

TECHNICAL PROGRAM

2012 ASHRAE Annual Conference

San Antonio, Texas

Sunday

June 24, 2012

8:00 a.m.–9:30 a.m.

Technical Paper Session 1 (Intermediate)

Case Studies of Efficiency Improvements in Chilled Water, Domestic Hot Water and Formula Standardization for Estimating Savings Uncertainties

Track: HVAC&R Fundamentals and Applications

Room: 007B

Chair: M. Ginger Scoggins, P.E., Member, Engineered Designs Inc., Raleigh, NC

This session groups a set of technical papers that all relate to expanding our knowledge of energy savings potential by using case studies which focus on more efficient chiller plants, domestic hot water loops in multi-family dwelling units, and the use of Bayesian formula for estimating savings uncertainties in retrofit projects.

1. Simulations of Chilled Water Cooling Coil Delta-T Characteristics (SA-12-001)

Zhiqin Zhang, Ph.D.1, Hui Li, Ph.D., P.E.2 and Jingjing Liu1, (1)Nexant, Inc., San Francisco, CA, (2)Texas A & M University, College Station, TX

2. Energy Savings Potential of Variable Condenser Water Flow Systems (SA-12-004)

Zhiqin Zhang, Ph.D. and Jingjing Liu, Nexant, Inc., San Francisco, CA

3. Method for Estimating Energy Savings Potential of Chilled Water Plant Retro-Commissioning (SA-12-005)

Zhiqin Zhang, Ph.D.1 and W. Dan Turner, Ph.D., P.E.2, (1)Nexant, Inc., San Francisco, CA, (2)Energy Systems Laboratory, College Station, TX

4. Using Energy Flow Analysis to Assess Energy Savings from Recirculation Controls in Multi-Family Central Domestic Hot Water Systems (SA-12-002)

Yanda Zhang, Ph.D., Member, Charlotte Bonneville, Stephen Wilson, Michael Maroney, P.E., Jeff Staller and Julianna Yun Wei, Heschong Mahone Group, Inc., Gold River, CA

5. Bayesian Analysis of Savings from Retrofit Projects (SA-12-003)

John A. Shonder, Member and Piljae Im, Oak Ridge National Laboratory, Oak Ridge, TN

Conference Paper Session 1 (Intermediate)

Low Energy Design and Integrated Energy System

Track: Integrated Energy Systems

Room: 007A

Sponsor: 07.01 Integrated Building Design, 07.04 Exergy Analysis for Sustainable Buildings

Chair: Tom Meyer, Member, National Environmental Balancing Bureau, Gaithersburg, MD

This conference paper session explores low energy design with integrated energy systems including applications in existing buildings and retrofits of a federal office building.

1. Achieving Deep Energy Savings in Existing Buildings Through Integrated Design (SA-12-C001)

Dave Moser, P.E., Member1 and Guopeng Liu, P.E.2, (1)PECI, Portland, OR, (2)Pacific Northwest National Laboratory, Richland, WA

2. Right Steps for Retrofits: Byron G. Rogers Federal Office Building Case Study (SA-12-C002)

Kendra Tupper, P.E., Member1, Nicole Hammer, P.E.1, Richard Osbaugh, P.E., Member2 and Michelle Swanson, P.E., Member2, (1)Rocky Mountain Institute, Boulder, CO, (2)RMH Group, Lakewood, CO

Seminar 1 (Intermediate)

Breaking Boundaries in Building Controls Integration

Track: Integrated Building Controls
Room: 001A

Sponsor: 07.06 Building Energy Performance

Chair: Kimberly A. Barker, Member, Siemens Building Technologies, Inc., Buffalo Grove, IL

Advanced, integrated BAS connects building systems in ways that pay off for building owners. They optimize building systems (HVAC, lighting, elevators, irrigation, etc.) based on occupancy (e.g., access control, occupancy sensors) and weather conditions. Building occupants interact with the building using dashboards to extend occupancy conditions in their office to seeing the buildings carbon-footprint. They allow remote monitoring and control from outside the building, empowering those who manage portfolios to even coordinating consumption in a sustainable city.

1. Enterprise Portfolio Management

James P. McClendon, P.E., Member, Walmart Stores Inc., Bentonville, AR

2. Integrated Automation in a Net Zero Energy Laboratory

Joseph Kilcoyne, Member, SC Engineers, Inc., San Diego, CA

3. Sustainable Cities Need Smart Integration

Pornsak Songkakul, Member, Siemens Building Technologies, Buffalo Grove, IL

Seminar 2 (Advanced)

Cleanroom Mechanical System Design and Operation Impact on Energy Usage

Track: HVAC&R Fundamentals and Applications

Room: 007D

Sponsor: 09.11 Clean Spaces

Chair: Vincent A. Sakraida, P.E., Member, Engineered Air, Denver, CO

Cleanrooms typically have very high air change rates and energy usage per square foot, making cleanroom air very expensive air. This seminar evaluates design and operational topics that can have a substantial affect on a cleanroom's energy usage. The first topic evaluates the potential energy savings and technical challenges of implementing a cleanroom variable air flow control system. The second topic evaluates the different mechanical system types that can be implemented for a specific cleanliness classification and their respective energy usage. The third topic presents research results on airlock impact on cleanroom performance.

1. Evaluate Potential Energy Savings and Technical Challenges Implementing a Cleanroom Variable Air Flow Control System

Vincent A. Sakraida, P.E., Member, Engineered Air, Denver, CO

2. Evaluate the Different Mechanical System Types That Can Be Implemented for a Specific Cleanliness Classification and Their Respective Energy Usage

Kevin Breslin, Merrick and Co., Aurora, CO

3. Functionality and Performance of Airlocks, Anterooms and Vestibules, Important Findings From Recent ASHRAE Research (RP-1431)

Wei Sun, P.E., Member, Engsysco Inc., Ann Arbor, MI

Seminar 3 (Basic)

Climate Change Basics

Track: HVAC&R Fundamentals and Applications

Room: 001B

Sponsor: 02.05 Global Climate Change

Chair: Van D. Baxter, P.E., Fellow ASHRAE, Oak Ridge National Laboratory, Oak Ridge, TN

This session discusses the basics of the science of climate change and stratospheric ozone depletion, the International and U.S. regulatory directions, and the potential impact of these issues on the HVAC&R industry. The first speaker discusses the basics of ozone depletion and climate change science and how it drives the Kyoto and Montreal Protocol regulations. Speaker two addresses the current status of the international regulations (Kyoto and Montreal Protocols) as well as potential US domestic legislation and/or regulatory action. The final speaker discusses what the potential future regulatory actions/directions might mean for the HVAC&R industry.

1. Basics of Climate Change and Ozone Depletion Science

Donald Brundage, P.E., Member, Southern Company Services, Atlanta, GA

2. Montreal and Kyoto Protocol Status and Decisions

Steven H. Bernhardt, Ph.D., Member, Honeywell International, Morristown, NJ

3. Potential Impact of An HFC Phase-Down On the HVAC&R Industry

Rajan Rajendran, Ph.D., Associate Member, Emerson Climate Technologies, Inc., Sidney, OH

Seminar 4 (Advanced)

Power Trends of Information Technology Equipment and the Usage of ASHRAE's Thermal Guidelines in Data Center Design and Operation

Track: HVAC&R Fundamentals and Applications

Room: 103A

Sponsor: 09.09 Mission Critical Facilities, Technology Spaces and Electronic Equipment

Chair: Robin A. Steinbrecher, Member, Intel Corp., Dupont, WA

Datacom (data processing and telecommunications) equipment advances quickly resulting in short product cycles and rapid upgrade frequency. Based on the latest information from the leading datacom equipment manufacturers, this seminar summarizes the latest datacom equipment power trends documented in the 3rd edition of the Datacom Power Trends and Cooling Applications, authored by ASHRAE TC 9.9. Optimization of data center cooling may be misinterpreted as simply increasing the inlet temperature to the ITE. However, energy savings and optimization must be viewed as a carefully considered and methodical process including all aspects of data center optimization. This seminar presents that process and its application to all types of data centers.

1. Datacom Component Power Trends

Robin A. Steinbrecher, Member, Intel Corp., Dupont, WA

2. Datacom Equipment Power Trends

Roger R. Schmidt, Ph.D., P.E., Member, IBM Corporation, Poughkeepsie, NY

3. A Methodology for Determining the Optimum Data Center Temperature for Energy Efficiency

Michael K. Patterson, Ph.D., P.E., Member, Intel Corp., Dupont, WA

Seminar 5 (Basic)

Thermal Comfort in Commercial Kitchens

Track: Indoor Environmental Applications

Room: 007C

Sponsor: 05.10 Kitchen Ventilation

Chair: Greg DuChane, Member, Trane, Columbus, OH

The commercial kitchen is a unique space where many different HVAC applications take place within a single environment (exhaust, supply, transfer, air conditioning, etc.). Obviously, the main activity in the commercial kitchen is the cooking process that is generating heat and effluents which must be captured and exhausted in order to control

and guarantee thermal comfort and good air quality for the employees. However commercial kitchens also have spaces for food preparation and dishwashing that experience different thermal environments. The existing knowledge of evaluation of thermal comfort may be inadequate and unsuitable for practical application in environments like commercial kitchens. The purpose of the ASHRAE (RP 1469) sponsored study "Thermal Comfort in Commercial Kitchens" is to determine the occupant thermal comfort range for workers in commercial kitchens' environments and to subsequently provide baseline data for the design community to evaluate new technologies for sustainable kitchen heating, ventilation, and air conditioning (HVAC) designs.

1. Thermal Comfort In Commercial Kitchens

John Stoops, Member, KEMA, Inc., San Francisco, CA

2. Thermal Comfort In Kitchens: Procedure, Instrumentation and Surveys for Documentation of the Thermal Environment In Kitchens

Angela Simone, Ph.D., Member, Denmark Technical University (KEMA, Inc.), San Francisco, CA

3. Thermal Comfort In Kitchens: Evaluation of Thermal Comfort In Kitchens Based On Physical Measurements and Subjective Results

Bjarne W. Olesen, SCANVAC, Lyngby, Denmark

Seminar 6 (Intermediate)

ASHRAE Guideline 20 and Better HVAC Software: A BIM Perspective

Track: Building Modeling Applications

Room: 103B

Sponsor: 01.05 Computer Applications, 07.01 Integrated Building Design

Chair: Stephen Roth, P.E., Member, Carmel Software Corporation, San Rafael, CA

ASHRAE GPC-20 (Guideline 20) is titled "Documenting HVAC&R Work Processes and Data Exchange Requirements." Its purpose is to define procedures for documenting work processes (Use Cases) and data exchange requirements for specific HVAC&R activities. For example, this guideline can be used by software designers to develop better software for HVAC engineers, energy modelers, and architects. This seminar provides an overview of the Guideline and how it can help HVAC practitioners improve their daily workflow efficiency. It also describes a real-world example of how a use case is being used to improve HVAC load calculation work-flows.

1. Overview of Guideline 20: Documenting Work Processes and Data Exchange Requirements

Robert J. Hitchcock, Member, Hitchcock Consulting, Kelsey, CA

2. A Real-World Use Case: Building Load Calculations

Charles S. Barnaby, Member, Wrightsoft Corporation, Lexington, MA

3. Create a Sample Guideline 20 Use Case
Benjamin Welle, P.E., Member, Center for
Integrated Facility Engineering (CIFE), Stan-
ford University, Stanford, CA

Sunday

June 24, 2012

9:45 a.m.–10:45 a.m.

Technical Plenary (Intermediate)

Interoperability of Smart Building Systems and Smart Grid

Track: Integrated Energy Systems

Room: 001A

Sponsor: Conferences and Expositions Committee

Chair: Dunstan Macauley, P.E., Member, TAI Engineers, Owings Mills, MD

As the industry moves toward smart buildings systems, the interoperability of smart buildings and the power grid becomes paramount. On the forefront of this activity of smart grids is Lawrence E. Jones, Ph.D., Director, Regulatory Affairs, Policy & Industrial Relations at Alstom Grid Inc. Dr. Jones has over 20 years of experience in the energy industry with expertise in, power systems engineering, communications and control technologies in power grid and electricity market operations, smart grid technologies including renewable energy integration. Dr. Jones will speak on the interoperability of smart building systems and smart grid.

1. Interoperability of Smart Building Systems and Smart Grid

Lawrence Jones, Ph.D., Alstom Grid Inc., Washington, DC

Sunday

June 24, 2012

11:00 a.m.–12:30 p.m.

Technical Paper Session 2 (Intermediate)

Advanced Technologies in Building Envelope Construction

Track: HVAC&R Fundamentals and Applications

Room: 007D

Chair: Andrew Price, P.E., Member, Stanley Consultants, Muscatine, IA

1. ASHRAE Standard 90.1 Metal Building U-Factors-Part 5: Mathematical Modeling of Wall Assemblies (SA-12-006)

Chris Kasprzak, Associate Member¹, David Musick¹, Mark Henry², Doug Fast, P.E.³ and Manoj K. Choudhary⁴, (1)Owens Corning, Toledo, OH, (2)Butler Manufacturing, Grandview, MO, (3)Johns Manville, Littleton, CO, (4)Owens Corning Center of Science and Technology, Granville, OH

2. Review and Economic Feasibility Study of the Currently Practiced New Housing Construction in Ontario (SA-12-007)

Alan Fung¹ and Aya Dembo, Student Member², (1)Ryerson University, Toronto, ON, Canada, (2)Ryerson University MIE, Toronto, ON, Canada

Conference Paper Session 2 (Basic)

Improving System Efficiency: How Measured Performance and Analysis Can Yield a Low Energy Solution

Track: HVAC&R Fundamentals and Applications

Room: 007B

Chair: Carl F. Huber, WaterFurnace International, Inc., Roanoke, IN

This conference session will cover a range of high efficiency options for residential applications that have the potential to lower energy consumption and/or the installed cost. Ground source heat pumps for space conditioning and water heating sharing a common foundation loop, the impact of a heat pump water heater within the conditioned space, a hybrid ground source heat pump that uses the ground as a thermal storage medium and humidification via a transport membrane in a gas furnace will be presented. The field sites, equipment, data collection methods and analysis techniques for these experimental applications will be examined.

