHRAE has funded two research projects to develop control sequences for VAV systems that meet Standard 62.1 Ventilation Rate Procedure requirements dynamically using CO2 and occupancy sensors while minimizing energy use. The first project (RP-1547, completed in 2013) established the fundamentals of CO2 demand controlled ventilation and theoretical control logic to optimize energy performance. This seminar discusses the final results of the second project (RP-1747) which included developing detailed direct digital control logic that was then successfully validated with field tests and simulations.

1. A Practical Demand Controlled Ventilation Strategy for Multiple Zone VAV Systems and Standard 62.1 (RP-1747)

Hwakong Cheng, P.E.

2. Field Testing of the RP-1747 Demand Controlled Ventilation Logic

Xiaohui Zhou

3. Energy Savings from Demand Controlled Ventilation and the Impact of Sensor Error: Simulation Results from RP-1747

Zheng O'Neill, Ph.D., P.E.

Sunday, January 13, 1:30 p.m. - 3:00 p.m

Seminar (Intermediate)

Practical Aspects of Incorporating Occupant Considerations into Building Design and Operations

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

Sponsor: MTG.OBB - Occupant Behavior in Buildings

While occupants are emerging as a significant source of building performance uncertainty, they are largely neglected in the design process. Many lessons can be learned from occupants in existing buildings via occupant surveys, data collection, and model development. Yet there are few precedents to improve future buildings. This seminar will focus on methods and case studies whereby occupants are a more central consideration for new building design and improving existing buildings operations. The scope ranges from fundamental research on incorporation of occupants into simulation-aided design to case studies and post-occupancy evaluations with occupant-centric controls.

1. Quantifying the Impact of Occupant Behavior on Savings of Energy Conservation Measures

Kaiyu Sun

2. Occupant Centered Controls

Zoltan Nagy, Ph.D.

3. Occupant behavior in building design codes and standards

Mohamed Ouf, Ph.D.

4. A Case Study: Assessing Occupants' Understanding of Building Controls in High Performance Buildings

Julia Day, Ph.D.

Sunday, January 13, 1:30 p.m. - 3:00 p.m

Seminar (Intermediate)

Uncertainties in Compressor Performance and Field Performance of Liquid-Chilling Systems

Track: Systems and Equipment

Sponsor: 8.2 - Centrifugal Machines, 8.1 - Positive Displacement Compressors

Two major drivers influence the HVACR industry today: climate change and minimum efficiency regulations. As these sometimes complementing items shape the future of HVACR products, it is important to consider the reality of performance uncertainty in these products, specifically that of compressors (components) and liquid chillers (systems) when installed in the field. This seminar will focus on the test measurement uncertainty of compressor performance and field performance of liquid-chilling systems, and suggest possible solutions to the challenges these uncertainties cause for both HVACR manufacturers and users.

1. Uncertainties in Compressor Performance

Justin Prosser, P.E.

2. An Introduction to Field Testing of Liquid Chillers and Standard 184

Ian Spanswick

Sunday, January 13, 1:30 p.m. - 3:00 p.m

Workshop (Basic)

Room Loads to Equipment Sizing Missing Link – How Can ASHRAE Help Young Engineers?

Track: HVAC&R Fundamentals and Applications

Sponsor: 4.1 - Load Calculation Data and Procedures

This workshop will help ASHRAE and TC4.1 understand what knowledge gaps exist for young engineers between load calculations and equipment selection. No ASHRAE standard or guideline exists to help engineers navigate from the calculated room loads to the equipment selections. As more experienced engineers retire, it can be a challenge for young engineers to understand how to connect the dots between loads and equipment. Elements considered in the loads to equipment selection process vary widely by region, climate type, and firm. This workshop will provide needed input to judge what additional standards or guidelines are needed, particularly for young engineers.

1. What We Learned from the Houston Workshop

Rachel Spitler

2. The Atlanta Workshop - An Interactive Survey

James Pegues

Sunday, January 13, 3:15 p.m. - 4:45 p.m

Seminar (Intermediate)

Building Energy Storage: The Future of the Smart Grid

Track: Building Integrated Renewables and Natural Systems

Sponsor: 6.9 - Thermal Storage

As our reliance on solar and wind generation continues to increase, the electrical grid must rapidly change to incorporate these new intermittent renewable resources. In order to maximize the benefit of these intermittent resources, storage must be a part of the future smart grid. This seminar will discuss the integration of energy storage within buildings in order to maximize the benefit of renewables for both the grid and building owners alike.

1. Unique Building Applications of Ice and Chilled Water Thermal Energy Storage

Guy S. Frankenfield, P.E.

2. Batteries are Magic Boxes: Can They Actually Deliver All They Slated To?

Ram Narayanamurthy, P.E.

3. Building Energy Storage: A Vital Component in a Low Carbon Future

Mark MacCracken, P.E.

Monday, January 14

Monday, January 14, 8:00 a.m. - 9:00 a.m.

Technical Paper Session (Intermediate)

Studies in Energy Efficiency

Track: Building Integrated Renewables and Natural Systems

Driving towards energy efficiency, these papers highlight recent studies in energy efficient technologies. From solar panels to motor design learn about new technical advances in energy efficient system components.

1. Seasonal Solar Energy Storage Technologies in Building

Uros Stritih

2. A Comparison of the Annual Energy Use of Fixed and Variable Airflow Parallel Fan-powered Terminal Units in a Small Office Building

Dennis O'Neal

3. Effects of System Materials towards the Breakdown of Lubricants and Low GWP Refrigerants 1774-RP

Ngoc Dung (Rosine) Rohatgi

4. Performance Evaluation of a 3-Fluid Membrane Liquid Desiccant Air-Conditioning System

Devin Storle

Monday, January 14, 8:00 a.m. - 9:00 a.m.

Conference Paper Session (Intermediate)

Air Distribution Strategies

Track: Systems and Equipment

People are spending an increasing amount of time in indoor spaces and air quality is a major concern in design. From new sensors to air distribution, the air we breathe inside buildings must be designed correctly. This session will highlight strategies for maintaining good indoor air quality for occupied spaces.

1. Capabilities and Limitations of Commercially Available Wireless Indoor Environment Sensors

Angelos Mylonas

2. Temporal Variations in Estimated Ventilation and Relative Performance Based on Continuous CO₂ Monitoring in Offices

Tomas Novotny

3. Comparing Configurations for Supply and Return Vents in Mixed Air Distribution Systems to Reduce Micro-particle Indoor Concentrations

Walid Chakroun

4. Photocatalytic Activity and Durability of Commercial TiO₂ Photocatalysts for Indoor Air Purification

Alirexa Haghghatmamaghani

Monday, January 14, 8:00 a.m. - 9:00 a.m.

Conference Paper Session (Intermediate)

Quality Office Conditions Through HVAC/R

Track: The Convergence of Comfort, IAQ, and Energy Efficiency Building

Thermal comfort and indoor air quality are two key components of quality conditioned spaces. We all want to work in those conditions, but how are they achieved. Listen to presentations on methods of improving thermal comfort and creating quality conditioned spaces.

1. Performance Evaluation of Active Chilled Beam in Real Office Conditions in a High-Performance Building in Heating

Rohit Upadhyay

2. The Convergence of Standard 90.1, 62.1, and 55 – Energy Efficiency Measures and an Example of an Office Building

Chonghui Liu

3. Restoring Trust – How Building Automation, Operations, and Tenants Restored Indoor Environmental Conditions Following Failed Improvement Measures

Orvil Dillenbeck

4. Indoor Air Quality & Energy Efficiency

Nirmal Ram D

Monday, January 14, 8:00 a.m. - 9:00 a.m.

Seminar (Advanced)

Advances in Low-GWP Refrigeration System Architectures

Track: Refrigeration

Sponsor: Refrigeration Committee, 10.7 - Commercial Food and Beverage Refrigeration Equipment, 8.01 Positive Displacement Compressors

The seminar will introduce new refrigeration system architectures in line with the new design trends aiming at reducing the refrigerant charge, increase in energy efficiency, and extending the temperature application range.

1. Micro-Distributed Systems

Timothy Anderson

2. Application of CO2 Transcritical Advanced Technologies in Hot Climates

Shitong Zha, Ph.D.

3. Combining HFO's with Various System Architectures to Reduce Energy Use and Emissions in Commercial Refrigeration

Gustavo Pottker

Monday, January 14, 8:00 a.m. - 9:00 a.m.

Seminar (Intermediate)

ASHRAE Thermal Guidelines Driving Data Center Performance & Innovation

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

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

The Thermal Guidelines can have a positive impact on global data center construction and operations. Outcomes show how when the Thermal Guidelines are applied innovatively, reliability and availability (the number data centre customer requirement) can be complementary to both energy-efficiency and sustainability. In addition, such an approach can also reduce both data center project capital expenditure and operational expenditure through-out the life cycle of the building. This session details the ASHRAE thermal guidelines, their application to enable free cooling for a new UK facility, and closes with how the concept was validated a priority.

1. The Real Opportunity of the Thermal Guidelines and their Impact on IT Equipment Design

Dustin Demetriou, Ph.D.

2. Data Center Site Selection, Business Decisions and Thermal Guidelines that Facilitate the Bold Decision to Enter the Wholesale Market and Adopt a Free Cooling Strategy

Paul Finch, CEng

3. Validating the Design Concept for a Data Center Without Mechanical Cooling in the Southern UK

Mark Seymour, CEng

Monday, January 14, 8:00 a.m. - 9:00 a.m.