1. Measured Performance and Analysis of Ground Source Heat Pumps for Space Conditioning and for Water Heating in a Low-Energy Test House Operated Under Simulated Occupancy Conditions (SA-12-C003)

Moonis R. Ally, Ph.D., Member, Jeffrey D. Munk, Van D. Baxter, P.E., Fellow ASHRAE and Anthony C. Gehl, Oak Ridge National Laboratory, Oak Ridge, TN

2. Measured Impact on Space Conditioning Energy Use in a Residence Due to Operating a Heat Pump Water Heater Inside the Conditioned Space (SA-12-C004)

Jeffrey D. Munk, Moonis R. Ally, Ph.D., Member and Van D. Baxter, P.E., Fellow ASHRAE, Oak Ridge National Laboratory, Oak Ridge, TN

3. Thermal Storage Properties of a Hybrid Ground Source Heat Pump (SA-12-C005)

Amanda Pertzborn, Student Member¹, G.F. Nellis² and Sanford A. Klein, Ph.D.³, (1)University of Wisconsin - Madison, Solar Energy

Laboratory, Madison, WI, (2)University of Wisconsin - Madison, Madison, WI, (3)University of Wisconsin, Madison, WI

4. Field Trials of a Waterless Home Heating and Humidification Technology (SA-12-C006)

Dexin Wang, Ph.D., Shawn Scott, Ainan Bao, Ph.D and William Liss, Gas Technology Institute, Des Plaines, IL

Conference Paper Session 3 (Intermediate)

Performance and Operational Measurement

Track: Indoor Environmental

Applications

Room: 007A

Chair: Gregory Dobbs, Ph.D., Member, Pennsylvania State University, Philadelphia, PA

It is increasingly important to be able to measure the performance of buildings. The data accumulated will allow us to better manage and predict energy use as well as evaluate the effectiveness of new design, construction and operational strategies. This session reports several new performance measurement techniques.

1. Environmental Noise Case Studies: Air-Cooled Refrigeration Chiller Installations near Residential Structures (SA-12-C007)

Jack B. Evans, P.E., Member, Chad N. Himmel, P.E., Member and Joshua D. Leasure, P.E., JEAcoustics / Engineered Vibration Acoustic & Noise Solutions, Austin, TX

2. Field-Test of the New ASHRAE/CIBSE/USGBC Performance Measurement Protocols for Commercial Buildings: Part I Intermediate and Advanced Level Indoor Environmental Quality Protocols (SA-12-C008)

Hyojin Kim, Student Member and Jeff S. Haberl, Fellow ASHRAE, Texas A&M University, College Station, TX

3. An Experimental and Simulation Study of Lighting Performance in Offices with Automated Roller Shades (SA-12-C009)

Hui Shen, Student Member and Athanasios Tzempelikos, Purdue University, West Lafayette, IN

Seminar 7 (Intermediate)

Effective Calibration of Building Energy Modeling Using Measured Data

Track: Building Modeling Applications

Room: 103B

Sponsor: 04.07 Energy Calculations

Chair: Keith R. Cockerham, P.E., Member, DLB Associates, Eatontown, NJ

Building energy modeling consistency has and will continue to be an area of concern for the BEM community. As BEM is relied on more and more as part of the United States' and ASHRAE's commitment to reduce energy consumption, more accurate

and better calibrated output from the models is critical to this energy saving effort. Continuing with the recent successful session from the 2012 Winter Conference on the same topic, this session shows best-practice methods to identify plausible causes of discrepancies between measured and modeled performance based on utility-level data, identifying causes of discrepancies, and understanding the challenges encountered. A number of case studies from various building types are presented. Some of these studies also compare post ECM utility data with the original simulation data.

1. Lessons Learned with Calibrating An Energy Simulation Model of a High Performance Hi-Rise Office Building

Tom Webster, P.E., Member, Center for the Built Environment (CBE), University of California, Berkeley, CA

2. BESTEST-EX: A Method for Testing Model Calibration Procedures

Ron Judkoff, Ph.D., Member, National Renewable Energy Laboratory, Golden, CO

3. Case Study of Calibrating Multiple Energy Simulation Studies for Hospital and Datacenter Clients As Part of a Utility Incentive Program

Nick Gmitter, Associate Member, DLB Associates, Eatontown, NJ

Seminar 8 (Intermediate)

Exploring Indoor Environmental Applications with Displacement Ventilation and Radiant Cooling and Heating Systems

Track: Indoor Environmental Applications

Room: 103A

Sponsor: 05.03 Room Air Distribution, 06.01 Hydronic and Steam Equipment and Systems, 06.05 Radiant Heating and Cooling

Chair: Mike McDermott, Member, Grumman Butkus Associates, Evanston, IL

Radiant chilled ceilings (CC) with thermal displacement ventilation (TDV) represent a promising integrated system design that combines the energy efficiency of both subsystems with the opportunity for improved ventilation performance resulting from the thermally stratified environment of DV systems. Presenters cover recent indoor environmental developments in TDV systems combined with radiant cooling and heating hydronic systems. We present appropriate applications for schools, offices, laboratories and large volume spaces. We explain how ASHRAE Standards 55-2010 and 62.1-2010 impact system design of these integrated air and hydronic systems. This presentation introduces a new design method based on laboratory experiments.

1. Predicted Thermal Comfort and Ventilation Performance In Combined Hydronic Floor and Displacement Ventilation Systems

Michel Tardif, P.Eng., Member, CanmetENERGY Natural Resources Canada, Ottawa, ON, Canada

2. Room Air Stratification and Ventilation Performance In Combined Chilled Ceiling and Thermal Displacement Ventilation Systems

Stefano Schiavon, Ph.D., Member, University of California, Berkeley, CA

3. Applied Chilled Sails and Thermal Displacement Ventilation

Jerry Sipes, Ph.D., P.E., Member, Price Industries Inc., Suwanee, GA

4. DV in Healthcare

Bob Gulick, P.E., Member, Mazzetti Nash Lipsey Burch, Portland, OR

Seminar 9 (Intermediate)

Practical Applications for DDC Dashboards and Green Kiosks

Track: Integrated Building Controls

Room: 001A

Sponsor: 01.04 Control Theory and Application, 07.03 Operation and Maintenance Management, 07.01 Integrated Building Design

Chair: Frank Shadpour, P.E., Fellow ASHRAE, SC Engineers, Inc., San Diego, CA

What is the most useful information to motivate occupants to reduce building energy use? As owners, facility operators, and occupants become more interested in the health and energy performance of their buildings, access to real-time data has become a priority in many high performance buildings. The displays, which were once locked away in mechanical rooms, are now proudly exhibited in lobbies. This seminar demonstrates practical applications to integrate DDC and lighting controls, web services, and metered energy data into effective and eye-catching facility dashboards. Enable and empower building stakeholders to be more energy efficient by becoming better informed and ultimately make better decisions.

1. Intelligent System Integration for Facility Dashboards and Green Kiosks

Ron Burnstein, Echelon Corporation, Encinitas, CA

2. Teaching Through Touch

Nathan Bailey, Automated Logic, Pasadena, TX

3. An Owner's Perspective On Leveraging Dashboard Information to Reduce Energy Use

David Umstot, P.E., San Diego Community College District, San Diego, CA

Seminar 10 (Basic)

Some Acoustical Impacts of Poor Aerodynamic Conditions in HVAC Systems

Track: HVAC&R Systems & Equipment

Room: 001B

Sponsor: 02.06 Sound and Vibration Control

Chair: Mark E. Schaffer, P.E., Member, Schaffer Acoustics Inc., Pacific Palisades, CA

The noise ratings for the equipment used in air distribution systems are determined from laboratory testing that is done with optimal airflow aerodynamics at the equipment's inlet and discharge connections. Real-world HVAC systems often do not have these optimal aerodynamic conditions. This seminar shows how less-than-optimal airflow aerodynamics in and near air handling units, terminal boxes and diffusers can cause the systems to produce unexpected, excessive noise.

1. The Effects of Poor Aerodynamics On Diffuser Noise

Zaccary Poots, Member, Nailor Industries, Houston, TX

2. Aerodynamic Effect of Terminal Unit Noise

Patrick Oliver, P.Eng., Member, E.H. Price, Ltd., Winnipeg, MB, Canada

3. The Effect of Poor Aerodynamics On Air Handling Unit Noise

Mark E. Schaffer, P.E., Member, Schaffer Acoustics Inc., Pacific Palisades, CA

Seminar 11 (Intermediate)

Standards Development for 2L Flammable Refrigerants

Track: Refrigeration Applications

Room: 007C

Sponsor: 03.01 Refrigerants and Secondary Coolants

Chair: William Walter, Member, Carrier Corporation, Syracuse, NY

Environmental considerations are reducing the number of chemicals that can be used as refrigerants. The HFCs were introduced to replace ozone depleting CFCs and HCFCs, but they are greenhouse gases and are subject to use restrictions in some countries. As a result the industry is evaluating chemicals with very low global warming potential. Some of these chemicals are mildly flammable and have been assigned to a new flammability safety classification, 2L, in ASHRAE Standard 34. This seminar provides information on the changes to standards that specify requirements for the use of 2L flammable refrigerants.

1. ASHRAE Standard 15: Proposed Changes to Incorporate 2L Refrigerants

Phillip Johnson, P.E., Member, McQuay International, Staunton, VA

2. EN 378, ISO 5149, IEC 60335-2-40: Proposed Changes to Incorporate 2L Refrigerants

Els Baert, Daikin Europe N.V., Ostende, Belgium

3. UL's Effort to Harmonize Product Safety Requirements for A2L, A2, and A3 Refrigerants

Brian Rodgers, Underwriters Laboratories, Northbrook, IL

Sunday

June 24, 2012

1:30 p.m.–3:00 p.m.

Conference Paper Session 4 (Intermediate)

Energy Conservation Strategies for HVAC Systems

Track: HVAC&R Systems & Equipment

Room: 001B

Chair: Andrew Rhodes, Southland Industries, Dulles, VA

1. Impacts of Air Filters on Energy Consumption in Typical HVAC Systems (SA-12-C010)

Nabil Nassif, Ph.D., P.E., Associate Member, North Carolina A&T State University, Greensboro, NC

2. Design and Analysis of an Integrated Heat and Energy Recovery Ventilation System with Economizer Control for Net-Zero Energy Solar Houses (SA-12-C011)

Jiten Mistry¹, Carl Yu Chen, Student Member¹, Sumeet Jhingan², Wey Leong, Ph.D.¹, Alan Fung¹, Seyed Pishavee¹ and Saman Shaban Nejad³, (1)Ryerson University, Toronto, ON, Canada, (2)Morrison Hersfield, Brampton, ON, Canada, (3)Ryerson University, North York, ON, Canada

3. Potential Peak Reduction and Energy Savings of Innovative Building Envelope Technologies Using Phase Change Materials (SA-12-C012)

Paulo Cesar Tabares-Velasco, Ph.D., Associate Member, Craig Christensen and Marcus Bianchi, National Renewable Energy Laboratory, Golden, CO

Seminar 12 (Advanced)

Data Center Containment, Control and Modeling: Interactions and Optimization Opportunities

Track: HVAC&R Fundamentals and Applications

Room: 103A

Sponsor: 09.09 Mission Critical Facilities, Technology Spaces and Electronic Equipment

Chair: David Moss, Dell, Inc, Austin, TX

In most data centers both the IT equipment and the data center itself are highly managed to optimize power, cooling and performance. In the past that optimization did not include simultaneous optimization of the overall entity. This seminar explores resulting non-optimal design characteristics and the methods used to operate both the IT equipment and the data center to solve cooling problems and better optimize its capability. The interaction of containment systems on IT equipment is covered along with the opportunity created using thermal sensing and simulation to manage the cooling. Techniques for avoiding data center limitation and stranded capacity are addressed as they relate to both the ITE and the data center cooling infrastructure.

1. Data Center Containment and Control: Data Center and ITE Interactions

David Moss¹ and Robin A. Steinbrecher, Member², (1)Dell, Inc, Austin, TX, (2)Intel Corp., Dupont, WA

2. Optimization of Containment Control Strategies Using Wireless Technology

Michael K. Patterson, Ph.D., P.E., Member¹ and Raju Pandey, Ph.D.², (1)Intel Corp., Dupont, WA, (2)University of California, Davis, Folsom, CA

3. Data Center Operational Management: Evaluating Data Centers and Avoiding Stranded Capacity

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

Seminar 13 (Intermediate)

Designing Commercial Kitchen Ventilation for High Performance, Low Energy Buildings

Track: Integrated Energy Systems

Room: 007C

Sponsor: 05.10 Kitchen Ventilation, ASHRAE Std 90.1

Chair: Francis Kohout, P.E., Member, McDonald's Corp, Oak Brook, IL

A commercial kitchen is an energy intensive manufacturing facility. It is the largest consumer of energy per unit of floor area when compared to other commercial or institutional occupancies. Given this condition, there exists opportunities to design ventilation systems which minimize both energy use and environmental impact, all while still addressing large internal heat gains and high ventilation requirements. To achieve these goals, this seminar provides guidance on general design approaches as well as specific design examples.

1. How Does Standard 189 Impact My Kitchen Ventilation Design?

Francis Kohout, P.E., Member, McDonald's Corp, Oak Brook, IL

2. CKV DCV, Energy Considerations, Codes, and Standard 90.1

Jeff Stein, P.E., Member, Taylor Engineering, Alameda, CA

3. How Hood Selection, Exhaust, and Makeup Air Systems Contribute to a High Performance Building Design

Richard T. Swierczynna, Associate Member, Food Service Technology Center, San Ramon, CA

4. Considerations When Designing High Performance Exhaust Systems

John Clark, P.E., Member, Karges-Faulconbridge, Inc, Minneapolis, MN

Seminar 14 (Intermediate)

Energy Efficient Snow Melt System Design

Track: HVAC&R Systems & Equipment

Room: 007B

Sponsor: 06.05 Radiant Heating and Cooling

Chair: Devin A. Abellon, P.E., Member, Uponor, Phoenix, AZ

Pedestrian and transportation safety, security, and building accessibility may require snow and ice control afforded by snow melting systems. Balancing energy and environmental issues with client expectations has never been more important, requiring greater analysis of system designs and equipment selection. The seminar reviews research leading to the development of the ASHRAE Transient Snow-melting Analysis Software, examples of load calculations based on storm characteristics using the program, conversion of loads into system designs and equipment selections for various applications.