Seminar (Basic)

Load Calculation Considerations for Radiant Systems

Track: HVAC&R Fundamentals and Applications

Sponsor: 4.1 - Load Calculation Data and Procedures, 6.5 - Radiant Heating and Cooling

Radiant systems have different cooling load characteristics than all-air systems, but most load calculations methodologies are designed for all-air systems. This session will discuss elements considered in radiant system load calculations, the problems with designing radiant systems using all-air system methods, review results from two recent radiant system research projects, and present a design tool for radiant system load calculations.

1. A Side-by-Side Laboratory Comparison of Peak Space Cooling Loads and Daily Thermal Energy Use for Radiant and All-air Systems

Jonathan Woolley

2. Development and Demonstration of an Interactive Web-based Design Tool for High Thermal Mass Radiant Cooling Systems

Carlos Duarte

3. Difference in Cooling Loads for Radiant and All-Air Systems for Different Load Scenarios

Ardeshir Mofkharhi

4. What Happens when Radiant Systems are Designed by Methods Developed for All-air Systems?

Atila Novoselac, Ph.D.

Monday, January 14, 9:45 a.m. - 10:45 a.m.

Conference Paper Session (Intermediate)

Ground Source Heat Pumps, from Experimental Applications to Novel Case Studies

Track: Building Integrated Renewables and Natural Systems

This session showcases recent applications and advances in Ground-Source Heat Pumps (GSHPs) using CO₂.

1. Strategies and Lessons Learned for Optimal Performance of Gas Heat Pump-Driven Residential Combination Space and Water Heating Systems

Paul Glanville

2. Experimental and Simulation Studies on a Solar-Ground Source Heat Pump System

Eikichi Ono

3. Modeling and Parametric Study of Large Diameter Shallow Bore Helical Ground Heat Exchanger

Antash Najib

Monday, January 14, 9:45 a.m. - 10:45 a.m.

Conference Paper Session (Intermediate)

Human Factors Design for Residential Buildings

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

Increasing efficiency of residential buildings has created challenges for the design professional with respect to human comfort. Creating high performing residential buildings also creates the long term challenge of performance over time. These papers discuss how performance changes over time and how to navigate the unintended consequences of high performing residential buildings.

1. Human Factors of High Performance of Multifamily Housing

Philip Agee

2. Experimental and Simulation Studies on a Solar-Ground Source Heat Pump System

Sara Beaini

3. Modeling and Parametric Study of Large Diameter Shallow Bore Helical Ground Heat Exchanger

Jordan Clark

Monday, January 14, 9:45 a.m. - 10:45 a.m.

Seminar (Intermediate)

Cannabis Grow Facilities - Challenges for HVAC Design, Equipment Selection and Operation

Track: Systems and Equipment

Sponsor: 1.5 - Computer Applications, 4.1 - Load Calculation Data and Procedures

The legalization of cannabis in many US states and Canada is providing a unique growth opportunity for the HVAC industry. Grow facilities that focus on cannabis require exacting and specific air conditions that differ from conventional HVAC systems. The first speaker will discuss how HVAC cooling and heating load calcs and equipment selection differ for grow facilities versus conventional HVAC applications. The speaker will discuss all of the additional parameters required to properly calculate cooling, heating, and humidification loads and the resulting equipment selection. The second speaker will discuss real world applications that he has worked with.

1. Specialized HVAC Load Calcs and Equipment Selection for Grow Facilities

Stephen Roth, P.E.

2. Cannabis Grow Facilities - Challenges for HVAC Design and Operation

Bruce Straughan, P.E.

Monday, January 14, 9:45 a.m. - 10:45 a.m.

Seminar (Intermediate)

Challenges of Using Open Source CFD Tools

Track: HVAC&R Fundamentals and Applications

Sponsor: 4.10 - Indoor Environmental Modeling

Computational Fluid Dynamics (CFD) has been rapidly catching on as an invaluable tool for indoor airflow analysis. Practitioners eventually face a choice between using commercial or open-source CFD software. Open-source CFD packages are an attractive option due to their affordability and ever-increasing capabilities. Potential drawbacks are their accuracy and the

relatively steep learning curve that goes along with any open source software platform. This session will showcase several open source CFD tools for various indoor airflow and contaminant modeling applications. Comparisons to commercial CFD packages will be made and the return on investment of open source tools will be evaluated.

1. Fast Fluid Dynamics for Energy Efficient Building Design and Operation

Wangda Zuo, Ph.D.

2. The Return on Investment: Modeling a Commercial Kitchen with Open CFD Tools

Duncan Phyfe

3. Assessment of the CFD-0 module of CONTAM for Airborne Contaminant Transport Modeling in Hospital and Laboratory Applications

Bruno Perazzo Pedroso Barbosa, DSc

Monday, January 14, 9:45 a.m. - 10:45 a.m.

Seminar (Intermediate)

Cutting-Edge Japanese Technologies SHASE Annual Award for ZEB Constructions in 2018

Track: Building Integrated Renewables and Natural Systems

Sponsor: MTG.ACR - Air Change Rate, 9.6 - Healthcare Facilities, 9.10 - Laboratory Systems 9.11 Clean Spaces

Two ZEBs, featuring a renewable and natural system with a SHASE Technical Award, will be introduced. One is a city hall which achieved “Nearly ZEB” with groundwater and woody biomass hot water for desiccant and radiant air-conditioning. This all-renewable energy system covers 53.4% of the annual heating/cooling load. Another is a ZEB renovation of occupied buildings which achieved positive energy balance after retrofitting while people are working inside. Major measures include: geothermal air-conditioning, solar heating, natural ventilation, desiccant units for intake air and PV and Wellness Control System. Energy reduction of 71% and PV created a Positive Energy Building (PEB).

1. ZEB City Hall Encompasses Regional History, Climate, and Resources in Japan

Tomohisa Takebe

2. ZEB Renovation of Building in Actual Use

Hiroki Kawakami

Monday, January 14, 9:45 a.m. - 10:45 a.m.

Seminar (Intermediate)

Hydronics Gone Haywire: What the Gen Xers and Baby Boomers Have Done Wrong - The Sequel

Track: Common System Issues and Misapplications

Sponsor: 6.1 - Hydronic and Steam Equipment and Systems

This session is ideal for YEA members and other designers so they do not repeat common mistakes and misapplications that the Gen Xers and Baby Boomers have made in the past. In this seminar, the audience will help to identify common mistakes and

misapplications in hydronic heating and cooling systems. Following the identification of the problem, the presenters will share mitigation techniques and discuss design methods used in the past to overcome the identified issues.

1. Chilled & Condenser Water System Misapplications & Mitigation

Michael Schwedler

2. Heating Water System Misapplications & Mitigation

Jason Atkisson, P.E.

Monday, January 14, 9:45 a.m. - 10:45 a.m.

Seminar (Intermediate)

Thermodynamic Analysis of Non-Vapor-Compression Cooling/Heating Technologies

Track: HVAC&R Fundamentals and Applications

Sponsor: 1.1 - Thermodynamics and Psychrometrics, Refrigeration Committee

This seminar focuses on non-vapor-compression (i.e. not-in-kind) HVAC technologies. This session first provides an overview of various not-in-kind technologies, including magneto-chloric, elastic-chloric and absorption based systems. This overview focuses on fundamental analysis based on first and second law of thermodynamics and performance comparison with vapor compression systems. Then two most promising technologies elastocaloric cooling and magnetocaloric cooling are discussed in detail separately. Fundamental theory are proposed and experimental data are presented. Overall, this session provides the audience a basic idea of non-vapor-compression technology potentials.

1. Thermodynamic Analysis of NIK Cooling/Heating Technologies

Kashif Nawaz

2. Regenerative Elastocaloric Cooling

Yunho Hwang, Ph.D.

3. Seasonal Performance Rating of Heat Pumps and Air Conditioners using Load-Based Testing

Suxin Qian, Ph.D.

Monday, January 14, 9:45 a.m. - 10:45 a.m.

Forum (Advanced)

What Do We Know about Contaminant Generation Rates?

Track: The Convergence of Comfort, IAQ, and Energy Efficiency Building

Sponsor: 7.6 - Building Energy Performance

Concentration levels of contaminants within the occupied spaces determine the indoor air quality. Several factors can affect these concentration levels including the sources of contaminants, their generation rates, location, strength, and the ventilation effectiveness of the HVAC system. Do we really know the generation rates of contaminant in the indoor spaces? How can those be measured and monitored? Do the supply airflow rate specifications account for the generation rates? This session will

brainstorm these questions and will attempt to identify current state of the art about the contaminant generation rates. Active participation is required from the attendees.

Monday, January 14, 11:00 a.m. - 12:00 p.m.

Conference Paper Session (Intermediate)

Equipment Component Design for Enhanced Operation

Track: Systems and Equipment

This session will highlight advances in system components for improved equipment operation. From nozzles to specialty coatings, new concepts are discussed, highlighting operational advantages from their use. Participants will walk away with an understanding of the improvements available and advantages from these new technologies.

1. Design of Multi Nozzles for a Portable Air Flow Meter using Numerical Simulation

Sang Taek Oh

2. Effect of Mixed Super-Hydrophilic and Super-Hydrophobic Surface Coatings on Droplets Freezing and Subsequent Frost Growth During Air Forced Convection Channel Flows

Lorenzo Cremaschi

3. Optimization of Microchannel Shape Using Analytical Models for Condensation

Khoudor Keniar

Monday, January 14, 11:00 a.m. - 12:00 p.m.

Conference Paper Session (Intermediate)

Equipment in Air Distribution

Track: Systems and Equipment

Air distribution is an important factor in HVAC system design. This session will cover methods of measurement to assure proper operation and components used for air distribution.