1. Snow Melt Research and Analysis of Design Alternatives Using the ASHRAE Snow Melt Software Tool

Jeffrey Spitler, Ph.D., P.E., Oklahoma State University, Stillwater, OK

2. Thermal to Hydraulic Calculation Procedure for Snow Melting Systems

Robert Bean PL(Eng.), Member, Healthy Heating, Calgary, AB, Canada

3. Optimizing Circulator Selections for Temperature Extremes in Glycol Mixes

Hans Brink Hansen M.Sc., Member, Grundfos A/S, Bjerringbro, Denmark

Seminar 15 (Advanced)

Exploiting the Advances in Absorption Fundamentals for Transformative Impact

Track: HVAC&R Systems & Equipment

Room: 007A

Sponsor: 08.03 Absorption and Heat Operated Machines

Chair: Ersin Gercek, P.E., Associate Member, Concord Engineering Group, Voorhees, NJ

In this session, three different research facets towards improving performance and efficiency of absorption cooling technologies

are evaluated. First author presents method of utilizing absorption cooling system assisted with a vapor compression system to improve system performance at high ambient temperatures. Second author deals with the application and evaluation of micro-channel heat exchangers in absorbers. Finally, the last authors present alternative fluids for absorbers to improve system resistance to crystallization issues.

1. Water/LiBr Absorption System Assisted Vapor Compression System for High Ambient Temperatures

Yunho Hwang, Ph.D., Member, University of Maryland, College Park, MD

2. Physical Properties of the Lithium Bromide + 1, 2-Propanediol Aqueous Solution

Omar Abdelaziz, Ph.D., Associate Member, Oak Ridge National Laboratory, Oak Ridge, TN

3. High Efficiency Energy Recovery Utilizing Micro-Channel Heat & Mass Exchangers Absorption System

Ebrahim Al-Hajri, Ph.D., Member, Petroleum Institute, Abu Dhabi, United Arab Emirates

Seminar 16 (Intermediate)

Modeling the Performance of VRF Systems

Track: Building Modeling Applications
Room: 103B

Sponsor: 08.07 Variable Refrigerant Flow

Chair: Dominic Kolandayan, Member, Daikin AC (Americas), Inc., Carrollton, TX

Expectations are at an all-time high for energy models to match the mechanical design exactly. However, many energy modeling programs do not explicitly model Variable Refrigerant Flow (VRF) systems. This seminar presents methods that utilize controlled laboratory data in energy simulation software with the goal of improving existing and future VRF energy models. Techniques are presented for modeling VRF systems using eQUEST which is based on the DOE-2.2 modeling engine. Finally, the differences in results among three energy modeling programs based on an example building are explored.

1. Data for Publicly Available VRF Systems

Ronald Domitrovic, Ph.D., Associate Member, Electric Power Research Institute, Knoxville, TN

2. Modeling VRF Systems Using eQUEST

Jaeyoon Koh, Ph.D., Member, LG Electronics U.S.A., Inc., Alpharetta, GA

3. Interpreting the Variations In Results When Modeling VRF Systems

Pam Androff, Associate Member, Mitsubishi Electric, Atlanta, GA

Seminar 17 (Intermediate)

Practical Applications with Storage and Treatment with Using Reclaimed and Harvested Waters in Your Water Conservation Efforts

Track: HVAC&R Fundamentals and Applications

Room: 007D

Sponsor: 03.06 Water Treatment

Chair: Scott Mayes, LAKOS, Olathe, KS

Everyone wants to save water, but how to do it. This seminar addresses the practical realities encountered using reclaimed and harvested waters by presenting real life experiences with water conservation efforts, including: 1) logistics of reclaimed/harvested water storage, 2) getting reclaimed water to storage/treatment areas, 3) practical uses for reclaimed/harvested waters, 4) expected treatment requirements for reclaimed/harvested waters, and 5) a comparison of issues with reclaimed vs. harvested waters.

1. Practical Applications with Storage and Treatment with Using Reclaimed and Harvested Waters

Dan Weimar, Member, Chem-Aqua, Tallahassee, FL

2. Using Reclaimed Water for Boiler Water Make Up

Mike Adams, Member, Garrett Calahan, Atlanta, GA

3. Water Treatment of Harvested Waters

Robert Walki, Ph.D., Associate Member, Nalco, Naperville, IL

Seminar 18 (Intermediate)

Strategies for Transformation of Facilities Management to Foster Economically, Environmentally and Socially Sustainable Buildings

Track: Integrated Building Controls

Room: 001A

Sponsor: 07.03 Operation and Maintenance Management, 02.08 Building Environmental Impacts and Sustainability

Chair: Om Taneja, Ph.D., P.E., Member, US, General Services Administration, Manhattan, NY

Buildings have more impact on the natural environment than any other sector of the economy. The future of facilities is going to be governed by how effectively we can transform facilities management towards lowering utilities and operating costs, minimizing waste, and improving work space based on measurements, commissioning and retro-commissioning of buildings. This seminar

presents simple operation and maintenance measures guided by trained O&M staff to optimize demand with building automation, load shaving technologies and collaboration with other parts of organizations to integrate HVAC&R systems with other building systems to enhance the effectiveness of integrated operational and maintenance practices.

1. An Approach to Facilities Operational Improvements: Train O&M Staff and Provide Tools to Measure, Track and Adjust Equipment and Systems

Om Taneja, Ph.D., P.E., Member, US, General Services Administration, Manhattan, NY

2. Green Buildings Can Waste Energy Efficiently

Larry Spielvogel, P.E., Fellow Life Member, Consulting Engineer, Bala Cynwyd, PA

3. The Commissioning OPR, BOD and Systems Manual: Make Them Work for You

Ronald Wilkinson, P.E., Member, Consultant, New York, NY

Sunday

June 24, 2012

3:15 p.m.–4:45 p.m.

Seminar 19 (Intermediate)

When Integrated Controls Are Not Integrated

Track: Integrated Building Controls

Room: 007D

Sponsor: 09.01 Large Building Air-Conditioning Systems

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

Three case studies are shared where integrated controls did not work and lessons learned presented. These examples will help designers improve project delivery by learning from others' mistakes.

1. Case Studies: How We Got This Student Union Building, Unified

Drew Rimmer, P.E., Member, Henderson Engineering, Lenexa, KS

2. Case Studies: City Hall Out of Control-Overview

Howard J. McKew, P.E., Member, BuildingSmartSoftware, Inc., North Andover, MA

3. Case Studies: Commissioning Finds Project without Control

Wade Conlan, P.E., Member, Exp, Maitland, FL

Monday

June 25, 2012

8:00 a.m.–9:30 a.m.

Technical Paper Session 3 (Intermediate)

Modeling and Simulation for Data Center Cooling, Rack Boundary Conditions, Central Chiller Plant Loop Delta T and Indoor Swimming Pool Evaporation

Track: HVAC&R Systems & Equipment

Room: 007C

Chair: Nick Gangemi, P.E., Member, Facility Gateway Corp., Madison, WI

The use of probabilistic methods of predicting failure in Reliability Engineering has greatly assisted the design of reliable electrical power distribution systems for data centers. We will discuss this same proven technique as applied to the mechanical cooling system in a data center. As cloud computing and computational needs grow, data centers will continue to be a large part of our energy load. Proper design and layout of the data center are critical to efficient energy use within the data center. Rather than just modeling racks as a black box, we will validate them against experimental temperature and velocity data. Chilled water loop Delta "T" is a critical parameter for the simulation and optimization of a central chilled water system. A quadratic regression model will be used to model the loop Delta "T". The modeling procedure will be divided into three steps: variables selection and filtering, best regression screening, and model adequacy check. Accurate calculation of evaporation from swimming pools is needed to ensure proper sizing of HVAC equipment as well as for the estimation of energy consumption. Previously, formulas for evaporation from occupied and unoccupied indoor swimming pools have been published and shown to be in good agreement with test data. However it was applicable only to positive density difference. This paper now extends them to negative density differences and includes the case when air is forced over the surface of the pool to remove off gases.

1. Reliability Modeling for Data Center Cooling Systems (SA-12-008)

Bob Schuerger, P.E.1, Gardson Githu, P.E.1, Bob Arno2 and Christopher W. Kurkjian, P.E., Member3, (1)HP Critical Facility Services, Los Angeles, CA, (2)HP Critical Facility Services, Frankfurt, NY, (3)kW Mission Critical Engineering, Troy, NY

2. The Development of Simplified Rack Boundary Conditions for Numerical Data Center Models (SA-12-009)

John Zhai, Ph.D., Member, Knud A. Hermansen, Student Member and Salah Al-Saadi,

Member, University of Colorado, Boulder, CO

3. Simulating Central Chiller Plant Loop Delta-T with Quadratic Regression Models (SA-12-010)

Zhiqin Zhang, Ph.D. and Jingjing Liu, Nexant, Inc., San Francisco, CA

4. Calculation of Evaporation from Indoor Swimming Pools: Further Development of Formulas (SA-12-011)

M. Mohammed Shah, Ph.D., P.E., Fellow ASHRAE, Consultant, New York, NY

Conference Paper Session 5 (Basic)

Thermal Comfort

Track: Indoor Environmental

Applications

Room: 007A

Chair: Bjarne W. Olesen, SCANVAC, Lynby, Denmark

The basic requirement of a properly designed and managed indoor environment is to maintain an acceptable level of thermal comfort. This session explores various approaches and their impact on thermal comfort.

1. A Comparison of Thermal Comfort Between the Archetype Sustainable Homes at the Kortright Centre for Conservation (SA-12-C013)

Agatha E. Pyrka and Alan Fung, Ryerson University, Toronto, ON, Canada

2. Long-Term Evaluation of Internal Thermal Comfort with Different Kinds of Glazing Systems and Window Sizes: From Energetic Considerations to Users' Comfort (SA-12-C014)

Francesca Cappelletti, Ph.D.1, Andrea Gasparella, Ph.D.2, Giovanni Pernigotto, Dr.Ing.3 and Piercarlo Romagnoni, Ph.D., Member1, (1)University IUAV of Venice, Venezia, Italy, (2)Free University of Bolzano, Bolzano, Italy, (3)University of Padova, Vicenza, Italy

3. Occupant Perceptions of an Indoor Thermal Environment in a Naturally Ventilated Building (SA-12-C015)

Salman Ilyas, Member1, Ashley Emery, Fellow ASHRAE2, Dean Heerwagen, Life Member2 and Judith Heerwagen, Ph.D.3, (1)Arup, Los Angeles, CA, (2)University of Washington, Seattle, WA, (3)J.H. Heerwagen & Associates, Inc., Seattle, WA

Seminar 20 (Intermediate)

BAS Integration in the Occupied Space

Track: Integrated Building Controls

Room: 001A

Sponsor: 01.04 Control Theory and Application

Chair: James Coogan, P.E., Member, Siemens, Buffalo Grove, IL

Integrated BAS is not confined to equipment rooms. In today's automated room, lighting, shading HVAC and natural ventilation systems work together to serve the occupant and maximize efficiency. Integra-

tion at the occupant's interface makes it simple to use a room with sophisticated capabilities.

1. Room Automation in Today's Office Building

Markus Kissel, Siemens Industry Inc, Gubelstrasse, Switzerland

2. Specifying Integrated Lighting and HVAC Controls

Ronald Poskevich, Blue Ridge Technologies, Atlanta, GA

3. Integrated BAS from the Hospital Bed

Robert Dubiel, Member, Mayo Clinic Health System, Eau Claire, WI

Seminar 21 (Basic)

Can I Determine My Loads with My Energy Modeling Program?

Track: Building Modeling Applications

Room: 103B

Sponsor: 04.01 Load Calculation Data and Procedures, 04.07 Energy Calculations

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

Load calculations and energy modeling tools are based on the same fundamental heat transfer theory. At present, the methods are fairly similar, yet there are some key differences in assumptions, especially with regards to the weather data. This seminar looks at the differences between the methods using the ASHRAE Headquarters Building. The results from both the design load calculation approach and the energy calculation approach are compared to actual measured data.

1. Overview of Cooling Load Calculation and Energy Modeling Procedures

Jeffrey Spitler, Ph.D., P.E., Oklahoma State University, Stillwater, OK

2. Comparison of Results From Cooling Load Calculation and Energy Modeling Programs

Steve Bruning, P.E., Fellow ASHRAE, Newcomb & Boyd, Atlanta, GA

3. Comparison of Calculated and Measured Loads for the ASHRAE HQ Building

Daniel Fisher, Oklahoma State University, Stillwater, OK

Seminar 22 (Intermediate)

Combined Heat and Power as a Policy Tool to Meet State Mandates to Provide Clean, Reliable Cost Effective Power

Track: Integrated Energy Systems

Room: 007B

Sponsor: 01.10 Cogeneration Systems

Chair: James Freihaut, Ph.D., Member, The Pennsylvania State University, State College, PA

Twenty-two states adopted Energy Efficiency Resources Standards (EERS)

between 2007 and 2010, passing the tipping point so that now more than half of all states have EERS in place for electricity, natural gas, or both. Utilities have been responding to this new policy environment by adding and developing programs, efficient technologies, market segmentation strategies, program approaches, and program designs. Certain states have recognized the importance of Combined Heat and Power technologies as an important tool in economically achieving energy efficiency, reliability and carbon reduction. This seminar presents three strategic arguments for increasing the use of CHP focusing on clean power production, reliable energy supply and economics of energy supply.

1. Clean Power

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

2. Reliable Power

Bruce Hedman, Ph.D., ICF, Arlington, VA

3. Cost Effective Power

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

Seminar 23 (Basic)

New Acoustical Criteria and Methods of Measuring HVAC Sound

Track: HVAC&R Fundamentals and Applications

Room: 007D

Sponsor: 02.06 Sound and Vibration Control

Chair: Karl L. Peterman, P.E., Member, Vibro-Acoustics, Markham, ON, Canada

Noise problems in buildings remains one of the top causes of occupant complaints. Recognizing this, many of the high performance building programs now require a minimum standard of acoustical performance - though the method to determine compliance has not yet been formalized. Recent ASHRAE-sponsored research and influence from international standards have led the technical committee on sound and vibration control to change the acoustical criteria table in the ASHRAE Applications Handbook. This session reviews the new table, sound criteria methods, new guides such as the IgCC and ASHRAE 189, and a sound measurement methodology currently under development.