1. In-Situ Observations of Series and Parallel Fan Powered Terminal Units

John Bryant

2. Development and Calibration of an Online Energy Model for AHU Fan

Jin Dong

3. Improving Effective Energy-Efficient Commercial Package Dedicated Outside Air Systems Located in Hot-Humid Climate Zones

Charles Withers

Monday, January 14, 11:00 a.m. - 12:00 p.m.

Seminar (Intermediate)

Cutting-Edge Japanese Technologies SHASE Annual Award for New Constructions in 2018

Track: The Convergence of Comfort, IAQ, and Energy Efficiency Building

Sponsor: 7.6 - Building Energy Performance

We introduce two buildings in Tokyo having earned the SHASE Technical Award for achieving energy efficiency and comfort. One is an office building featuring “radiant ceiling air-conditioning with slight air flow” and “medium-temperature chilled/warm water for air-handling units”. Energy saving of 63% was realized, which also earned it the ASHRAE Technology Awards 2017 First Place. Another is a high-rise hospital, also featuring “radiant ceiling air-conditioning for all patients’ rooms”, plus an “odor sensor-based ventilation-control system” that successfully reduced the volume of intake outdoor fresh air. Energy saving of 32% was achieved with the LEED-HC v2009 Gold.

1. Practice of an Environmental Facility Plan for a New Construction Building

Taro Hongo

2. Creation of Urban High-rise Hospitals through Medical and Architectural Collaboration

Koichi Machida

Monday, January 14, 11:00 a.m. - 12:00 p.m.

Seminar (Basic)

Low GWP Refrigerants: Components and System Designs

Track: Refrigeration

Sponsor: 8.4 - Air-to-Refrigerant Heat Transfer Equipment, 3.1 - Refrigerants and Secondary Coolants, 8.1 - Positive Displacement Compressors

This seminar focuses on low GWP refrigerants and the methodology of adopting them in system design. The performances of a variety of lower GWP alternatives at various temperatures are presented. The design method of compressors is also included.

1. Evaluation of Alternative Lower GWP Refrigerants

Paul de Larminat, Ph.D., P.E.

2. Development of a Light-commercial Hot-gas Bypass Load Stand for Accelerated Compressor Development

Craig Bradshaw, Ph.D.

Monday, January 14, 11:00 a.m. - 12:00 p.m.

Seminar (Intermediate)

Modeling MegaStructures, Arena, etc.

Track: The Engineer's Role in Architecture

Sponsor: 4.10 - Indoor Environmental Modeling

Computational Fluid Dynamics (CFD) will accurately model “Mega Structures”. The engineer can take advantage of the ability of CFD to accurately solve a wide range of applications in support of today’s designs. We will look at two very different applications but each sharing the critical need to show accurate solar loading in their analysis. The first analysis will look at a

sem-transparent photovoltaic installation; successfully reducing the heating cost in an automotive tunnel. The second analysis will look at conditioning strategies for tall, open spaces with large solar loads. The atrium includes displacement ventilation and an active radiant slab.

1. Modeling of Road Tunnel with Semi-transparent Photovoltaic (STPV) Installed at Tunnel Approachs

Liangzhu (Leon) Wang

2. Conditioning Strategies for Tall Open Spaces with Large Solar Loads

Mike Koupriyanov, P.E.

Monday, January 14, 11:00 a.m. - 12:00 p.m.

Seminar (Intermediate)

NetZero: Understanding, Reducing, and Mitigating Uncertainty in the Design Phase

Track: The Convergence of Comfort, IAQ, and Energy Efficiency Building

Sponsor: 7.6 - Building Energy Performance

Understanding different types of simulations and the usage of each is critical to designing and operating high performance buildings. When utilizing simulation to demonstrate code or above code performance, standard occupancy profiles and miscellaneous unregulated loads are acceptable and lead to satisfactory decisions. However, as we pursue net zero and regenerative design and operations, understanding and quantifying the impact of these loads and their relationship to thermal comfort and IAQ parameters becomes much more significant. This session will explore ways to understand and mitigate the uncertainty leading to better design and operation of high performance buildings.

1. Design Phase Modeling: Unregulated Uncertainties in the Path to Net Zero

Abigail Hampsmire, P.E.

2. NetZero: Best and New Practices to Reduce Uncertainty in the Design Phase Simulations

Brenda Morawa, P.E.

3. NetZero: How to Understand and Mitigate Uncertainties from the Owner's Perspective

Christina Rohs

Monday, January 14, 11:00 a.m. - 12:00 p.m.

Seminar (Basic)

Pairing Geothermal and Hydronic Systems in Residential Buildings

Track: Systems and Equipment

Sponsor: 6.1 - Hydronic and Steam Equipment and Systems, 6.8 - Geothermal Heat Pump and Energy Recovery Applications

This seminar provides design tools and tips for residential buildings utilizing a ground-source heat pump paired with hydronic heating and cooling system. A cutting-edge design example for a home currently constructed in Northern California is the basis of the seminar. Presenters will review the load calculations and sizing of the ground-loop heat exchanger and hydronic piping

design. Combining sound piping strategies, proper air management, and latest pump technology with simple design and control approaches can improve overall system efficiencies. References to applicable sections of ASHRAE 90.2 will be included in the design considerations.

1. Ground-Source Heat Pump Design for a Moderate Residence in Northern California

Lisa Meline, P.E.

2. Energy Efficient Residential Hydronic System Design

Stan Kutin

Monday, January 14, 11:00 a.m. - 12:00 p.m.

Seminar (Intermediate)

Space Pressurization for Infection Control and Hospital Accreditation

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

Sponsor: 1.4 - Control Theory and Application, 9.6 - Healthcare Facilities

To maintain accreditation, the operations staff in a hospital has to maintain and demonstrate performance of the HVAC systems that pressurize critical spaces. Success starts with mechanical design principles and continues through construction and commissioning. Finally, it persists in a formal, documented performance monitoring program. This session explains physical aspects of pressurization, analyzes design approaches and design decisions. Finally, it presents the ideas and execution of a monitoring and maintenance program that supports infection control and accreditation.

1. Controlling Contaminants with Space Pressurization

James Coogan, P.E.

2. Creating a Program to Identify and Monitor Pressurized Spaces in a Hospital

Dennis Ford

Monday, January 14, 11:00 a.m. - 12:00 p.m.

Seminar (Intermediate)

Tall Space Load Calculations

Track: HVAC&R Fundamentals and Applications

Sponsor: 4.1 - Load Calculation Data and Procedures

Tall spaces are a load calculation challenge since the normal ASHRAE load calculation's assumption of a well-mixed space does not apply to tall spaces such as an atrium, a gather hall or an airport, where it is not necessary to condition the space above the occupied height. This session examines case studies of tall space load calculations and the benefits of using CFD, computational fluid dynamics.

1. Using Physics to Conserve Energy

Peter Simmonds, Ph.D.

2. Load Estimation for Tall Spaces using Computational Fluid Dynamics

Dan Nall, AIA

Monday, January 14, 11:00 a.m. - 12:00 p.m.

Workshop (Basic)

Getting Involved with ASHRAE Standards

Track: HVAC&R Fundamentals and Applications

Sponsor: 7.6 - Building Energy Performance

The ASHRAE standards process can seem complex and opaque from the outside. However, getting involved with this process - as a member of a standards project committee or as a reviewer/commenter - is relatively easy. This session will provide an overview of the ASHRAE standards process, with specific advice on getting involved. Questions are welcomed and encouraged.

1. Getting Involved with ASHRAE Standards

Walter Grondzik, P.E.

Monday, January 14, 2:15 p.m. - 3:45 p.m.

Seminar (Basic)

How Revisions to Standard 180 will Help Improve Maintenance Services

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

Sponsor: 7.3 - Operation and Maintenance Management

News Flash: BSR/ASHRAE/ACCA Standard 180, Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems, has been updated and published in 2018. This seminar explores the updates to Standard 180-2018.

1. Standard 180 Use and Updates

Donald Langston

2. Western HVAC Performance Alliance Inc. (WHPA) Use of Standard 180

Richard Danks, P.E.

3. Operations and Maintenance Programs Using Standard 180: A Factor for Persistence in Building Energy Performance

Cedric Trueman, P.Eng.

4. How Standard 180 Can Transform the HVAC Maintenance Industry

Kristin Heinemeier

Monday, January 14, 2:15 p.m. - 3:45 p.m.

Seminar (Basic)

Update on Global Policies and Programs for Best Use of Refrigerants

Track: Refrigeration

Sponsor: 7.3 - Operation and Maintenance Management

Fluorinated gases are used in refrigeration and air-conditioning applications worldwide and contribute to global warming. The Montreal Protocol was extended to control the production and consumption of HFCs in the Kigali Amendment. EU adapted new F-gas Regulation from 2015. As switching of high GWP refrigerants to low GWP and confining refrigerants within the system become important, UN, IIR, US and EU are striving their efforts. UN Environment OzonAction promotes proper refrigerant management in developing countries. The US DOE directs building energy consumption reductions. This session provides updates on global refrigerant regulations and efforts to best use of refrigerants throughout lifetime.

1. An Overview of Refrigerants Related Policies in Article 5 Countries and UN Environment Partnerships to Support Compliance with the Protocol

Ayman Eltalouny

2. The application of the EU F-Gas Regulations: An Example for Other Regions?

Didier Coulomb

3. IIR Actions to Reduce Refrigerant Emissions

Didier Coulomb

4. US GHG Regulation and EERE Program Update

Antonio Bouza

Monday, January 14, 2:15 p.m. - 4:15 p.m.