1. Standardized Methodology for Sound Level Measurement

Karl L. Peterman, P.E., Member, Vibro-Acoustics, Markham, ON, Canada

2. Multi-Cultural Acoustical Criteria and the New ASHRAE Criteria

Jason Swan, Member, Sandy Brown Associates, LLP, London, United Kingdom

3. Uncertainties in Measuring HVAC Noise

Richard Peppin, Member, Scantek, Inc., Columbia, MD

Seminar 24 (Intermediate)

Proper Sizing of Copper Tube and Fittings for High Pressure Refrigerant Applications

Track: Refrigeration Applications

Room: 001B

Sponsor: 10.03 Refrigerant Piping, 03.08 Refrigerant Containment

Chair: John J. Sluga, Member, Hansen Technologies Corporation, Bolingbrook, IL

The purpose of the session is to address inconsistencies in current practices for predicting failure in pressure piping. This is particularly important to engineers using R410a and CO2 in their refrigeration designs. Presentations show hoop strain is a better predictor of failure than wall thickness for pressure piping; compare hoop strain predicted performance to other performance predictors; and lastly describe what changes to ASME and ASTM codes are under development with this knowledge.

1. Development and Evaluation of Copper Tube and Fittings Used In R-410A and CO2 Applications

Chris Mueller, Member, Mueller Industries, Memphis, TN

2. Evaluation of Predicted Failure Using Dimensional Criteria In Current Standards

Charles Stout, P.E., Member, Mueller Industries, Memphis, TN

3. Proposed Changes to Regulations Governing Pressure Piping

Charles Stout, P.E., Member, Mueller Industries, Memphis, TN

Seminar 25 (Intermediate)

Radiant Cooling in High Humidity Environments

Track: HVAC&R Fundamentals and Applications

Room: 103A

Sponsor: 06.05 Radiant Heating and Cooling

Chair: Devin A. Abellon, P.E., Member, Uponsor, Phoenix, AZ

The use of radiant cooling systems has been proven as an alternative strategy to provide superior thermal comfort while significantly reducing overall building energy usage. However, its adoption in many regions has been slow due to concerns over surface condensation. This seminar explores the conditions which define an indoor environment conducive to human health and comfort, and show that a radiant cooling system designed to such guidelines would not be at risk for condensation. This seminar also includes case studies showing how radiant cooling systems have been used as part of an energy efficient design solution in high humidity environments.

1. Designing the Indoor Environment for Health and Comfort

Robert Bean PL(Eng.), Member, Healthy Heating, Calgary, AB, Canada

2. Radiant Cooling: The Bangkok Airport

Peter Simmonds, Ph.D., Fellow Member, IBE Consulting Engineers, Sherman Oaks, CA

3. Radiant Cooling: Clemson University

Michael Talbot, P.E., Talbot & Associates Consulting Engineers, Inc., Charlotte, NC

Monday

June 25, 2012

9:45 a.m.–10:45 a.m.

Conference Paper Session 6

(Advanced)

Integrated Building Controls

Track: Integrated Building Controls

Room: 001A

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

This conference paper session shares lessons learned in 20 years of experience in HVAC system commissioning services and recommendations for solving common issues found in commissioning. It then examines a method for reducing energy consumption in HVAC systems using model-based optimization that could be integrated into energy management and control systems. This optimization process uses evolutionary algorithms and artificial neural networks to implement the optimization process.

1. What We Have Learned from 20 Years of HVAC System Commissioning (SA-12-C016)

E. Thomas Lillie, P.E., Member, Horizon Engineering Associates, LLP, St. Louis, MO

2. Modeling and Optimization of HVAC Systems Using Artificial Intelligence Approaches (SA-12-C017)

Nabil Nassif, Ph.D., P.E., Associate Member, North Carolina A&T State University, Greensboro, NC

Conference Paper Session 7 (Basic)

Optimal Zoning Strategies to Maximize Building Performance

Track: Building Modeling Applications

Room: 007A

Chair: Megan LaHiff, P.E., Associate Member, Stan Weaver Company, Orlando, FL

1. Beyond the Shoebox: Zoning Approaches for Unusual Building Shapes (SA-12-C018)

Lillian Smith, Autodesk, Waltham, MA

2. A Simulation and Experimental Study of the Impact of Passive and Active

Facade Systems on the Energy Performance of Building Perimeter Zones (SA-12-C019)

Ying-Chieh Chan, Student Member and Athanasios Tzempelikos, Purdue University, West Lafayette, IN

Seminar 26 (Intermediate)

Laboratories and Environmental Performance Criteria

Track: HVAC&R Fundamentals and Applications

Room: 103B

Sponsor: 09.10 Laboratory Systems

Chair: Michael Ratcliff, Ph.D., P.E., Member, RWDI, Redlands, CA

Laboratories have special requirements and characteristics compared to regular buildings. The Labs21 Environmental Performance Criteria was an attempt to establish a LEED type program to reduce the environmental impacts for laboratories. Unfortunately the LEED organization has decided to not pursue a LEED for labs program. This seminar discusses the current Labs21 criteria and how such a program may advance in the future.

1. What Gives with the Labs 21 Environmental Performance Criteria?

Philip Wirdzek, International Institute of Sustainable Laboratories, Arlington, VA

2. A Planned Sustainability Improvement Evaluation System for Labs

Gordon Sharp, Ph.D., P.E., Member, Aircoity, Inc., Newton, MA

Seminar 27 (Intermediate)

Thermal Energy Storage: From Concept to Completion

Track: HVAC&R Systems & Equipment

Room: 007C

Sponsor: 06.09 Thermal Storage, 01.10 Cogeneration Systems

Chair: Robert Willis, Member, Ice Energy, Fort Collins, CO

Thermal energy storage (TES) is a proven technology, historically providing benefits to system owners and utilities by shifting electric loads from peak to off-peak periods. In addition, integration of TES into the design of various mechanical systems can reduce cost, improve efficiency and reliability, and enable more effective operating strategies. This session provides an in-depth look at several supply and demand side applications of TES demonstrating these benefits. Design and modeling considerations are covered along with performance results of the installations.

Case studies presented feature a range of technologies including chilled water storage,

turbine inlet cooling, ice storage, and geoexchange systems.

1. Chilled Water Thermal Energy Storage: Case Studies

Guy S. Frankenfield, P.E., Member, Natgun Corporation, Grand Prairie, TX

2. Integration of Energy Storage with GeoExchange Systems

Ed Lohrenz, Member, Geo-Xergy Systems, Inc., Winnipeg, MB, Canada

Seminar 28 (Intermediate)

Advanced Techniques for Editing Building Energy Models

Track: Building Modeling Applications

Room: 103A

Chair: Molly Curtz, P.E., Member, Arup, Seattle, WA

In this practical seminar, attendees will learn to work more efficiently and accurately with large, complex building energy model input files. Techniques presented will include both direct manipulation of text-based input files and approaches for efficient editing within the eQuest GUI (Graphical User Interface), including regular expressions, BDL expressions, and user-defined defaults. We will focus primarily on working with DOE-2.2 (eQuest) input files, but the core techniques are also useful in other modeling software. This seminar will help experienced modelers learn to work faster and smarter, avoiding repetitive and error-prone manual editing.

1. Advanced Techniques for Editing Building Energy Models

Molly Curtz, P.E., Member, Arup, Seattle, WA

Seminar 29 (Intermediate)

Current Design Standards for Upper Air UV Disinfection Installations: Bridging Global Gaps

Track: HVAC&R Fundamentals and Applications

Room: 007D

Sponsor: 02.09 Ultraviolet Air and Surface Treatment

Chair: Sam Guzman, Member, American Ultraviolet Company, Schooleys Mountain, NJ

This seminar discusses the need for a set of standards regarding the proper application of upper air UV disinfection units and how it impacts the transmission of airborne diseases worldwide. The lack of standards and the variation in the application of UV wall and ceiling mounted fixtures has led to resistance to the use of UV technology as a solution for transmission control. The design and installation of the UV fixtures has a dramatic impact on the effectiveness and safety of their use.

1. The Need for Standards for Upper Air UV Applications

Richard L. Vincent, Member, Mount Sinai School of Medicine, New York, NY

2. System Design for Upper Air Disinfection

Chuck Dunn, Member, Lumalier Corporation, Memphis, TN

Forum 1 (Advanced)

IBD, IPD - We OK? When Performance Is the Goal, What Should Be In the Deal?

Track: Integrated Energy Systems

Room: 007B

Sponsor: 07.01 Integrated Building Design, 01.07 Business, Management & General Legal Education

Chair: E. Mitchell Swann, P.E., Member, MDC Systems, Paoli, PA

IBD and IPD have become common terms in project execution today. In many of these projects, high performance is the goal. But perceptions of performance can be subjective. How do you know when it is good enough? This forum captures the experiences and expectations of ASHRAE members on IBD, IPD and performance-based projects with an aim to help inform the industry about what works and doesn't work so well in the contractual agreements covering their projects. The feedback collected will help to develop a future joint guidance publication from TC 1.7 and 7.1. Forewarned is forearmed!

Forum 2 (Intermediate)

Will Standard 90.1 Help or Hurt the Data Center Industry?

Track: HVAC&R Fundamentals and Applications

Room: 001B

Sponsor: 09.09 Mission Critical Facilities, Technology Spaces and Electronic Equipment

Chair: David Quirk, P.E., Member, Verizon Wireless, Basking Ridge, NJ

ANSI/ASHRAE/IESNA Standard-90.1, Energy Standard for Buildings, has been amended to include data centers within the scope of the 2010 edition, following approval of Addendum aq. Since this change to Standard 90.1 there have been many industry letters, public review comments, articles, and even presentations indicating concerns and disagreement over the changes. This forum reviews some of the current requirements and get industry feedback on whether the current requirements will hurt the data center industry and possibly require steps backwards for innovation in data center design.

Monday

June 25, 2012

11:00 a.m.–12:00 noon

Conference Paper Session 8 (Intermediate)

Field and Laboratory Results from HVAC Maintenance Programs

Track: HVAC&R Systems & Equipment

Room: 007A

Sponsor: 06.03 Central Forced Air Heating and Cooling Systems

Chair: Judith Jennings, P.E., Member, Pacific Gas and Electric, San Francisco, CA

HVAC Maintenance Measures have been a central part of utility HVAC energy efficiency efforts in recent years, yet the savings reported using different metrics vary widely and are subject to a wide range of factors. HVAC installation and maintenance faults, weather dependency, refrigerant charge method, system characteristics such as metering device, line length, unit location, individual vs. combined measures, and a host of other variables affect the outcome of maintenance efforts. Utility programs, contractors and researchers have spent considerable effort trying to understand the key elements and to determine the most successful approach to achieving savings. EM&V efforts have been limited and challenging. The three papers in this session provide three perspectives to broaden our understanding this complex problem. Heinemeier provides analysis of the sources of uncertainty in delivering and measuring these programs. Stoops will focus on the challenges and uncertainties faced in conducting evaluations of HVAC tune-up and refrigerant charge correction programs. Mowris will provide laboratory test results of HVAC diagnostic fault detection and the impacts of installation and maintenance faults on the measured application Energy Efficiency Ratio (EER) and Seasonal Energy Efficiency Ratio (SEER).

1. Uncertainties in Achieving Energy Savings from HVAC Maintenance Measures in the Field (SA-12-C020)

Kristin Heinemeier, Ph.D., P.E., Member1, Marshall B. Hunt, P.E.2, Marc A. Hoeschele, P.E.3 and Elizabeth Weitzel, Affiliate3, (1)Western Cooling Efficiency Center, Davis, CA, (2)Pacific Gas & Electric, Davis, CA, (3)Davis Energy Group, Davis, CA

2. Laboratory Measurements of HVAC Installation and Maintenance Faults (SA-12-C021)

Robert Mowris, P.E., Member1, Robert Eshom2 and Ean Jones2, (1)Verified Inc., Olympic Valley, CA, (2)Verified Inc., Truckee, CA

Seminar 30 (Intermediate)

Case Studies in Controls

Track: Integrated Building Controls

Room: 001A

Sponsor: 01.04 Control Theory and Application

Chair: David Kahn, P.E., Member, RMH Group, Lakewood, CO

This session examines two differing approaches to energy savings: a case study of a retrofit and a programming strategy, and performance verification for VAV terminals. The case study is an energy retrofit of a Salt Lake office building resulting in 50% energy reduction. Controls were replaced, enhanced monitoring installed and solar PV and domestic water heating employed. Strategies for controlling terminal equipment to minimize energy usage while remaining in compliance of ventilation requirements are presented. Specialized database optimized for the intake, management, analysis and presentation of large volumes of "time series" data from building systems, sensors, and controls is described.

1. Over 50% Energy Reduction with Retrofits Plus Solar: An Office Building Case Study

Gaylen Atkinson, Member, Atkinson Electronics, Salt Lake City, UT

2. Dynamic Reset of VAV System Duct Pressure, Ventilation Airflows and Concurrent Compliance/Performance Verification

Matt Dugan, Member, DLV Automation, Atlanta, GA

Seminar 31 (Intermediate)

Commissioning the Building Envelope

Track: HVAC&R Fundamentals and Applications

Room: 001B

Sponsor: 07.09 Building Commissioning

Chair: Mike Eardley, P.E., Member, Cannon Design, Boston, MA

This seminar focuses on the complexities of building envelope commissioning, specifically examining the differences and interactions between typical mechanical and building envelope commissioning from pre-design through post occupancy. Various commissioning techniques and testing procedures utilized by the presenters are discussed.

1. Leading the Commissioning Process for the Building Envelope

David Cantrill, P.E., Associate Member, Commissioning & Green Build Solutions Inc., Duluth, GA

2. Design and Field Testing Considerations for the Building Envelope

Fiona Aldous, Wiss, Janney, Elstner Associates, Inc., Irving, TX

Seminar 32 (Basic)

Ramification of Aisle Containment and Server Airflow Design in New and Existing Data Centers

Track: HVAC&R Fundamentals and Applications

Room: 103A

Sponsor: 09.09 Mission Critical Facilities, Technology Spaces and Electronic Equipment

Chair: Nick Gangemi, P.E., Member, Facility Gateway Corp., Madison, WI

Cold and hot aisle containment has become a widely accepted method of increasing the efficiency of data center operation. The concept of physically separating cold and hot air paths in the data center makes logical sense, and aisle containment provides a simple method for accomplishing this, that on the surface appears to remove the chance of any airflow mixing. However, like most data center operation concepts, the true nature of containment is more complex. This presentation explores the theoretical application of aisle containment, and the reality of server airflow leakage that results in bypass air that is at the heart of the potential inefficiencies that may be found. Methods of eliminating this bypass air are presented.