Workshop (Basic)

Best Practices of the Mentor-Mentee Relationship

Track: HVAC&R Fundamentals and Applications

Sponsor: College of Fellows, YEA Committee

Mentoring can be a powerful resource and create mutually beneficial relationships for the mentor and mentee. ASHRAE members at any stage of their career will benefit from having access to a fellow member as they work through a challenging or demanding project, move into a new role, or seek a trusted advisor relationship for a prolonged period of time. This mentorship workshop is meant to be an interactive experience to kickstart ASHRAE's mentorship program among all attendees.

1. Best Practices of the Mentor-Mentee Relationship

Ralph Kison

Monday, January 14, 4:00 p.m. - 5:00 p.m.

Seminar (Intermediate)

Assessing the Effectiveness of Economizers for De-Centralized Cooling Systems

Track: Systems and Equipment

Sponsor: 7.6 - Building Energy Performance

As standards and energy codes become more stringent in their requirements for economizers, designers are faced with incorporating these requirements into their design in ways that are both practical and cost effective. Differences in compliance paths often lead to confusion during design, and it is unclear to what extent the prescriptive economizer requirements are effective. In this seminar, we will review current energy code adoptions and their requirements for economizers, discuss design challenges as they pertain to different cooling system types, review the effectiveness of economizers based on system type, building and application, and assess potential heat recovery benefits.

1. Applying Economizers to De-centralized Systems

Jonathan Johrden, P.E.

2. Economizer Energy Performance and Cost Benefit Analysis

Sam Mason, P.E.

Monday, January 14, 4:00 p.m. - 5:00 p.m.

Seminar (Intermediate)

Using Air to Air Energy Recovery to Help Balance Comfort, IAQ, and Energy

Track: The Convergence of Comfort, IAQ, and Energy Efficiency Building

Sponsor: TC 5.5 Air to Air Energy Recovery

Air to Air Energy Exchangers can be applied to traditional HVAC systems. To do so there is a balance between utilizing existing cooling equipment and air to air energy exchangers that will physically fit and function as desired. This seminar will look at several examples of finding this balance to help achieve comfort, IAQ and energy saving goals.

1. Wraparound Heat Pipe Technology: Using Heat Pipes to Save Energy and Improve IAQ

Mazen Awad

2. Upgrading Your Rooftop – Energy Recovery Applications in Commercial Unitary Equipment

Kristin Sullivan

Tuesday, January 15

Tuesday, January 15, 8:00 a.m. - 9:30 a.m.

Debate (Intermediate)

Filtration Doesn't Matter.....or Does It?

Track: The Convergence of Comfort, IAQ, and Energy Efficiency Building

Sponsor: 2.4 - Particulate Air Contaminants and Particulate Contaminant Removal Equipment, 2.3 - Gaseous Air Contaminants and Gas Contaminant Removal Equipment

The purpose of this debate session is to explore the role and value of air filtration in HVAC systems. Indoor Air Quality is an essential contribution to Occupant Comfort, yet comes at a cost. Both sides of filtration's contribution to IAQ and value will be addressed.

1. Jeffrey Siegel, Ph.D., The University of Texas at Austin, Austin, TX

2. **Matt Middlebrooks**, Filtration Group, Dallas, TX

3. **Donald Thornburg**, Camfil USA, Riverdale, NJ

4. **Dennis Stanke**, Trane, La Crosse, WI

Tuesday, January 15, 8:00 a.m. - 9:30 a.m.

Conference Paper Session (Intermediate)

Efficiency and Health Benefits of Modern Hydronic Systems

Track: Systems and Equipment

Focus on energy efficiency and public health have been common topics in ASHRAE over the past few years. Several papers on energy efficiency in hydronic systems and one statistical analysis of Legionella in cooling water systems will be presented.

1. Method for Centrifugal Chiller Power Estimation and Prediction – Development and Verification

Marcelo Acosta

2. Industry/Government/Academia Partner to Achieve SCOP>5 Hot-Climate MEPS Air-Cooled Chiller

Muhammad Tauha Ali

3. Legionella Regulation, Cooling Tower Positivity, and Water Quality in the Quebec Context – A Review of Field Data

Patrick Racine

4. Effect of the Specification of Chilled and Hot Water Coil on Efficiency of Air Conditioning System with Water Thermal Storage

Tomoya Kawaji

Tuesday, January 15, 8:00 a.m. - 9:30 a.m.

Seminar (Basic)

Adapting to Thrive - Shaping Resilient Future Urban Performance through Historical Insight

Track: The Engineer's Role in Architecture

Sponsor: CIBSE ASHRAE Liaison Committee

Changes in the external climate and in the expectations of building owners and occupants are a game changer for designers and operators. This seminar will show that success in engineering the future built environment can be powered through knowledge and experience amassed from previous projects, research and operation. It will show how engineers and their societies, such as ASHRAE and CIBSE, can adapt their historic knowledge base to meet future challenges and deliver solutions to meet the needs of tomorrow's clients and society. The presentations will illustrate this by considering technological innovations that are firmly founded on robust historical insight.

1. Adapting to Change

Stephen Lisk

2. From Historical Pankhā to Traditional Ceiling Fan: Low-energy Cooling and Ventilation in Indian Homes

Dennis Loveday, Ph.D.

3. Employing Historical Data to Inform the Development of Sustainable and Resilient Microgrids

John Griffiths, P.E.

4. Going Digital – Modeling Historical Infrastructure

Drury Crawley, Ph.D.

Tuesday, January 15, 8:00 a.m. - 9:30 a.m.

Seminar (Intermediate)

How was that Supposed to Work Again? The Importance of Documented & Understandable Sequences of Operation throughout the Life Cycle of a High Performance Building

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

Sponsor: 7.3 - Operation and Maintenance Management, 1.4 - Control Theory and Application, 7.9 - Building Commissioning

Facilities personnel come and go. Training to understand the HVAC system in their building is always a challenge. A properly constructed narrative and graphical style Sequences of Operation is potentially the best training tool available as subsequent generations of building personnel are trained. This seminar/workshop discusses how a narrative sequence can serve the purposes of both immediate construction and long term operations.

1. Different Writers, Different Readers, Different Styles

James Coogan, P.E.

2. Case Study - Comparing Effective and Ineffective SOO

Bill Gnerre

3. The SOO as a Tool for Construction & Operations

Michael Gallagher, P.E.

Tuesday, January 15, 8:00 a.m. - 9:30 a.m.

Seminar (Intermediate)

HVAC Optimization

Track: HVAC&R Fundamentals and Applications

Sponsor: Publication and Education Council

There is a strong need to develop new HVAC optimization technologies to increase the energy efficiency and cost effectiveness of HVAC systems in residential and commercial buildings (not only for the customer, but for the manufacturer as well). In this session we present material from recently published papers from ASHRAE's archival journal, Science and Technology for the Built Environment, on the subject.

1. Development of a Distributed Artificial Fish Swarm Algorithm to Optimize Pumps Working in Parallel Mode

Tianyi Zhao, Ph.D.

2. Field Test of the ASHRAE/CIBSE/USGBC Performance Measurement Protocols: Part I Intermediate Level Energy Protocols and Field Test of the ASHRAE/CIBSE/USGBC Performance Measurement Protocols: Part II Advanced Level Energy Protocols

Hyojin Kim, Ph.D.

3. Multivariable Extremum Seeking Control for a Multi-functional Variable Refrigerant Flow System

Yaoyu Li, Ph.D.

Tuesday, January 15, 8:00 a.m. - 9:30 a.m.

Seminar (Advanced)

Refrigerant Flammability Fundamentals

Track: Refrigeration

Sponsor: 3.1 - Refrigerants and Secondary Coolants, MTG.LowGWP - Lower Global Warming Potential Alternative Refrigerants

Concerns about the impact of refrigerants on climate change are driving new regulatory policies to restrict and lower the global warming potential (GWP) impact of fluorocarbon refrigerants used in the HVAC&R industry. In response, the industry is developing and examining a new class of lower GWP refrigerants, many of which are flammable. As this transition moves forward, many questions exist about changing to flammable refrigerants options and requirements to use them safely. This seminar will highlight research into important considerations unique to flammable refrigerants, that engineers, designers, and building owners should keep in mind regarding next-generation refrigerants.

1. Flammability Fundamentals

Gregory Linteris, Ph.D.

2. Evaluation of Experimental Methods for Burning Velocity of Flammable Refrigerants

Gregory Linteris, Ph.D.

3. Flammability and Risk Assessment of Low GWP Refrigerants

Sarah Kim, Ph.D.

4. Hot Surface Ignition Testing of Low GWP 2L Refrigerants

Patrick E. Coughlan

5. Effects of Temperature and Pressure on Quenching Distances of Low GWP 2L Refrigerants

Kenji Takizawa

Tuesday, January 15, 8:00 a.m. - 9:30 a.m.

Seminar (Intermediate)

Securing BACnet Networks: Present and Future

Track: HVAC&R Fundamentals and Applications

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

Securing BACnet networks for confidentiality, integrity and availability (aka CIA Triad) becomes a requirement that should not be neglected. Methods to secure BACnet networks are available today and are outlined in this seminar. BACnet Secure Connect (BACnet/SC) is a new networking option to be added to BACnet which supports IT security for BACnet communications using standard IT technologies used in other critical applications such as online banking. Audit logging and reporting is a complement to securing the communications. Recently added to the standard, it specifies reporting and logging of auditable operations performed by client and server devices on a system.

1. Understanding the Options for Securing your Building Automation Infrastructure

Dave Robin

2. BACnet Secure Connect (proposed BACnet Addendum 135-2016bj)

Bernhard Isler

3. BACnet Audit Reporting and Logging (published BACnet Addendum 135-2016bi)

Michael Osborne, P.Eng.

Tuesday, January 15, 8:00 a.m. - 9:30 a.m.