1. Ramification of Aisle Containment and Server Airflow Design In New and Existing Data Centers

Daniel B. Kennedy, Associate Member, Tate Inc, Jessup, MD

Seminar 33 (Intermediate)

Review of the Updated AHRI Standards 260 and 880

Track: HVAC&R Systems & Equipment

Room: 007C

Sponsor: 02.06 Sound and Vibration Control

Chair: Chris Papadimos, Member, Papadimos Group, San Francisco, CA

More than ever the need for valid sound data for ducted equipment and air terminals is required to be subsequently used in accurately predicting sound levels inside the building and developing appropriate sound treatment options that have direct bearing on costs. This session discusses at length the recently updated AHRI Standards 260 and 880 for testing and rating ducted air handling equipment and air terminals, respectively.

1. Update On AHRI Standard 260, Sound Rating of Ducted Equipment

Curt Eichelberger, P.E., Member, Johnson Controls, York, PA

2. Consequences of Recent Updates to AHRI Standard 880 Performance Rating of Air Terminals

Patrick Oliver, P.Eng., Member, E.H. Price, Ltd., Winnipeg, MB, Canada

Seminar 34 (Intermediate)

Update on Evaporative Cooling Technologies: Simple Keeps Getting Better

Track: HVAC&R Fundamentals and Applications

Room: 103B

Sponsor: 05.07 Evaporative Cooling

Chair: Leon Shapiro, J.D., Member, VRTX Technologies, Oak Park, CA

Evaporative cooling technologies have been successfully utilized for years to provide energy efficient cooling. Advances in the design of indirect evaporative cooling equipment allow for hybrid systems that improve efficiencies and indoor air quality. This program provides insights in their use in high performance and sustainable data centers and big box retail buildings.

1. Indirect Evaporative Cooling Offers Advantages for Data Center Recovery from Power Interruption

Nicholas H. DesChamps, Ph.D., P.E., Fellow Life Member, eForay Consulting LLC, Las Vegas, NV

2. Field Results for Retrofit Hybridization of High Performance Evaporative Cooling In Big Box Retail

Steve Slayzak, Associate Member, Colorado Corporation, Denver, CO

Forum 3 (Basic)

How Could the Service Water Heating Handbook Chapter Better Assist You?

Track: HVAC&R Fundamentals and Applications

Room: 007B

Sponsor: 06.06 Service Water Heating Systems

Chair: Amin Delagah, Associate Member, PG&E Food Service Technology Center, San Ramon, CA; Jim Lutz, Ph.D., Member, Lawrence Berkeley National Laboratory, Berkeley, CA

The water heater is the last major energy using appliance to be examined by energy efficiency professionals. Hot water systems have been evolving in the last five years, with many new water heating products and distribution systems architectures introduced. Research of domestic hot water systems has gained steam and there has been great emphasis to reduce the hot water use of fixtures and equipment. Unfortunately, some of the reference documents that support several key sections of the current Service Water Heating chapter are outdated, dating back to 1969 for commercial and 1985 for residential facilities. This forum is an opportunity for the Society to help build a roadmap

for updating Chapter 50 of the HVAC Applications Handbook.

Forum 4 (Intermediate)

Optimum Design Verification: Is It Really Optimum?

Track: Building Modeling Applications

Room: 007D

Sponsor: TG1 Optimization

Chair: Stephen J. Treado, Ph.D., P.E., Member, The Pennsylvania State University, University Park, PA

Optimization is frequently misused and misunderstood. Part of the reason is that optimization means different things to different people, ranging from a general assessment to a rigorous mathematical procedure. When applied to the design process, optimization may require certain idealizations and assumptions in the modeling process to facilitate a timely solution or to account for unknown parameters. As a result, there exists lingering questions regarding the accuracy or realism of the optimization results. The purpose of this forum is to provide an opportunity for designers to discuss their use of optimization and their experiences with verifying their results, and identify needs for optimum design verification.

Monday

June 25, 2012

2:15 p.m.–3:15 p.m.

Seminar 35 (Intermediate)

Integrating Design, Commissioning and BMS Controls to Deliver Mission Critical Success

Track: Integrated Building Controls

Room: 007D

Sponsor: 07.09 Building Commissioning

Chair: Gerald J. Kettler, P.E., Life Member, AIR Engineering and Testing, Carrollton, TX

Mission critical facilities require a unique holistic approach to design, controls and commissioning to ensure maximum system reliability. Going beyond the traditional approach and establishing a more unified automation project team provides the best opportunity to meet the client owner's project requirements (OPR) while minimizing total cost of ownership (TCO). Integration of these critical project team members throughout all project phases from planning through operations is critical to optimizing a facility that is reliable and easy to own and operate. Best

practices at various stages are explored including ways to setup projects for success. Case studies are presented providing lessons learned that have helped develop and improve this non-traditional approach.

1. Mechanical System Commissioning of Mission Critical Facilities

Justin Seter, Member, DLB Associates, Atlanta, GA

2. Controls and Automation for the Commissioning Process

Sean Graham, P.E., Member, DLB Associates, Atlanta, GA

Monday

June 25, 2012

3:30 p.m.–4:30 p.m.

Seminar 36 (Intermediate)

Control Specification Fundamentals: How to Get What You Really Want

Track: Integrated Building Controls

Room: 007D

Sponsor: 01.04 Control Theory and Application

Chair: Larry J. Fisher, Member, ECT Services, Louisville, KY

Over the past 30 years controls have advanced from nearly 100% pneumatic controls (which were interoperable), to proprietary DDC controls, to the current day of integrated building systems that use open protocols (BACnet, LON, MODBUS). This has presented a challenge to the engineering community. Specifications today must not only address factory and field mounted control systems; they must provide sequences of operation for traditional HVAC systems, new green technologies, building energy use optimization, and predictive control strategies; they must specify graphical user interfaces, including dashboards and educational kiosks; they must address network communication and response speeds; and they must span the specification sections within the plan and spec documents that include the building systems integrated into the building automation system.

1. Controls Specification 101

Chariti Young, Member, Automated Logic Corp., Kennesaw, GA

2. DDC: How to Get What You Really Want?

Frank Shadpour, P.E., Fellow ASHRAE, SC Engineers, Inc., San Diego, CA

Tuesday
June 26, 2012
8:00 a.m.–9:30 a.m.

Technical Paper Session 4
(Intermediate)

Improvements in HVAC System Efficiency

Track: HVAC&R Fundamentals and Applications

Room: 007B

Chair: Dharam V. Punwani, Avalon Consulting, Naperville, IL

1. Short-Term Curtailment of HVAC Loads in Buildings (1390-RP) (SA-12-012)

lixing Gu, Ph.D., P.E., Member and Richard Raustad, Florida Solar Energy Center, Cocoa, FL

2. Development of a Tool to Improve the Energy Efficiency of Existing Commercial and Institutional Buildings (SA-12-013)

Angela Lewis, P.E., Student Member, University of Reading, Alexandria, VA

3. Laboratory Testing of a Fabric Air Dispersion System (SA-12-014)

Stephen A. Idem, Ph.D.1, D. Kulkarni1, Ananth Nalla2 and Kevin J. Gebke, Member3, (1)Tennessee Tech University, Cookeville, TN, (2)Mechanical Engineering, Tennessee Tech University, Cookeville, TN, (3)DuctSox Corporation, Peosta, IA

4. Ventilation Requirements for Refrigerating Machinery Rooms (1448-RP) (SA-12-015)

Scot Waye, Ph.D., P.E., Member, Ronald Petersen, Ph.D., Member and Anke Beyer-Lout, CPP Inc., Fort Collins, CO

Seminar 37 (Intermediate)

Commissioning of Under Floor Air Distribution Systems

Track: HVAC&R Systems & Equipment
Room: 103B

Sponsor: TRG7 Underfloor Air Distribution, 05.03 Room Air Distribution

Chair: Michael McQueeney, P.E., Member, AirFixture, Kansas City, KS

Presenters cover the differences in commissioning (Cx), troubleshooting, testing and balancing underfloor air distribution (UFAD) systems as compared to traditional ducted systems. Presentation content includes the idiosyncrasies associated with UFAD that engineers, contractors and operators need to be aware of so that obstacles to a successfully operating system can be avoided. The audience will learn how to obtain the IAQ,

energy and cost saving benefits associated with UFAD through the use of proper Cx techniques. Real examples of successes and lessons learned will be used throughout the session including data collected to demonstrate compliance of system operation and performance. The seminar also highlights typical misunderstandings and misconceptions of UFAD operation and the resolutions developed during design, construction, and operation of UFAD systems.

1. Design Phase Commissioning of Under Floor Air Distribution Systems

Dennis Jones, P.E., Member, GROUP14 ENGINEERING, INC., Denver, CO

2. UFAD System Forensics and Troubleshooting Challenges

Jim Megerson, P.E., Member, Aviations & Facilities, M.E. GROUP, Overland Park, KS

3. Proper Testing and Balancing of UFAD Systems

Donald Hill, P.E., Member, Accutec Service, Inc., Lee's Summit, MO

Seminar 38 (Intermediate)

Case Studies In Engineering Ethics, Part 1

Track: HVAC&R Fundamentals and Applications

Room: 007C

Sponsor: 01.07 Business, Management & General Legal Education

Chair: Michael Connor, P.E., Member, Connor Engineering Solutions, Alpharetta, GA

This is an interactive session where participants will breakup into small groups and discuss an ethics case adjudicated by the NSPE. Test your ethics IQ against an actual case decided by a board of your peers and obtain ethics continuing education credits in the process. Three cases are presented along with the final outcome.

1. Don't Burn the Fire Code!

Michael Bilderbeck, P.E., Member, Pickering, Inc., Memphis, TN

2. Trespassing On Intellectual Property

Warren Hahn, P.E., Member, Hahn Engineering, Tampa, FL

3. Rush to Judgment

Michael Connor, P.E., Member, Connor Engineering Solutions, Alpharetta, GA

Seminar 39 (Intermediate)

Indoor Moisture and Health: The Ins and Outs of the Wet and Dry, Part 1

Track: Indoor Environmental Applications

Room: 001A

Sponsor: Environmental Health Committee

Chair: Andrew Persily, Ph.D., Fellow ASHRAE, NIST, Gaithersburg, MD

Among the many indoor air quality issues faced by building designers, engineers and occupants, indoor moisture is one of the most important. While not a contaminant itself, excessive moisture levels increase the likelihood for microbial growth and the resulting health affects of allergy, asthma and other respiratory impacts. In addition, relative humidity is a key factor in determining occupant comfort, and there are significant questions as to the impacts of dry air on both health and comfort. This two part seminar will present the latest research findings on health effects associated with indoor moisture and provide practical perspective on how to better manage indoor moisture through design, operation and maintenance.

1. Indoor Moisture and Viruses: Will Damp Air Give You a Cold or Not?

Yuguo Li, Ph.D., Fellow ASHRAE, Hong Kong University, Hong Kong, China

2. Is There a Connection Between House Dust Mites and the Sensation of Dryness?

Jan Sundell, M.D., Fellow ASHRAE, Tsinghua University, Beijing, China

3. Indoor Moisture In ASHRAE Standards: What's a Designer to Do!

Andrew Persily, Ph.D., Fellow ASHRAE, NIST, Gaithersburg, MD

Seminar 40 (Intermediate)

Market Transformation of DCV Systems for Kitchen Ventilation

Track: Integrated Energy Systems

Room: 007A

Sponsor: 05.10 Kitchen Ventilation

Chair: Derek W. Schrock, Member, Halton Co., Scottsville, KY

Commercial kitchens have the largest energy intensity (usage per square foot) and can exceed any other building segment by an order of magnitude. Of the largest components of the energy use in a kitchen is the HVAC component which consists of the large exhaust hoods along with the energy required to treat the replacement air. By applying demand control ventilation (DCV) systems on the cooking equipment lineup with the exhaust hoods, large energy savings can be obtained. This seminar presents an overview of DCV systems, a case study of energy savings that can be obtained with DCV systems, a description of a field protocol for evaluating the performance of DCV systems, and field challenges that these systems encounter.

1. DCV Technologies for Commercial Kitchens: Past, Present and Future!

Don Fisher, Food Service Technology Center, San Ramon, CA

2. A Field Test Method to Determine the Performance of DCV Systems

Richard T. Swierczynna, Associate Member, Food Service Technology Center, San Ramon, CA

3. M & V for Kitchen Ventilation DCV Controls

Vernon A Smith, P.E., J.D., Associate Member, Smith Energy Engineers, Niwot, CO

4. Field Challenges with DCV Systems

Andrey Livchak, Ph.D.1 and Derek W. Schrock, Member2, (1)Halton Group Americas, Bowling Green, KY, (2)Halton Co., Scottsville, KY

Seminar 41 (Intermediate)

New Research In Ground Source Heat Pumps

Track: HVAC&R Systems & Equipment
Room: 007D

Sponsor: 08.04 Air-to-Refrigerant Heat Transfer Equipment, Publishing & Education Council

Chair: Reinhard Radermacher, Ph.D., Fellow ASHRAE, University of Maryland, College Park, MD

This session features two recently published papers on advances in heat transfer research, in ASHRAE's HVAC&R Research Journal. Ground coupled heat pumps are gaining considerable attention. To shed additional light on the challenges, opportunities and latest research for such systems, HVAC&R Research prepared a topical issue on these systems under the guidance of guest editors Jeff Spittler and Michel Bernier.

1. Multipole Method to Calculate Borehole Resistances In Borehole Heat Exchangers

Johan Claesson, Ph.D., Member1 and Göran Hellström, Ph.D., Member2, (1)Chalmers University of Technology, Gothenburg, Sweden, (2)Lund University, Lund, Sweden

2. New Analytical Solution for Sizing Vertical Borehole Ground Heat Exchangers In Environments with Significant Ground-water Flow: Parameter Estimation from Thermal Response Test Data

Andrew Chiasson, Ph.D., P.E., Member, University of Dayton, Dayton, OH

3. A Semi-Analytical Model for Serpentine Horizontal Ground Heat Exchangers

Mikael Philippe, Ph.D., Member1, Michel Bernier, Ph.D., Fellow ASHRAE2, Dominique Marchio, Ph.D.3 and Simon Lopez, Ph.D., Member1, (1)Bureau des Recherches Géologiques et Minières, Département Géothermie, Orléans, France, (2)Ecole Polytechnique De Montreal, Montreal, QC, Canada, (3)Mines ParisTech, Centre Energétique et Procédés, Paris, France

Seminar 42 (Intermediate)

Sustainable Chiller Plant Efficiency: GPC 22 In Application

Track: HVAC&R Systems & Equipment
Room: 001B

Sponsor: 08.02 Centrifugal Machines, 09.01 Large Building Air-Conditioning Systems

Chair: Ray Good, P.E., Associate Member, McQuay International, Staunton, VA

Monitoring the performance of chilled-water plants is of growing importance in these times of rising energy costs and increased environmental awareness. This session explores the role that ASHRAE Guideline 22-2008 can play in guiding the designer and end user to obtain better performance data for the purpose of monitoring the efficiency of chilled-water plants. First an overview of Guideline 22 is given with recommendations for its proper interpretation and application. Specific experiences and recommendations are shared from the perspectives of both a consultant and end user who have applied Guidelines 22 in real world situations.

1. Overview of Guideline 22

Mick Schwedler, P.E., Member, Trane, La Crosse, WI

2. Use and Specification of Guideline 22: A Consulting Engineer's Perspective

Stephen W. Duda, P.E., Member, Ross & Baruzzini, Inc., St. Louis, MO

3. Experiences Utilizing Guideline 22: A Facility Director's Perspective

John I. Vucci, Member, University of Maryland, College Park, MD

Seminar 43 (Intermediate)

Standard 62.1: Multiple-Zone Systems, Demand Control and Energy

Track: Indoor Environmental Applications

Room: 103A

Sponsor: 04.03 Ventilation Requirements and Infiltration

Chair: John J. Carter, Member, CPP, Inc., Fort Collins, CO

Standard 62.1-2010 has added additional requirements to the design of demand controlled ventilation. This seminar provides an update on the validity of the multiple-zone systems calculations, presents several different schemes for implementing demand control ventilation in these systems, and provides analysis of the potential for reducing energy consumption.

1. Experimental Validation of the Multiple Zones Procedure of ANSI/ASHRAE Standard 62.1

Grenville K. Yuill, Ph.D., Fellow Life Member, Retired – University of Nebraska – Lincoln, Placitas, NM

2. CO2-Based Demand Controlled Ventilation for Multiple Zone HVAC Systems

Josephine Lau, Ph.D., Associate Member, University of Nebraska – Lincoln, Omaha, NE

3. Standard 62.1: One Dynamic Reset Approach

Dennis Stanke, Member, Trane, La Crosse, WI

Tuesday

June 26, 2012

9:45 a.m.–10:45 a.m.

Conference Paper Session 9 (Basic)

Energy Modeling Basics

Track: Building Modeling Applications

Room: 103A

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

1. Energy Modeling Basics: A Brave New World for Young Building Modeling Professionals (SA-12-C022)

Jared A. Higgins, P.E., Member, Parkhill, Smith, & Cooper, Inc., Lubbock, TX

2. DOE Commercial Building Asset Rating: An Application of Centralized Modeling Tools (SA-12-C023)

Na Wang, Ph.D.1, Viraj Srivastava, Ph.D., Member1, Willy Gorrissen1 and Cody Taylor2, (1)Pacific Northwest National Laboratory, Richland, WA, (2)Department of Energy, Washington, DC

3. Calibration of a Building Energy Model Considering Parametric Uncertainty (SA-12-C024)

Zheng O'Neill, Ph.D., P.E., Member1, Bryan Eisenhower, Ph.D., Member2, Vladimir Fonoberov, Ph.D.3 and Trevor E. Bailey, Ph.D.1, (1)United Technologies Research Center, East Hartford, CT, (2)UCSB-Center for Energy Efficient Design, Santa Barbara, CA, (3)Aimdyn, Inc., Santa Barbara, CA

Seminar 44 (Intermediate)

Advances in Heat Transfer Research

Track: HVAC&R Systems & Equipment

Room: 007D

Sponsor: 08.04 Air-to-Refrigerant Heat Transfer Equipment, Publishing & Education Council

Chair: Reinhard Radermacher, Ph.D., Fellow ASHRAE, University of Maryland, College Park, MD

This session features three recently published papers on advances in heat transfer research in ASHRAE's HVAC&R Research Journal.

1. Model-Based Robust Temperature Control for VAV Air-Conditioning System
Gongsheng Huang, Ph.D., Member, Hong Kong Polytechnic University, Hong Kong, Hong Kong

2. Experimental Measurement And Numerical Simulation to Determine Characteristics of an Infrared Tube System
Samer Hassan, Ph.D., Member, Schwank Ltd., Ontario, ON, Canada

Seminar 45 (Intermediate)

Case Studies in Engineering Ethics II

Track: HVAC&R Fundamentals and Applications

Room: 007C

Sponsor: 01.07 Business, Management & General Legal Education

Chair: Michael Connor, P.E., Member, Connor Engineering Solutions, Alpharetta, GA

This is an interactive session where participants will breakup into small groups and discuss an ethics case adjudicated by the NSPE. Test your ethics IQ against an actual case decided by a board of your peers and obtain ethics continuing education credits in the process. Three cases are presented along with the final outcome.

1. In Plain Sight

Michael Bilderbeck, P.E., Member, Pickering, Inc., Memphis, TN

2. Thanks for the Help

Warren Hahn, P.E., Member, Hahn Engineering, Tampa, FL

Seminar 46 (Intermediate)

Energy Conservation and Fan Energy Efficiency Grade

Track: HVAC&R Systems & Equipment

Room: 103B

Sponsor: 05.01 Fans, 05.09 Enclosed Vehicular Facilities

Chair: Aresh Raychaudhuri, P.E., Member, US Dept. of Veterans Affairs, Washington, DC

Minimum fan efficiency grade is under consideration in several national standard. This seminar discusses the definition and meaning of fan energy efficiency grade. The impact of the efficiency grade on the fan selection and technologies also is discussed.

1. Fan Efficiency Grade Classification for Fans

Michael Brendel, Ph.D., Member, Lau Industries/Ruskin Company, Dayton, OH

2. Impact of Minimum Fan Efficiency Grade

John Cermak, Ph.D., Member, ACME Engineering & Manufacturing Corp., Tulsa, OK

Seminar 47 (Intermediate)

Indoor Moisture and Health: The Ins and Outs of the Wet and Dry, Part 2

Track: Indoor Environmental Applications

Room: 001A

Sponsor: Environmental Health Committee
Chair: Andrew Persily, Ph.D., Fellow ASHRAE, NIST, Gaithersburg, MD

Among the many indoor air quality issues faced by building designers, engineers and occupants, indoor moisture is one of the most important. While not a contaminant itself, excessive moisture levels increase the likelihood for microbial growth and the resulting health affects of allergy, asthma and other respiratory impacts. In addition, relative humidity is a key factor in determining occupant comfort, and there are significant questions as to the impacts of dry air on both health and comfort. This two part seminar will present the latest research findings on health effects associated with indoor moisture and provide practical perspective on how to better manage indoor moisture through design, operation and maintenance.

1. How Building Operators Avoid Soggy Facilities

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

2. Humidification Systems As Potential Sources of Indoor Contaminants

Wayne Thomann, Ph.D., Associate Member, Duke University/Medical Center, Durham, NC

3. ASHRAE's Newly Revised Position Document On Mold: What We Know and Don't Know about Mold In Buildings

Lew Harriman III, Fellow ASHRAE, Mason Grant, Portsmouth, NH

4. Moisture In Residences: From Wet Basements to Leaky Roofs

William B. Rose, Member, University of Illinois, Champaign, IL

Seminar 48 (Intermediate)

Variable Frequency Drive Performance: What Is It and How Does It Relate to AHRI 1210-2011?

Track: HVAC&R Systems & Equipment

Room: 001B

Sponsor: 01.11 Electric Motors and Motor Control

Chair: Derrick Vigil, Member, Baldor Electric Company, Greenville, SC

Variable frequency drive (VFD) usage is on the rise in HVAC&R systems. Can VFD performance have a significant effect on system performance? How would you know how your VFD performs? This seminar explores how VFD performance can effect system performance and provide an overview of AHRI Standard 1210-2011, Performance Rating of Variable Frequency Drives.

1. VFD Efficiency: Part-Load Variability and Effects On Air-Handling System Energy Consumption

Andrea Krukowski, Brown University/ Lawrence Berkeley National Laboratory, New York, NY

2. AHRI Standard 1210-2011, Performance Rating of Variable Frequency Drives

Rupal Choksi, Associate Member, AHRI, Arlington, VA

Forum 5 (Intermediate)

Safety Requirements for Class 2L Refrigerants

Track: Refrigeration Applications

Room: 007A

Sponsor: 03.01 Refrigerants and Secondary Coolants

Chair: Christopher Seeton, Ph.D., Member, Honeywell, Buffalo, NY

In 2010, ASHRAE Standard 34 added an optional subclass 2L to the existing Class 2 flammability classification of refrigerants. Subsequently Standard 34-2010 "addendum h" reclassified several refrigerants from Class 2 to Class 2L, including R-32, R-717, R-143a, & R-1234yf, and "addendum i" designated R-1234ze(E) as Class 2L. This forum discusses the approaches to development of safety requirements for Class 2L refrigerants, to define the safe use and application of HVAC&R equipment using these refrigerants. Standard 15-2010 currently defines safety requirements for Class 1, 2, and 3 refrigerants, pertaining to restrictions on refrigerant use, installation restrictions, design and construction of equipment and systems, and operation & testing. This forum will provide an opportunity for interested parties to discuss the appropriate use of Class 2L refrigerants.

Forum 6 (Intermediate)

Standards As They Relate to Cooling Tower Operations and Design: Too Much, Too Little, Or Just Right?

Track: HVAC&R Systems & Equipment

Room: 007B

Sponsor: 08.06 Cooling Towers and Evaporative Condensers

Chair: Frank Morrison, Member, Baltimore Aircoil Company, Baltimore, MD

ASHRAE Standards (such as Standards 90.1, 189.1, and proposed Standard 191) as well as State and local Standards (such as California's Title 24) have been used as an effective means to achieve greater energy and water efficiencies. Proposed revisions to some of these Standards seek to push efficiency requirements for many HVAC&R systems and equipment further still. This forum explores whether current Standards and proposed revisions do not do enough to maximize energy/water efficiencies; or do they go so far as to render some equipment non-competitive in the marketplace; or are they, as Goldilocks would say, "just right"?

Tuesday

June 26, 2012

11:00 a.m.–12:30 p.m.

Technical Paper Session 5 (Advanced)

Innovative Strategies to Improve Equipment Efficiency

Track: HVAC&R Systems & Equipment

Room: 007C

Chair: Jon J. Cohen, H-O-H Water Technology, Inc, Palatine, IL

1. Secondary Control Strategies for Cycling Air Conditioning and Refrigeration Systems (SA-12-016)

Bryan Rasmussen, Ph.D., Member¹ and Swarooph Seshadri², (1)Texas A&M University, College Station, TX, (2)The Mathworks Inc., MA

2. New Correlation Equations for Ammonia Water Vapor-Liquid Equilibrium (VLE) Thermodynamic Properties (SA-12-017)

Syed Said, M. A. El-Shaarawi, Ph.D. and Muhammad Umar Siddiqui, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia

3. Development of a High Efficiency Home Heating and Humidification Technology (SA-12-018)

Dexin Wang, Ph.D., Ainan Bao, Ph.D. and William Liss, Gas Technology Institute, Des Plaines, IL

4. Selection of Desiccant Equipment at Altitude (RP-1339) (SA-12-019)

Nelson Fumo, Ph.D., Member¹ and Pedro Mago, Ph.D., Member², (1)The University of Texas at Tyler, Tyler, TX, (2)Mississippi State University, Mississippi State, MS

Conference Paper Session 10 (Basic)

Optimizing Energy Modeling Strategies to Improve Energy Usage Forecasting

Track: Building Modeling Applications

Room: 001B

Chair: Michelle Contri, P.E., Member, DLB Associates, Eatontown, NJ

1. Use of Flexible Research Platforms (FRP) for BIM and Energy Modeling Research (SA-12-C025)

Piljae Im and Mahabir Bhandari, Member, Oak Ridge National Laboratory, Oak Ridge, TN

2. Using Measured Utility Data to Verify Energy Models (SA-12-C026)

Jared A. Higgins, P.E., Member, Stephen D. Foster and J. Ryan Bailey, Associate Member, Parkhill, Smith, & Cooper, Inc., Lubbock, TX

3. Investigating the Performance of Two Types of Solar Domestic Water Heating (SDWH) Systems with Drain Water Heat Recovery Through Computer Simulation and Experimental Analysis (SA-12-C027)

Kamyar Tanha, Student Member, Alan Fung and Wey Leong, Ph.D., Ryerson University, Toronto, ON, Canada

4. Decision Making for HVAC&R System Selection for a Typical Office Building in the UK (SA-12-C028)

Mehdi Shahrestani, Student Member, Runming Yao, Ph.D., Member and Geoffrey Cook, Ph.D., School of Construction Management and Engineering, University of Reading, Reading, United Kingdom

Seminar 49 (Intermediate)

Net Zero Energy with Large Radiant Surface Heat Exchangers

Track: HVAC&R Systems & Equipment

Room: 103A

Sponsor: 06.05 Radiant Heating and Cooling

Chair: Devin A. Abellon, P.E., Member, Uponor, Phoenix, AZ

Radiant heating and cooling systems, utilizing "low temperature heating and high temperature cooling" allow system components, such as chillers, boilers, heat pumps and renewable sources, to operate within their maximum engineered performance range. This seminar covers design and control strategies for embedded-tube radiant-based HVAC systems for maximum energy efficiency and enhanced thermal human comfort. A case study of an ambitious project in San Francisco, California will illustrate how radiant based systems can be used as part of an energy efficient design solution on a projected LEED Platinum, Net-Zero project.