Seminar (Intermediate)

Understanding the Noise & Vibration Associated with Variable Refrigerant Flow (VRF) Systems

Track: Common System Issues and Misapplications

Sponsor: 2.6 - Sound and Vibration

Variable Refrigerant Flow (VRF) systems are generally described as high energy efficient and super quiet systems. Though there are some noise and vibration issues that regularly arise that many engineers and contractors are not aware of until there are issues. This session will explore some of the most common issues and some best practices to optimize the installation of these systems with respect to noise and vibration.

1. VRF Noise Testing Standards

Jerry Lilly, P.E.

2. Vibration Isolation & Noise Control for VRF Condensing Units

Erik Miller-Klein, P.E.

3. A Field Guide to Noise and Vibration Issues for Installed VRF Systems

Roman Wowk

Tuesday, January 15, 9:45 a.m. - 10:45 a.m.

Conference Paper Session (Intermediate)

Desiccant Dehumidification

Track: Building Integrated Renewables and Natural Systems

Implementation of dehumidification strategies can improve overall efficiency of cooling systems. This session highlights desiccant dehumidification systems and their impact on energy efficiency. Some of these methods are new methods to increase performance.

1. Desiccant Dehumidification Process for Energy Efficient Air Conditioning

Jonathan Maisonneuve

2. Sensitivity Study of Crystallization Fouling in a Liquid-to-Air Membrane Energy Exchanger using Three Desiccant Solutions

Adesola Olufade

3. A Novel Heat and Mass Transfer Model for Membrane-based Ionic Liquid Desiccant Air Dehumidifier

Roman Wowk

Tuesday, January 15, 9:45 a.m. - 10:45 a.m.

Seminar (Intermediate)

Cutting-Edge Japanese Technologies SHASE Annual Award for Smart Community in 2018

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

Sponsor: 7.6 - Building Energy Performance

The advantages of operating a high-performance system effectively will be introduced in the SHASE Technical Award. One is a set of residential and office blocks in Tokyo, within which power and heat from cogeneration are shared respectively. This Community Energy-Management System helped save 30% of energy and 15% of power. Another is a large university in Nagoya. As well as various technical measures including PV, battery, demand forecast and control of lighting and air-conditioning, this university introduced a "Navigation of Power-Saving System", which controls the R/D facilities.

1. A Smart Community with Energy Sharing for the Existing City Area

Akiko Ushiyama

2. Smart Energy-management System for 70 University Buildings

Mitsugu Kawamura

Tuesday, January 15, 9:45 a.m. - 10:45 a.m.

Seminar (Basic)

Energy Efficiency and the Impact on Human Health

Track: The Convergence of Comfort, IAQ, and Energy Efficiency Building

Sponsor: EHC, MTGMTG.HWBE - Health and Wellness in the Built Environment

As part of the work for the new MTGMTG.HWBE - Health and Wellness in the Built Environment Multidisciplinary Task Group (MTG), set up to support President Sheila Hayter's agenda for this year, the seminar will introduce human-centered building standards, discuss the differences in design, verification, and requirements across standards, and discuss the research needs for further development of human-centered building standards. As well, the seminar will provide an overview of major IAQ problems in buildings, followed by the strategies and technologies for reducing indoor air pollution.

1. Human-Centered Building Standards

Nicholas Clements, Ph.D.

2. Integrated IAQ Strategies via Source Control, Ventilation and Air Purification for Low Energy Buildings

Jensen Zhang, Ph.D.

Tuesday, January 15, 9:45 a.m. - 10:45 a.m.

Seminar (Intermediate)

Ground-Source Heat Pumps Using Carbon Dioxide

Track: Refrigeration

Sponsor: 6.8 - Geothermal Heat Pump and Energy Recovery Applications

This session showcases recent applications and advances in Ground-Source Heat Pumps (GSHPs) using CO₂.

1. Direct Expansion Ground Source Heat Pump with CO₂

Alain Nguyen, Ph.D.

2. Measurements and Energy Analysis for a Prototype Carbon Dioxide Ground Source Heat Pump

Harrison Skye, Ph.D.

Tuesday, January 15, 9:45 a.m. - 10:45 a.m.

Seminar (Intermediate)

Latest Research Highlights

Track: HVAC&R Fundamentals and Applications

Sponsor: Publication and Education Council

In this session we present material from recently published papers from ASHRAE's archival journal, Science and Technology for the Built Environment, on the subjects of two ASHRAE research projects on experimental modeling, as well as important new developments on CFD modeling of refrigeration leaks.

1. Experimental Methodology and Results for Heat Gains from Various Office Equipment and Equipment Power Consumption and Load Factor Profiles for Buildings' Energy Simulation(ASHRAE RP-1742)

Omer Sarfraz

2. Field Measurement and Modeling of UVC Cooling Coil Irradiation for HVAC Energy Use Reduction (RP-1738) – Part 1: Field Measurements and Field Measurement and Modeling of UVC Cooling Coil Irradiation for HVAC Energy Use Reduction (RP-1738) – Part 2: Energy, IAQ, and Economic Modeling

Joseph Firrantello, Ph.D., P.E.

3. CFD Modeling of Flammable Refrigerant Leaks inside Machine Rooms- Emergency Ventilation Rate for Different Size Chillers

Paul Papas, Ph.D.

Tuesday, January 15, 9:45 a.m. - 10:45 a.m.

Seminar (Intermediate)

The New Chapter 36 of the HVAC Applications Handbook – Energy and Water Use and Management

Track: HVAC&R Fundamentals and Applications

Sponsor: 7.6 - Building Energy Performance

Chapter 36 of the upcoming version of the ASHRAE HVAC Applications Handbook will reflect updates in energy use and management and new sections relating to water use and management. Because of the interconnected nature between energy and water use, sound management of both resources are necessary for the high performance of buildings. Seminars in this session will address updates and additions to the chapter, including experience, case studies, and research that led to chapter's updated and new content.

1. First Impressions - What is New and Updated about Chapter 36?

John Constantinide

2. Updates on Commercial Building Energy Use and Cost Metrics

Terry Sharp, P.E.

3. Updates on Energy and Water Benchmarking, Conservation, and Audits

Eric Yang, P.E..

Tuesday, January 15, 9:45 a.m. - 10:45 a.m.

Seminar (Intermediate)

They Really Did That! Perspectives from State Engineering Board Members

Track: The Engineer's Role in Architecture

Sponsor: 1.7 - Business, Management & General Legal Education

The presentations will deal with the practice of engineering from the perspective of an ASHRAE members who are member of the State Engineering Registration Boards. It will include state-to-state differences in rules/laws, and requirements that are common among states. It will also deal with actual cases that have been adjudicated by the Boards.

1. A Missouri Board Member's Perspective

Kelley Cramm, P.E.

2. A Kansas Board Member's Perspective

Richard Hayter, Ph.D., P.E.

Tuesday, January 15, 11:00 a.m. - 12:30 p.m.

Technical Paper Session (Intermediate)

Optimizing Components in HVAC Systems

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

Whether looking for new materials for modern refrigerants or optimizing design through CFD, system components play a large role in building performance. This session includes papers on materials and system components for today's high performing building systems.

1. Comprehensive Analyses of Variable, Constant Speed Pumps and Heat Exchanger and Energy Cost Savings Potential in KU Power Plant

Raouf Alabdullah

2. Energy Performance, Comfort, and Lessons Learned from a Net-Zero Energy Library

Vasken Dermardiros

3. Preliminary Investigations of the Impact of VFD Output Voltage on Motor Efficiency

Greg Wang

4. Optimizing Stairway Pressurization Systems by Automating CFD Simulation

Ali Hasan

Tuesday, January 15, 11:00 a.m. - 12:30 p.m.

Seminar (Intermediate)

Chemistry of New and Retrofit Systems with Low GWP Refrigerants

Track: Refrigeration

Sponsor: 3.2 - Refrigerant System Chemistry, MTG.LowGWP - Lower Global Warming Potential Alternative Refrigerants

New low global warming potential refrigerants such as hydrofluoro-olefins (HFOs) are inherently less chemically stable than their predecessors such as hydrofluorocarbons and hydrochlorofluorocarbons. It is imperative that their stability in the presence of lubricants, materials of construction and trace contaminants, such as processing chemicals, water and air, be understood to ensure safe and reliable long term operation of HVACR equipment. This seminar will provide an overview of the various tests and studies being conducted to understand the system chemistry of HVACR systems using HFO refrigerants as viewed from the perspective of an HVACR system manufacturer, lubricant suppliers, and a refrigerant supplier.

1. System Chemistry Comparison of HFC and Low GWP Alternatives

Sage Tomlinson

2. Evaluation of the Chemical Stability of HFC and HFO Alternatives – When Applied as R22 Retrofit in Refrigeration Equipment

Hitomi Arimoto

3. Chemical Stability of New Low GWP Olefin Based Refrigerants

Stephen Kujak

4. What do We Need to Understand About System Chemistry and Low GWP Refrigerants?

Joe Karnaz, DSc

Tuesday, January 15, 11:00 a.m. - 12:30 p.m.

Seminar (Basic)

Equipment Selections with Respect to Noise and Vibration

Track: The Engineer's Role in Architecture

Sponsor: 2.6 - Sound and Vibration

This seminar provides three perspectives on how ventilation equipment is selected with noise and vibration performance in mind. These conversations happen behind the scenes on many projects, now hear it straight from each vested party: acoustic engineers, mechanical engineers, and manufacturers. Each group has different needs, and understand those at the onset can streamline the design, selection, and construction process.

1. Equipment Selections with Respect to Noise and Vibration - Acoustical Consultant's Perspective

Roman Wowk

2. Equipment Selections with Respect to Noise and Vibration - Mechanical Engineer's Perspective

Jeff Boldt, P.E.