1. Designing for Net-Zero Energy Usage Using Radiant-Based Heating and Cooling Systems

Peter Simmonds, Ph.D., Fellow Member, IBE Consulting Engineers, Sherman Oaks, CA

2. Simplified Control and Piping Options for Low Temperature Heating with High Temperature Cooling

Robert Bean, Healthy Heating, Calgary, AB, Canada

3. Case Study: Exploratorium Museum San Francisco

Peter H. Rumsey, Member, Rumsey Engineers, Inc, Oakland, CA

Seminar 50 (Advanced)

Design, Performance and Efficiency Impact of Low-GWP Refrigerants on Systems and Components

Track: HVAC&R Systems & Equipment

Room: 007D

Sponsor: 03.01 Refrigerants and Secondary Coolants, TC 8.01 Positive Displacement

Compressors, 10.07 Commercial Food and Beverage Cooling Display and Storage

Chair: Georgi S. Kazachki, Ph.D., Fellow ASHRAE, DRS Technologies, Florence, KY

The properties of the Low-GWP refrigerants are in most cases different from the properties of refrigerants to be replaced. These differences have an impact on the design, performance and efficiency of the systems and their components. The purpose of the session is to explain and illustrate the evolution of the design process around the specific properties of the Low-GWP refrigerants that are already in an advanced stage of development.

1. Advances in Low-GWP Refrigerants for Stationary Systems

Brett L. Van Horn, Ph.D., Member, Arkema, King of Prussia, PA

2. Analysis of Low-GWP Refrigerants in Existing Compressor Technologies for Refrigeration Systems

Samuel Yana Motta, P.Eng., Member, Honeywell - Buffalo Research Laboratory, Buffalo, NY

3. Transient Performance Evaluation of Automotive Secondary Loop Systems with Low-GWP Fluids

Yunho Hwang, Ph.D., Member, University of Maryland, College Park, MD

4. Prospective of Low-GWP Refrigerants

J. Steven Brown, Ph.D., Member, The Catholic University of America, Washington, DC

Seminar 51 (Basic)

Existing Building Commissioning Process: Best Practices

Track: HVAC&R Fundamentals and Applications

Room: 103B

Sponsor: 07.09 Building Commissioning

Chair: Mark "Dusty" Wheeler Jr., Member, Honeywell, Washington, DC

This session outlines the activities involved in performing the Existing Building Commissioning Process (EBCxP) by presenting best practices according to ASHRAE Guidelines as well as case studies.

1. Existing Building Commissioning Process (EBCxP): Best Practices

Bill Dean, National Research Council of Canada, Saskatoon, SK, Canada

2. Existing Building Commissioning (EBCx): Case Studies

Holly Townes, P.E., Member, Puget Sound Energy, Bellevue, WA

3. On-Going Commissioning for Existing Buildings: Case Studies

David E. Claridge, Ph.D., P.E., Fellow ASHRAE, Texas A & M University, College Station, TX

Seminar 52 (Basic)

Federal, State and Local Grassroots Engagement: How Helping ASHRAE Helps You

Track: HVAC&R Fundamentals and Applications

Room: 007A

Sponsor: Advocacy Committee

Chair: Mark Wills, ASHRAE, Washington, DC

Federal, state, and local governments propose thousands of ordinances, regulations, and bills each year on building codes and standards; engineering licensure; sustainable buildings; and many other issues impacting ASHRAE members' work. Consequently, member involvement in the policy process is crucial to achieving the Society's overarching mission and goals. This session addresses the current status of key policy initiatives, and provides members guidance for effectively combining technical expertise with policymaking opportunities to become a more effective advocate for themselves, the Society, chapters, and the profession, thus enabling them to become a more "complete" ASHRAE member.

1. State and Local Energy Codes: Development, Adoption, Implementation and Compliance

Maureen Guttman, Building Codes Assistance Project, Washington, DC

2. Challenges to Engineer Licensure

Richard B. Hayter, Ph.D., P.E., Kansas State University, Manhattan, KS

3. Key ASHRAE Issues and Priorities In Congress and Federal Agencies

Mark R. Ames, ASHRAE, Washington, DC

Seminar 53 (Intermediate)

Green Building Energy Performance Pathways and Evaluation Approaches

Track: Integrated Energy Systems

Room: 001A

Sponsor: 02.08 Building Environmental Impacts and Sustainability, 07.06 Building Energy Performance

Chair: David Ellis, P.E., Member, HDR Architecture Inc., Alexandria, VA

Several government and private sector organizations, including ASHRAE, publish model codes, standards, and guidelines for use in the U.S. as well as other countries. These documents address the design, construction, commissioning, and operation of green buildings and are intended for voluntary as well as mandatory adoption. This seminar will describe different approaches used in model codes and standards to determine and compare the energy and environmental performance of new green buildings

as well as existing buildings that are renovated and desire to be considered green. Site energy, energy cost, primary energy, and greenhouse gas emissions calculation options will be discussed. Pathways to implement these methods will also be identified, including mandatory, prescriptive, and performance pathways, as well as an outcome-based pathway. Major distinctions among approaches and pathways will be illustrated, as well as the benefits and challenges of the different options.

1. ASHRAE Standard 189.1 and bEQ Baseline Energy Performance Calculations

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

2. 2012 International Green Construction Code Energy Performance Methodology

R. Christopher Mathis, Member, MC2 Mathis Consulting Company, Asheville, NC

3. Outcome-Based Energy Compliance Pathway for Green Building Designs

David Conover, Member, Pacific Northwest National Laboratory, Washington, DC

Seminar 54 (Intermediate)

How to Efficiently Serve Low Dewpoint Applications

Track: HVAC&R Fundamentals and Applications

Room: 007B

Sponsor: 08.12 Desiccant Dehumidification Equipment and Components

Chair: Andrew Lowenstein, Ph.D., Member, AIL Research, Inc., Princeton, NJ

The supply of low dewpoint air often is essential to the successful functioning of a building or industrial process. Supplying air at dewpoints below 40F can be particularly challenging. This seminar will present case studies where desiccant systems successfully served applications that demanded air with dewpoints below 40F and as low as -55F. The potential for energy savings will be highlighted.

1. Desiccants for Low Dewpoint In Hospital and Archival Applications

Scott McGinnis, Member, Munters Corporation, Selma, TX

2. Minimize Cooling System Refrigerant Charge Using Liquid Desiccant Dehumidification/Cooling Equipment

Michael Harvey, Kathabar Dehumidification Systems Div. of Niagara Blower Company, Buffalo, NY

3. Keeping Dewpoints Low In Supermarkets - Costs and Savings

Jeffrey Halley, J & J Mechanical, Brea, CA

4. Application of Desiccant Dehumidification to a Foundry

Chris Bogart, BRY Air, Sunbury, OH

Tuesday

June 26, 2012

5:30 p.m.–6:30 p.m.

Forum (Intermediate)

Comparing HVAC Efficiency: Why Ground Source Heat Pump Systems Are Superior

Track: HVAC&R Systems & Equipment

Room: 001B

Sponsor: 06.08 Geothermal Heat Pumps and Energy Recovery Applications

Chair: Keith Swilley, Member, Gulf Power Company, Pensacola, FL

OPEN SESSION: no badge required; no PDHs awarded; presented during the TC's meeting. Make no mistake, when you need space conditioning the most, part load or full load, ground source heat pumps provide the overall best efficiency. Metered and manufacturer data will be shared comparing different types of mechanical equipment to ground source heat pump equipment and their system efficiencies.

Wednesday

June 27, 2012

8:00 a.m.–9:30 a.m.

Technical Paper Session 6 (Advanced)

Improvements in Building Thermal Performance

Track: HVAC&R Fundamentals and Applications

Room: 007B

Chair: Charles E. Henck, Whitman, Requardt & Associates LLP, Baltimore, MD

1. Thermal Performance and Charge Control Strategy of a Ventilated Concrete Slab (VCS) with Active Cooling Using Outdoor Air (SA-12-020)

Yuxiang Chen, Student Member1, Andreas Athienitis, Ph.D., P.E., Member2 and Khaled Galal, Ph.D., P.E.3, (1)Concordia University, Montreal, ON, Canada, (2)Concordia University, West Montreal, QC, Canada, (3)Concordia University, Montreal, QC, Canada

2. Thermal Performance of Building Envelope Details for Mid- and High-Rise Buildings (1365-RP) (SA-12-021)

Patrick Roppel, P.Eng., Mark Lawton, P.Eng., Member and Neil Norris, Morrison Hershfield, Vancouver, BC, Canada

3. Parametric Investigation of PCM Thermal Properties on Energy Demand and Temperature of Buildings in Toronto (SA-12-022)

M. Ebrahim Poulad, Student Member and Alan Fung, Ryerson University, Toronto, ON, Canada

Technical Paper Session 7 (Advanced)

Modeling Indoor Thermal Performance

Track: Building Modeling Applications

Room: 007C

Chair: Michael Meteyer, P.E., Member, Cogdell Spencer ERDMAN, Madison, WI

1. Field Measurements of Thermal Conditions During Surgical Procedures for the Development of CFD Boundary Conditions (SA-12-023)

John Zhai, Ph.D., Member1, James S. McNeill, Student Member1 and Jean Hertzberg, Ph.D.1, (1)University of Colorado, Boulder, CO

2. Modeling Phase Change Materials with a Building Simulation Code Developed in MATLAB (SA-12-024)

Dahai Zhang, Student Member1, Alan Fung1, Fabio Almeida, Ph.D., Student Member1 and Sridhar Sadasivam, Ph.D.2, (1)Ryerson University, Toronto, ON, Canada, (2)Purdue University, West Lafayette, IN

3. Occupancy Simulation in Three Residential Research Houses (SA-12-025)

Philip R. Boudreaux, Anthony C. Gehl and Jeffrey E. Christian, Associate Member, Oak Ridge National Laboratory, Oak Ridge, TN

Conference Paper Session 11 (Intermediate)

Optimizing HVAC System Performance

Track: HVAC&R Systems & Equipment

Room: 007A

Chair: Henry A. Becker, Member, H-O-H Water Technology, Inc, Palatine, IL

1. Laboratory Evaluation of Aftermarket Boiler Control Systems (SA-12-C029)

Patricia F. Rowley1 and Paul Glanville, P.E., Associate Member1, (1)Gas Technology Institute, Des Plaines, IL

2. Using Steady State Predictions to Improve the Transient Response of a Water to Air Heat Exchanger (SA-12-C030)

David A. Hodgson, Ph.D., Member1, Peter M. Young, Ph.D.2, Charles W. Anderson, Ph.D.2, Douglas C. Hittle, Ph.D.2, William S. Duff, Ph.D.2 and Daniel B. Olsen, Ph.D.2, (1)Union College, Schenectady, NY, (2)Colorado State University, Fort Collins, CO

3. A High-Efficiency, Reduced-Emissions Combustion Control System for Commercial and Industrial Boilers (SA-12-C031)

Guido Poncia, Ph.D.1, Christoph Haugstetter1, David Liscinsky1, Junqiang

Fan, Ph.D.1, Joseph Mantese, Ph.D.1, Meredith Colket, Ph.D.1, Heidi Hollick1, Ricardo Garvey1, Kenneth Swanson2, Mike McCarron2, Alan Bukofske2, Duffy Parlett2 and Mauro Atalla, Ph.D.1, (1)United Technologies Research Center, East Hartford, CT, (2)Fireye Inc., Derry, NH

4. Hybrid Solar Thermal and Ground Source Heat Pump System (SA-12-C032)

Farzin Rad, P.Eng., Member, Alan S. Fung, Dr.Eng., P.Eng., Member and Wey H.Leong, Dr.Eng., P.Eng., Member, Ryerson University, Toronto, ON, Canada

Seminar 55 (Intermediate)

bEQ In Operation Rating: An Overview

Track: Integrated Energy Systems

Room: 001A

Sponsor: bEQ Committee

Chair: Amy Musser, Ph.D., P.E., Member, Vandemusser Design, PLLC, Asheville, NC

This seminar provides an overview of the bEQ In Operation building rating overview, describing what is involved in the rating and the how the rating is conducted. Also, it addresses the BEAP certification and energy auditing, which will cover the basics of getting certified, explaining why and how an auditor would become a certified BEAP. Ways to use certification to enhance your consulting business and market your company's services will be discussed. Finally, a review of an applied Building Energy Assessment answers questions, such as what is required for building energy assessment and how is it applied in the field and why does assessment go beyond energy and look at other aspects of the building?

1. bEQ In Operation Rating

Thomas H. Phoenix, SPC, Greensboro, NC

2. BEAP Certification and Energy Auditing

John Dunlap, Dunlap and Partners, Richmond, VA

3. Applied Building Energy Assessment

Hoy R. Bohanon, P.E., Member, Working Buildings, Winston-Salem, NC

Seminar 56 (Intermediate)

How Air Filter Selection Affects Energy Consumption

Track: Indoor Environmental Applications

Room: 007D

Sponsor: 02.04 Particulate Air Contaminants and Particulate Contaminant Removal Equipment

Chair: Philip Winters, P.E., Member, Filtration Group, Joliet, IL

Approximately half of all energy consumed in commercial and residential buildings is used for the HVAC systems and a significant contributor to that energy consumption is the fan power required to move air throughout the building. Air filters create resistance to that air flow and as a result,

contribute to the energy consumption. However, air filters play a critical role in keeping the HVAC system clean and contribute to good IAQ within the occupied spaces. This seminar combines the lessons from recent ASHRAE-funded research with other emerging research to help building owners and operators understand the role that air filter pressure drop plays in building energy consumption.

1. Energy Implications of Residential HVAC Filters

Jeffrey Siegel, Ph.D., Member, University of Texas, Austin, TX

2. Filter Pressure Drop Matters: Results of Field Reductions In Static Pressure On Air Conditioner Performance

John Proctor, P.E., Proctor Engineering, San Rafael, CA

3. Selecting Air Filters with Lowest Life Cycle Cost Using Field Measurements of Air Filter Performance and Fan Energy Measurements

Donald D. Thornburg, Member, Camfil-Farr, Riverdale, NJ

Seminar 57 (Basic)

Methods and Tools to Support the Modeling Process

Track: Building Modeling Applications

Room: 103B

Sponsor: 04.07 Energy Calculations

Chair: Amir Roth, United States Department of Energy, Washington, D.C.

Today's burgeoning market for building energy modeling services presents great opportunities and challenges for practitioners. Challenges exist due to the expansive knowledge required to deliver services, the lack of standardized methods and the absence of building energy modeling (BEM) tools that support the modeling process. This session reviews key BEM tasks and identifies those that would benefit from being automated in software tools. The session provides examples of practical user-developed BEM tools that support delivering and streamlining services. It introduces efforts to develop modular, standardized whole-building simulation components, automated workflow procedures and an open source energy modeling platform.