3. Equipment Selections with Respect to Noise and Vibration – Manufacturer's Perspective

Curt Eichelberger, P.E.

Tuesday, January 15, 11:00 a.m. - 12:30 p.m.

Seminar (Intermediate)

Humidity IS Health

Track: The Convergence of Comfort, IAQ, and Energy Efficiency Building

Sponsor: 5.11 - Humidifying Equipment, 9.6 - Healthcare Facilities

New studies correlate moderate indoor humidity levels with reduced viral and bacterial infections in both young and elderly building occupants. Other health benefits are also seen with these humidity levels. This seminar will present these results, as well as updates on the high-pressure fogging systems recently allowed in healthcare facilities by BSR/ASHRAE/ASHE Addendum m to ANSI/ASHRAE/ASHE Standard 170-2013. In addition, the expected break-even points of some of the currently available humidification solutions will be shown.

1. The Effects of Indoor-Air Relative Humidity on Health Outcomes and Cognitive Function in Residents in a Long-term Care Facility

Stephanie Taylor, M.D.

2. The Impact of Steam Humidification on Influenza Virus in Preschool Classrooms

Alex Generous

3. New Options! Fogging Systems in Healthcare Applications

William Truong

4. Estimating the Break-even Point of the Most Common Steam and Adiabatic Systems

Raul Simonetti

Tuesday, January 15, 11:00 a.m. - 12:30 p.m.

Seminar (Basic)

Multiscale Building Energy Modeling, Part 9

Track: HVAC&R Fundamentals and Applications

Sponsor: 4.7 - Energy Calculations, 1.5 - Computer Applications

Development of urban- or multiscale building energy models is becoming increasingly tractable for many applications including city-wide energy supply/demand strategies, urban development planning, electrical grid stability, and urban resilience. This seminar has assembled researchers and practitioners from universities or industry within the United Kingdom, Canada, and the United States with capabilities in the field of multiscale energy models to discuss the data, algorithms, workflow, and practical challenges addressed in their applications involving building energy analysis at the scale of a city.

1. Modelling London's Building Stock and its Associated Energy Use

Paul Ruyssevelt, Ph.D.

2. TBD

David Shipley, P.Eng.

3. Wide-area 3D Imaging using Foliage-penetrating Laser Radars for City-scale Building Evaluation

Eric Statz, Ph.D.

4. Building Modeling and District System Optimization at Scale

Peter Ellis

Tuesday, January 15, 11:00 a.m. - 12:30 p.m.

Seminar (Intermediate)

Not your Father's Onsite Energy Generation System: Lessons Learned from 135 years Applying Combined Heat and Power Systems (CHP)

Track: Common System Issues and Misapplications

Sponsor: 1.10 - Cogeneration Systems

Building integrated CHP systems are increasingly being applied to save money, increase event resilience, improve power quality, support microgrids, and/or reduce carbon emissions. Nevertheless, many in the building engineering community have little or no knowledge about or experience with CHP system design or application. Each region throughout the USA has unique engineering,

climate and policy approaches to energy. This seminar will review important CHP lessons learned from real 21st century installations in three East Coast regions.

1. Lessons Learned from 98 CHP Systems Operating in New York State Since 2000

Hugh Henderson

2. CHP Design and Application Lessons Learned from the Mid-Atlantic Region Since 2000

Gearoid Foley

3. CHP Design and Application Lessons Learned from the Southeast Region Since 2000

Bruce Hedman

Tuesday, January 15, 11:00 a.m. - 12:30 p.m.

Seminar (Intermediate)

Transient Temperature Changes in the Data Center: Should We Be Worried?

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

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

The thermal environment of most mission-critical spaces is designed and operated to respect steady-state temperature limits. However, a robust and resilient facility must endure cooling-equipment failure and even periods with a complete loss of utility power. Even under “normal” conditions, IT loads vary and cooling units cycle on and off. Predictive modeling can improve transient performance by influencing design choices and allowing operators to optimize the control of systems they already have. Predictive modeling further reveals that it is difficult to comply with current ASHRAE Thermal Guidelines. This provocative seminar explores these issues and suggests a path forward.

1. Data Center Temperature Rise following the Loss of Primary Power

James VanGilder, P.E.

2. The Impact of Airside and Waterside Failure on Data Center Lab Cooling Performance

Kourosh Nemati, Ph.D.

3. Modeling Transient Behavior in a Data Center -When is it Needed?

Mark Seymour, CEng

Tuesday, January 15, 1:30 p.m. - 3:00 p.m.

Seminar (Intermediate)

Lighting up Indoor Environmental Quality Interactions in Schools: Impact on Health and Performance

Track: The Convergence of Comfort, IAQ, and Energy Efficiency Building

Sponsor: SGPC 10

This seminar will shed light on how student health and performance are impacted by indoor environmental quality in schools, spanning thermal, indoor air quality, lighting, and acoustic conditions and their interactions. The United States EPA sponsored seven projects under the Science to Achieve Results (STAR) program, focused on “Healthy Schools: Environmental Factors, Children’s Health and Performance, and Sustainable Building Practices”. Three project investigators will present their findings. This seminar will benefit those working in the design, construction, and operation of K-12 educational buildings by providing a better understanding of how indoor environmental quality can benefit occupants in educational settings.

1. An Investigation of Indoor Environmental Factors and Their Effects on K-12 Student Achievement

Lily Wang, Ph.D., P.E.

2. Identifying the Determinants of Indoor Air Quality in Schools in mid-Atlantic Region and Their Impacts on Student Performance

Kirsten Koehler, Ph.D.

3. Did School Indoor Environment Affect Health and Performance among the Students and Teachers in New York State?

Shao Lin, Ph.D.

4. Indoor Air Quality in High Schools in Central Texas

Atila Novoselac, Ph.D.

Tuesday, January 15, 3:15 p.m. - 4:45 p.m.

Debate (Intermediate)

College of Fellows Debate: Owners Owe a “Standard of Care” to their Projects

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

Sponsor: College of Fellows, 1.7 - Business, Management & General Legal Education

Barreling through the industry is the quest for quantifiable measurement of building performance. Most times it's “high”, but frankly you’ll need to measure “medium” and “low” to know what “high” performance is. The industry has long bemoaned the quality of O&M. O&M is an “over time” activity and performance can only be measured “over time”. Designers are obliged to meet the Standard of Care; contractors, the “custom and practice”. But what about owners? Do owners have comparable obligations to a project? Do Owners have a Standard of Care? What have yea? Yay or Nay? Come listen, consider, and weigh in.

1. Larry Spielvogel, P.E., Consulting Engineer, Bala Cynwyd, PA

2. Don Beaty, P.E., DLB Associates, Eatontown, NJ

3. Richard Rooley, FREng, Stoke Poges

4. Martin Weiland, P.E., US General Services Administration, Washington, DC

5. William Bahnfleth, Ph.D., P.E., Pennsylvania State University, University Park, PA

6. Mitchell Swann, P.E., MDC Systems, Paoli, PA

Wednesday, January 16

Wednesday, January 16, 8:00 a.m. - 9:30 a.m.

Conference Paper Session (Intermediate)

Advances in Heat Recovery

Track: Systems and Equipment

Heat recovery and energy efficiency of boiler systems go hand in hand. Increasing boiler and heat recovery efficiency reduces carbon emissions and drives our industry towards our new energy future. Come hear presentations on what is new in boiler and heat recovery efficiency.

1. A Liquid-desiccant-based Heat Recovery System for Gas-fired Boilers in District Heating Networks

Xiaoyue Zhang

2. A Case Study of Sensitivity Analysis of the Domestic Hot Water System in Large Hotels

Zhihong Pang

3. Integrated Heat Recovery System Design of a Variable Refrigerant Flow (VRF) Heat Recovery System with a Domestic Hot Water System

Dongsu Kim

4. Demonstrating the Benefit of Multi-objective Optimization and Clustering for the Design of Waste Heat Recovery Systems

Gabriel Legorburu

Wednesday, January 16, 8:00 a.m. - 9:30 a.m.

Conference Paper Session (Intermediate)

Building Performance with Respect to Energy Efficiency

Track: Di Construction, Operation, and Maintenance of High Performance Systems

Energy efficiency is a key performance indicator of building performance. After design, implementation and commissioning, performance must be maintained to realize the impact of energy efficient technologies. These presentations illustrate methods to determine building performance and KPI's for operating at design efficiencies.

1. Targeting Building Energy Efficiency Opportunities – An Open-source Analytical & Benchmarking Tool

Han Li

2. Taking the (Fuel) Blinders off Energy Codes Part 2: Metrics and Mechanics in the Modern Era

Jim Edelson

3. Energy, Emissions, and Economics (EEE) Impact Derivation and Applications for Energy Performance Calculations and Comparisons

Neil Leslie

4. System-level Key Performance Indicators (KPIs) for Building Performance Evaluation

Han Li

Wednesday, January 16, 8:00 a.m. - 9:30 a.m.

Seminar (Intermediate)

Building Data Exchange Formats: Sharing Building Data with Ease

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

Sponsor: 7.6 - Building Energy Performance

Collecting and exchanging building data is become more and more necessary since the digitization of the design and operation of buildings. In addition, several jurisdictions are now requiring mandatory benchmarking, energy auditing, and specific ratings (bEQ, LEED, Energy Star, etc) to be performed on buildings. These jurisdictions are forcing the exchange of a large amount of detailed building data such as building characteristics (e.g. building geometry, areas, building types, HVAC system definition) as well as building performance data. This seminar will discuss existing formats used for building energy data exchange such as gbXML, HPXML, and BuildingSync.

1. Green Building XML (gbXML) and Its Role in BIM and Analysis Software Interoperability

Stephen Roth, P.E.

2. Exchanging Home Performance Data with HPXML

Noel Merket

3. BuildingSync: Data Exchange from Commercial Building Energy Audits

Nicholas Long

Wednesday, January 16, 8:00 a.m. - 9:30 a.m.

Seminar (Basic)

The Force is Strong with this One: Facilitating Integrated Project Delivery

Track: The Engineer's Role in Architecture

Sponsor: 7.1 - Integrated Building Design

Integrated design and delivery require a collaborative effort from all parties throughout project lifecycle. This requires a shift in how we as an industry think about and deliver projects. Baby steps are allowed. This seminar discusses various aspects of integrated project delivery and strategies to implement an integrated design process. This session will consider ways to successfully facilitate integrated project delivery, from current perceptions around integrated design to tools, processes, and the roles we might play.

1. Jedi Mind Tricks for Integrated Project Delivery (But First You Must Believe...)

Mitchell Swann, P.E.

2. The Force is Strong with This One: Integrated Design Process Perceptions

Michel Tardif

3. The Force will be with You, Always: Facilitating Success in Integrated Project Delivery

Martin Roy et Associés

4. Welcome to the Dark Side: Simulation in the Integrated Design Process

Danielle Monfet, Ph.D.

Wednesday, January 16, 8:00 a.m. - 9:30 a.m.

Seminar (Intermediate)

The Role of Energy Storage for Buildings Integrated with Renewable Energy Systems

Track: Building Integrated Renewables and Natural Systems

Sponsor: 6.9 - Thermal Storage, 7.5 - Smart Building Systems

Design of sustainable buildings and net-zero buildings requires careful integration between onsite renewable energy systems, energy storage, and the built environment. This session will show case recent advances in modeling tools and field and numerical studies that consider natural systems, energy storage, efficiency measures and onsite renewable energy systems at the building and campus scale in different locations across the U.S.

1. The Necessity of Thermal Energy Storage as Part of Net-Zero Building Design

Karl Heine

2. Sizing and Dispatch Strategy of a Renewable System for a Cluster of Buildings in a Campus Scale

Mohammad Hassan Fathollahzadeh

3. Thermal Energy Storage for a Movie Theater with Integrated PV Systems: A Case Study

Marcel Christians, Ph.D.

Wednesday, January 16, 8:00 a.m. - 9:30 a.m.

Seminar (Intermediate)

Room Air Cleaner, Can it Improve IAQ?

Track: The Convergence of Comfort, IAQ, and Energy Efficiency Building

Sponsor: 2.3 - Gaseous Air Contaminants and Gas Contaminant Removal Equipment, 2.4 - Particulate Air Contaminants and Particulate Contaminant Removal Equipment

As a solution to Indoor Air Quality (IAQ) issues, room air cleaners are widely used in indoor environments. These room air cleaners use a combination of different air cleaning technologies to remove wide ranges of pollutants such as particulate matters, bioaerosols, volatile organic compounds and inorganic gases. Some room air cleaners use ionizers which may produce ozone. It is important to understand how IAQ monitoring devices work.

1. Ozone Reaction with Human Surfaces Due to Ozone-emitting Air Cleaners

Youngbo Won

2. Modern IAQ Monitoring MOS Devices Especially for Residential Environment

Tomohiro Kawaguchi

3. Performances of Electric Air Cleaning Technologies for Gas/Vapor Removal

Chang-Seo Lee, Ph.D.

4. Impact of Portable Air Cleaners on Residential IAQ: Testing and Simulation

Thad Ptak, Ph.D.

Wednesday, January 16, 8:00 a.m. - 9:30 a.m.

Seminar (Intermediate)

Thermodynamic Limits for Buildings: Part 2

Track: HVAC&R Fundamentals and Applications

Sponsor: 7.4 - Exergy Analysis for Sustainable Buildings (EXER)

This seminar will address the issues mechanical system design engineers encounter in daily situations, but cannot appropriately address with energy analysis only. Since exergy analysis enables the comparison of different forms of energy and different energy qualities, it makes it possible to optimize the performance of an HVAC system holistically, including fan and pump powers. This seminar will include presentations from practitioners and from researchers, and will cover the applicability of exergy analysis in optimizing the HVAC system performance, and how we can use exergy analysis to reach net zero energy or exergy building targets.

1. Thermodynamic Limits for Buildings: Energy vs Exergy

Birol Kilkis, Ph.D.

2. When do the Results of Exergy Analysis Differ from Energy Analysis?

Antash Najib, P.Eng.

3. Exergy Losses in a Hydronic System and How to Avoid Them

Mike Trantham

4. Is Work-to-Heat Ratio (WTHR) a better metric than COP for exergy analysis?

William Kopko

Wednesday, January 16, 8:00 a.m. - 9:30 a.m.

Workshop (Intermediate)

An Overview of the Newly Published Guideline 36

Track: The Convergence of Comfort, IAQ, and Energy Efficiency Building

Sponsor: 1.4 - Control Theory and Application, Guideline 36

This workshop is intended to familiarize attendees with the newly published Guideline 36 and the TC 1.4 Control Research agenda that will provide future content.

1. An overview of Guideline 36

Mark Hydeman, P.E.

Wednesday, January 16, 9:45 a.m. - 10:45 a.m.

Panel (Basic)

The Cage Match: An Uncommon Approach to Accelerating ASHRAE Standard Development

Track: HVAC&R Fundamentals and Applications

Sponsor: 5.4 - Industrial Process Air Cleaning (Air Pollution Control)

This panel draws upon the panelists unique experiences in moving forward ASHRAE Standard development. Facing stagnation or lack of progress can be daunting when developing an ASHRAE Standard. Even more so, it sometimes appears there is no end and the Standard stays in development for perpetuity. The panelists share their experiences in pushing through these boundaries to cross the finish line with an ASHRAE Standard.

1. The Cage Match: An Uncommon Approach to Accelerating ASHRAE Standard Development

Bob Burkhead

2. The Cage Match: An Uncommon Approach to Accelerating ASHRAE Standard Development

Chris Fischer

3. The Cage Match: An Uncommon Approach to Accelerating ASHRAE Standard Development

Bruce McDonald, P.Eng.

4. The Cage Match: An Uncommon Approach to Accelerating ASHRAE Standard Development

Geoff Crosby

Wednesday, January 16, 9:45 a.m. - 10:45 a.m.

Conference Paper Session (Intermediate)

Numerical Techniques for HVAC Design

Track: HVAC&R Fundamentals and Applications

Numerical modeling methods aid the design engineer from conception to component selection. New techniques for demonstrating these concepts will be illustrated with metrics that the design professional can implement.

1. Study on the Prediction Models of Temperature and Energy by using DCIM and Machine Learning to Support Optimal Management of Data Center

Kosuke Sasakura

2. Comparison of Approaches for Calculating Annualized Data Center Energy Metrics

Rehan Khalid

3. Cooling System with Low Power Usage Effectiveness below 1.02x for Server Rooms

Naoki Aizawa

Wednesday, January 16, 9:45 a.m. - 10:45 a.m.

Conference Paper Session (Intermediate)

Thermal Comfort in Transportation

Track: HVAC&R Fundamentals and Applications

Thermal comfort in transportation has different considerations than in large buildings. Many of the systems have different designs and components. This session discusses strategies for thermal comfort on air land and sea.

1. Numerical Investigation of Thermal Comfort Inside Cruise Ships

Essam E. Khalil

2. Shape Effectiveness of HVAC Outlets on Automobile Thermal Comfort

Essam E. Khalil

3. Novel Ventilation Concept for Efficient Heating and Cooling Dynamics of Vehicle Passenger Compartments

Tobias Dehne

Wednesday, January 16, 9:45 a.m. - 10:45 a.m.

Seminar (Basic)

How Standard 100 can be Applied to Atlanta's Building Energy & Water Efficiency Ordinance

Track: The Convergence of Comfort, IAQ, and Energy Efficiency Building

Sponsor: 2.8 - Building Environmental Impacts and Sustainability, 7.6 - Building Energy Performance, SSPC 100

Learn how cities with energy conservation goals can adopt Standard 100 to boost energy efficiency in existing buildings. We will hear from the City of Atlanta and get an update on how their program is progressing. Additionally, we will get background on Standard 100 and go through the steps of the Standard 100 compliance flow chart.

1. How to use Standard 100 and seek compliance

Curtis Fong

2. Atlanta's Building Energy and Water Efficiency Ordinance

Megan O'Neil

Wednesday, January 16, 9:45 a.m. - 10:45 a.m.

Seminar (Intermediate)

In Legionella, Measure What Matters: Insights for the Water Quality Practitioner

Track: Common System Issues and Misapplications

Sponsor: 9.6 - Healthcare Facilities

Water Management Plans are considered a good tool to manage bacterial growth including Legionella in Building Water Systems. However, water management plans that are being developed are missing important information. This seminar will discuss the state of science and the latest key insights from standards and guidelines that the practitioner needs to know. Case studies will be used to show what a good management plan consists of and what is missing from others.

1. Legionella: State of Science and Regulations

Lan Chi Nguyen Weekes, P.Eng.

2. Why do I have to manage water? Legionella that's why?

Nate Sanders

Wednesday, January 16, 9:45 a.m. - 10:45 a.m.

Seminar (Advanced)

Integration of Renewable Systems and Natural Ventilation – Control Challenges

Track: Building Integrated Renewables and Natural Systems

Sponsor: 1.4 - Control Theory and Application

Smart engineers are designing even smarter buildings but what are the challenges to getting there? The application of smart systems has resulted in a duplication of effort and, at times, results in conflicting controls parameters. This seminar identifies proper application, monitoring and integration of sustainable systems into the building automated controls, and examines resulting issues that may arise. Let's tackle these issues, because a building can only perform as great as the control system allows it!

1. What to do with all this Energy? The Trick to Tracking and Controlling Green Systems

Larry Scholl

2. Renewable Systems Integration; A Key to Smart Buildings Success

Michael Pouchak, P.E.

Wednesday, January 16, 9:45 a.m. - 10:45 a.m.

Forum (Basic)

Environmental Health Trends Impacting HVAC&R

Track: HVAC&R Fundamentals and Applications

Sponsor: EHC

ASHRAE Environmental Health Committee (EHC) is responsible for identifying major environmental health trends impacting the practice of HVAC&R. This forum seeks feedback from attendees related to the current environmental health trends in the industry. How these trends are impacting our industry? How ECH can be proactive in response to these trends? How ECH can reach out to other organizations to develop avenues for information exchange and collaboration? This session will brainstorm these questions and will attempt to identify current trends in environmental health. Active participation is required from the attendees.

Wednesday, January 16, 9:45 a.m. - 10:45 a.m.

Forum (Intermediate)

Empirical Verification of Metabolic Heat, Moisture, and Contaminant Dissipation Rates from Occupants at Various Activity Levels

Track: HVAC&R Fundamentals and Applications

Sponsor: 2.1 - Physiology and Human Environment

ASHRAE publications currently reference values of metabolic sensible and latent heat, moisture, and contaminant dissipation rates that are based on research conducted by ASHRAE and others over 40 years ago. This forum will address potential future studies with modern calorimetric methods to ascertain values that reflect current occupant activities and demographics.

Wednesday, January 16, 11:00 a.m. - 12:30 p.m.

Debate (Intermediate)

Intelligent, Efficient and Resilient Data Centers – What is Needed? Rules of Thumb, Science or Just Technology?

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

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

Designing, operating and maintaining a modern data center presents a host of options - but what is important and how should you choose? Is it sufficient just to produce a design that operates within guidelines? Do you need a scientific assessment? Or, will pure technology win the day? Leading individuals from the National Science Foundation Center for Energy-Smart Electronic Systems will debate what's important, including ASHRAE thermal guidelines, power and cooling infrastructure, IT cooling systems and intelligent controls. Come and join this controversial debate on how to have a best in class data center today and tomorrow.

1. **Roger Schmidt, Ph.D., P.E.**, IBM, Poughkeepsie, NY
2. **Kanad Ghose, Ph.D.**, Binghamton University, Binghamton, NY
3. **Dereje Agonafer, Ph.D.**, University of Texas at Arlington, Arlington, TX
2. **Mark Seymour, CEng**, Future Facilities Ltd, London

Wednesday, January 16, 11:00 a.m. - 12:30 p.m.

Technical Paper Session (Intermediate)

Analysis of Building Systems

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

Research on analyzing and methods of analyzing building systems is important to society as a whole. When writing standards, this information is relied on for modeling purposes, basing decisions and ensuring we are leading the industry in our standards. These papers present research on evaluating various systems and provide valuable information performance.

1. Development of a Reference Building Information Model (BIM) for Thermal Model Compliance Testing (RP-1468) Part-II: Test Cases and Analysis

Jeff Habrel

2. Representative Layer-by-Layer Descriptions of Fenestration Systems with Specified Bulk Properties such as U-factor and SHGC (1588-RP)

Yu Joe Huang

3. Energy Performance of an Occupancy-based Climate Control Technology in Guest Rooms

Hyojin Kim

4. HVAC System Air Leakage Requirements for Deep Energy Retrofit Projects

Wendy Broers

5. Evaluating the Capability of Algebraic Equations in Accurately Determining the First Sighting of a Smoke Layer in a Steady State Fire Condition in Atriums – A CFD Approach

Ali Hasan

Wednesday, January 16, 11:00 a.m. - 12:30 p.m.

Conference Paper Session (Intermediate)

Advances in Refrigerants

Track: HVAC&R Fundamentals and Applications

New refrigerants and advancements in refrigerants is a key topic in ASHRAE. Through ASHRAE research and other industry organizations, refrigerants are more relevant than ever. This session provides several papers on modern refrigerants and their application.

1. Flammable Refrigerants Performance Comparison, Safeties, and Lessons Learned

Amir Jokar

2. Accelerated Life Methodology for Determining Acceptable Chemical Reactivity in HVACR Systems

Stephen Kujak

3. Improved Control of Condensers

Richard Love

4. Impacts of Defrosting Air Cooling Coils

Donald Cleland

Wednesday, January 16, 11:00 a.m. - 12:30 p.m.

Conference Paper Session (Intermediate)

Energy Efficient Ventilation

Track: The Convergence of Comfort, IAQ, and Energy Efficiency Building

Designing energy efficiency into proper ventilation system to meet ASHRAE standards must be considered in HVAC design. This session will illustrate advances in ventilation design to meet new and improved standards like ASHRAE 62.1-2016.

1. Performance Evaluation of Energy-Efficient Hybrid Ventilation Systems for Office Buildings

Hisaya Ishino

2. Further Simplifying ASHRAE Standard 62.1 for Application to Existing Buildings: Comparing Informative Appendix D and Section 6.2.5.3 with Real-World Data

Meghan McNulty

3. Simulation Study of Infiltration Effects on CO₂-based Demand Controlled Ventilation System with High-Variant Occupancy Schedules

Siliang Liu

4. Temporal Analysis of Wind Data for Wind Driven Ventilation Assessment

James Lo

Wednesday, January 16, 11:00 a.m. - 12:30 p.m.

Seminar (Intermediate)

Development of High-Reliability, Low-Cost, Occupancy Presence, Counting and CO2 Sensor Technologies and ASHRAE Testing Standards/Guidelines

Track: The Convergence of Comfort, IAQ, and Energy Efficiency Building

Sponsor: 7.5 - Smart Building Systems, MTG.OBB - Occupant Behavior in Buildings

Current nationwide efforts by universities, companies, and research labs through ARPA-E's SENSOR (Saving Energy Nationwide in Structures with Occupancy Recognition) program include the development of user-transparent low-cost, high-accuracy occupancy sensing systems that quantify human presence to significantly reduce building energy use. These projects include development of occupancy presence, occupancy counting and CO2 sensors, with the overall goal of 30% reduction in HVAC energy use. This seminar will cover an overview of the SENSOR program and projects for residential and commercial buildings, and the need and ongoing efforts to develop ASHRAE standards and/or guidelines for standardized testing of occupancy sensing technologies.

1. ARPA-E SENSOR Program Overview and Goals: Development of High-Reliability, Low-Cost Occupancy Sensor Development and Testing

Jennifer Gerbi, Ph.D.

2. Commercial and Residential Building Occupancy Presence and Counting Sensor Technologies: Goals and Efforts to Date

Zheng O'Neill, Ph.D., P.E.

3. Innovative CO2 Sensor Development for Commercial Buildings: Goals and Efforts to Date

Jeff Rhodes, Ph.D.

4. Development of Guidelines/Standards for Occupancy Sensor Testing: ASHRAE's Role

Kristen Cetin, Ph.D., P.E.

Wednesday, January 16, 11:00 a.m. - 12:30 p.m.

Seminar (Intermediate)

How to Ensure that Your Building Control Improvements Actually Last

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

Sponsor: 7.6 - Building Energy Performance, 1.4 - Control Theory and Application

Do the improvements and retrofits that we make to building controls actually persist over time? This session will explore that question for a number of different scenarios including retrocommissioning, new building commissioning, and general retrofit of building automation. We'll present results from primary research on the subject and also hear first-hand accounts from controls and commissioning contractors in the field. The session will also demonstrate methods for improving persistence, including longer term activities like monitoring.

1. Key steps to improving persistence of commissioning

Jeff Stein, P.E.

2. Observations and results from a field study of retrocommissioning persistence

Xiaohui Zhou

3. Stories from the field: working with facility managers toward persistent improvements

Jason Jones

4. Persistence of Savings isn't a Side Issue – using new tech to make sure savings show up at the meter

Jim Kelsey

Wednesday, January 16, 11:00 a.m. - 12:30 p.m.

Seminar (Basic)

You Can't Always Get What You Want

Track: Common System Issues and Misapplications

Sponsor: 6.8 - Geothermal Heat Pump and Energy Recovery Applications, 7.9 - Building Commissioning

This session presents multiple examples of how you (the designer) don't get what you always want. Just because a system is designed well or with good intention does not mean that it gets built or operated the way you intended. The purpose of the seminar is to present examples of projects that didn't meet the design intent because the system wasn't initially commissioned, or properly constructed, operated, or maintained. Or they didn't follow sound engineering principles. Examples of how to avoid these pitfalls will be presented, along with good solutions and good examples.

1. "Well you just might find (through commissioning) that you didn't get you need".

Michael Kuk

2. But if you try...you get what you need

Stephen Kavanaugh

3. Burying Mistakes

Lisa Meline, P.E.

Wednesday, January 16, 11:00 a.m. - 12:30 p.m.

Workshop (Intermediate)

How to Model Thermal Bridging Using Clear Transmittance Method

Track: The Engineer's Role in Architecture

Sponsor: 4.4 - Building Materials and Building Envelope Performance

Many energy standards, heat loss calculations, and whole building simulations overlook thermal bridging or use simplified building envelope details when calculating the overall thermal performance of a wall. This often neglects significant contributions to heat loss such as intersections between building envelope components, window to wall connections, floor interface, and others that have thermally conductive materials bypassing the thermal insulation.

1. Improving Heat Loss Calculations Using Linear Transmittance

Peter Adams, P.Eng.

2. Thermal Bridges

Chris Schumacher