1. Supporting the Modeling Process

Ellen Franconi, Rocky Mountain Institute, Boulder, CO

2. Supporting BEM: The Practitioner Perspective

Kate Turpin, P.E., Member, SERA Architects, Portland, OR

3. Supporting BEM: The "Technicians" Perspective

Jesse Dean, National Renewable Energy Laboratory, Golden, CO

Seminar 58 (Intermediate)

Mold, Moisture, and Damp Buildings: New Understanding and Guidelines for Reducing the Health Effects

Track: Indoor Environmental Applications

Room: 103A

Sponsor: 01.12 Moisture Management in Buildings, TC 8.10, TC 8.12, and SSPC 62.1

Chair: Steve Cornick, Member, National Research Council Canada, Ottawa, ON, Canada

For years, damp buildings were thought to generate negative health effects. Until recently, the magnitude of health effects has not been quantified. The mechanisms which lead to negative effects were not understood. Research advances have provided a clearer path towards understanding what levels of dampness are problematic, what the specific links are between asthma and dampness, and what strategies are effective in reducing moisture accumulation. The presentations describe results of research as well as new guidance for architects, mechanical system designers and owners. The information is also of interest to occupants of buildings which are perceived to be damp.

1. The Revised ASHRAE Position Document On Indoor Mold and Moisture Management

Lew Harriman III, Fellow ASHRAE, Mason Grant, Portsmouth, NH

2. Observations and Recommendations Based On NIOSH Investigations of Damp Buildings and Their Health Effects

Jean Cox-Ganser, Ph.D. and Kay Kreiss, M.D., CDC-NIOSH, Morgantown, WV

3. New U.S. EPA Guidelines for Moisture Management In Buildings

Terry Brennan, Camroden Associate, Westmoreland, NY

Seminar 59 (Intermediate)

The Effect of the Outdoor Environment on Indoor Environment Modeling

Track: Indoor Environmental Applications

Room: 001B

Sponsor: 04.10 Indoor Environmental Modeling

Chair: James VanGilder, P.E., Member, APC by Schneider Electric, Billerica, MA

While it is common practice to represent the effects of the outside world simplistically when performing an indoor environment analysis, this approach may not always yield realistic predictions. This seminar considers the coupled nature of the indoor and outdoor environments with examples including indoor CO exposure rates from outside generators. Concepts discussed here are directly applicable to the design of high-performance,

energy-efficient buildings which utilize natural ventilation.

1. How to Define Flow Boundary Conditions for Natural Ventilation Through Large Openings by CFD

Qingyan Chen, Ph.D., Purdue University, West Lafayette, IN

2. Wind Driven Natural Ventilation When There Are No Windward Openings

David Banks, Ph.D., Member, CPP Wind Engineering and Air Quality Consultants, Ft. Collins, CO

3. Impact of Indoor Buoyancy On Outdoor Wind Driven Natural Ventilation

Atila Novoselac, Ph.D., Associate, University of Texas at Austin, Austin, TX

4. Modeling the Effects of Outdoor Gasoline Powered Generator Use On Indoor Carbon Monoxide Exposures

Liangzhu (Leon) Wang¹ and Steven Emm-erich, Member², (1)Concordia University, Montreal, QC, Canada, (2)National Institute of Standards and Technology, Gaithersburg, MD

Wednesday

June 27, 2012

9:45 a.m.–10:45 a.m.

Technical Paper Session 8 (Advanced)

Study the Degradation of Typical HVAC Materials, Filters and Components Irradiated by UVC Energy

Track: HVAC&R Systems & Equipment

Room: 007A

Chair: Richard L. Vincent, Member, Mount Sinai School of Medicine, New York, NY

1. Study the Degradation of Typical HVAC Materials, Filters, and Components Irradiated by UVC Energy. Part I. Literature Search (1509-RP) (SA-12-026)

Robert E. Kauffman, Ph.D., University of Dayton Research Institute, Dayton, OH

2. Study the Degradation of Typical HVAC Materials, Filters, and Components Irradiated by UVC Energy. Part II. Polymers (1509-RP) (SA-12-027)

Robert E. Kauffman, Ph.D. and J. Douglas Wolf, University of Dayton Research Institute, Dayton, OH

Technical Paper Session 9 (Advanced)

Design Applications for High Performing Buildings

Track: Integrated Energy Systems

Room: 001A

Chair: Mike McDermott, Member, Grumman Butkus Associates, Evanston, IL

1. Design of Roofs for Increased Solar Potential of BIPVT Systems and their Applications to Housing Units (SA-12-028)

Caroline Hachem, Ph.D., Student Member, Andreas Athienitis, Ph.D., P.E., Member and Paul Fazio, Ph.D., P.Eng., Member, Concordia University, West Montreal, QC, Canada

2. Achieving Net-Zero Energy Conditions in Retrofit: A Case Study for a Performance Arts Building Using an Hourly Simulation Approach (SA-12-029)

Dr. Cenk Cy Yavuzturk, Ph.D., SBA Member¹, J.E. Fuller² and Dennis J. O'Connor, Student Member³, (1)Mechanical Engineering Dept, University of Hartford, West Hartford, CT, (2)University of Hartford, West Hartford, CT, (3)University of Hartford, Hartford, CT

Technical Paper Session 10 (Intermediate)

Commission and Calibration of HVAC Systems to Improve Efficiency

Track: HVAC&R Fundamentals and Applications

Room: 001B

Chair: Charles E. Henck, Whitman, Requardt & Associates LLP, Baltimore, MD

This session will present a case study of energy saving opportunities implemented in an existing building and then commissioning the systems to perform at their optimal levels. A savings for over \$500,000 was realized with the improvements which is a 15% electrical reduction and a 7% gas reduction. The second paper will present a methodology to calibrate the multi-zone model CONTAM to two buildings. An air flow sensitivity analysis identifies influential systems and a tracer gas analysis identifies macro zones which are used to tune the model parameters.

1. HVAC Systems Commissioning in a Manufacturing Plant (SA-12-030)

Yunhua Li, Student Member¹, Bei Zhang, Student Member¹, Mingsheng Liu, Ph.D., P.E., Member², Lixia Wu, Ph.D., Member³, Jinrong Wang, Member⁴ and Tom Lewis, Member⁴, (1)University of Nebraska-Lincoln, Lincoln, NE, (2)DTL Controls, LLC, Omaha, NE, (3)Bes-Tech, Inc., Philadelphia, PA, (4)Omaha Public Power District, Omaha, NE

2. Investigation of CO₂ Tracer Gas-Based Calibration of Multi-Zone Airflow Models (SA-12-031)

T. Agami Reddy, Ph.D., P.E., Fellow ASHRAE¹, Steven Synder, Associate Member² and William P. Bahnfleth, Ph.D., P.E., Fellow ASHRAE³, (1)The Design School The School of Sustainability, Tempe, AZ, (2)Johnson Controls Inc., Philadelphia, PA, (3)Pennsylvania State University, University Park, PA

Seminar 60 (Intermediate)

Datacom Space Technology Advances; From Containment Fire Protection to Oil Immersion Cooling

Track: HVAC&R Fundamentals and Applications

Room: 103A

Sponsor: 09.09 Mission Critical Facilities, Technology Spaces and Electronic Equipment

Chair: Michael K. Patterson, Ph.D., P.E., Member, Intel Corp., Dupont, WA

IT equipment and facilities are in a constant state of technology advancement; from airflow management to alternative cooling, such as oil immersion cooling. This seminar covers specific topics supporting these advances. Airflow containment is now commonly used in the datacom space to improve airflow management, helping drive energy efficiency improvements. One of the main challenges in containment implementation is fire protection design. This is covered in the first presentation. In the second, a side-by-side evaluation of air and oil immersion cooling is presented. Energy and thermal performance is shared from identical racks of IT equipment across a range of workloads.

1. Datacom Aisle Containment Systems and Associated Fire Protection Requirements

David Quirk, P.E., Member, Verizon Wireless, Basking Ridge, NJ

2. Oil Immersion Cooling and Reductions in Data Center Energy Use

Michael K. Patterson, Ph.D., P.E., Member1 and Christiaan Best2, (1)Intel Corp., Dupont, WA, (2)Green Revolution Cooling, Austin, TX

Seminar 61 (Intermediate)

Next Generation of Heat Exchangers and Energy Systems with Sustainability in Mind

Track: HVAC&R Systems & Equipment

Room: 103B

Sponsor: 01.03 Heat Transfer and Fluid Flow, 08.05 Liquid-to-Refrigerant Heat Exchangers

Chair: Amir Jokar, Ph.D., P.E., Member, Exponent Inc. Thermal Sciences Practice, Los Angeles, CA

Design, optimization and maintenance of micro/mini-channel compact heat exchangers are critical in energy efficiency of HVAC&R systems. This seminar discusses new technologies for heat exchangers that aim to significantly improve energy efficiencies while preserving economic and environmental sustainability of the systems. These topics are critical to current and future ASHRAE research, as indicated in the ASHRAE 2010-2015 strategic plans. TC 1.3 and TC 8.5 have sponsored and monitored several ASHRAE funded research projects related to the topics presented in this semi-

nar for the last five years. The seminar assists engineers, practitioners, and operators in the design and operation of this type of equipment.

1. Energy Efficiency and Heat Exchanger Compaction with the Next Generation Micro Channel Heat Exchangers

Michael M. Ohadi, Ph.D., Fellow ASHRAE, University of Maryland, College Park, MD

2. Ammonia/Carbon Dioxide Cascade Condensers Using Plate Exchangers

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

Seminar 62 (Intermediate)

Smart Grid in Texas, What's Happening?

Track: Integrated Energy Systems

Room: 007D

Sponsor: 07.05 Smart Building Systems

Chair: Joshua D. Rhodes, Student Member, The University of Texas at Austin, Austin, TX

The current energy grid is antiquated and is losing the ability to meet the demand required of it. To meet rapidly growing demand, the current grid is being modernized not only with the capacity to move more resources, but to do so in a smarter way. This Grid 2.0, or Smart Grid is evolving to not only move more energy and water, but to move information as well. This track discusses the development and build-out of smart grid infrastructure in Texas.

1. Making the "Smart Grid" a "Green Grid"

Colin Meehan, Environmental Defense Fund, Austin, TX

2. The Pecan Street Smart Grid Demonstration Project

Chris Holcomb, Pecan Street, Austin, TX

Forum 7 (Intermediate)

Accurately and Correctly Modeling Air-to-Air Energy Recovery Technologies

Track: Building Modeling Applications

Room: 007C

Sponsor: 05.05 Air-to-Air Energy Recovery

Chair: Carol E. Marriott, P.Eng., Member, Carol Marriott Consulting, Maple Grove, MN

To help determine and isolate issues in correctly modeling AAERV systems in the most popular modeling programs used by architects and engineers. How is the technology properly quantified with respect to performance? Are controls sequences properly identified when estimating savings in buildings? Should an algorithm be developed to support these initiatives? Is there/are there metrics that can be used with existing programs? The results of this forum will fuel future Research and Program initiatives by TC 5.5.

Forum 8 (Intermediate)

If Hydronic HVAC Systems Are So Great, Why Doesn't Everyone Have One?

Track: HVAC&R Systems & Equipment

Room: 007B

Sponsor: 06.01 Hydronic and Steam Equipment and Systems, 06.05 Radiant Heating and Cooling

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

Radiant heating/cooling and hydronic systems have been identified as underutilized technologies and a low-energy HVAC system that can reach a 50% net site energy savings goal. So, if radiant heating and cooling systems are so great, why are they not "front of mind" for new construction and retrofits? Is it the costs? Is it a lack of understanding of designs? Is it lack of knowledge in proper installation and commissioning? Come prepared to discuss the barriers and your methods to overcome them as we strive for low energy buildings to help create research and implementation agendas for this technology.

Wednesday

June 27, 2012

11:00 a.m.–12:30 p.m.

Conference Paper Session 12 (Intermediate)

Low Energy Design and Integrated Energy Systems

Track: Integrated Energy Systems

Room: 001B

Sponsor: 01.10 Cogeneration Systems, 07.01 Integrated Building Design

Chair: Dharam V. Punwani, Avalon Consulting, Naperville, IL

This conference paper session explores low energy design with integrated energy systems including collection of condensate water, combined heat/power systems, tri-generation systems and commissioning and energy management.

1. Zero Refrigeration in the USA (SA-12-C033)

Robert Tozer, Ph.D., Member, Operational Intelligence Ltd, Kingston upon Thames, United Kingdom

2. The Challenge of Low Energy Design in Low Energy Cost States (SA-12-C034)

Stephen W. Duda, P.E., Member, Ross & Baruzzini, Inc., St. Louis, MO

3. Targeting a Net-Zero Energy Student Center: Part 1 – Thermal and Electrical Load Minimization (SA-12-C035)

Trevor Caldwell, Kelton Friedrich, Brad Greigus, Ryan Verschuere, Jordan Anderson, Aaron Murenbeeld, Kaveh Arfaei, Mahsa

Boroum and James S. Cotton, Ph.D., P.E., Member, McMaster University, Hamilton, ON, Canada

4. Targeting a Net-Zero Energy Student Center: Part 2 – Systems to Meet Building Loads (SA-12-C036)

Kelton Friedrich, Trevor Caldwell, Brad Grebus, Ryan Verschuere, Jordan Anderson, Aaron Murenbeeld, Kaveh Arfaei, Mahsa Boroum and James S. Cotton, Ph.D., P.E., Member, McMaster University, Hamilton, ON, Canada

Conference Paper Session 13 (Intermediate)

Contamination and Environment Control Applications

Track: Indoor Environmental Applications

Room: 007A

Chair: Jeff J. Traylor, P.E., Member, EMCOR Facilities Services, Durham, NC

Increasingly, we are looking to advanced technologies and automated control systems and strategies to provide an acceptable indoor environment in a cost effective manner. This session features several papers that explore our indoor environment and how we can maintain improved control over its quality and acceptability for occupants.

1. Contaminant Removal Effectiveness of Displacement Ventilation Systems During Heating Season; Summary Results from Three Field Studies (SA-12-C037)

Boualem Ouazia, Ph.D., Member1, Iain Macdonald, Ph.D.2 and Michel Tardif, P.Eng., Member3, (1)The Institute for Research in Construction (IRC) / National Research Council Canada (NRC), Ottawa, ON, Canada, (2)National Research Council Canada, Montreal, QC, Canada, (3)CanmetENERGY Natural Resources Canada, Ottawa, ON, Canada

2. A Robust CO₂-Based Demand-Controlled Ventilation Control Strategy for Multi-Zone HVAC Systems (SA-12-C038)

Nabil Nassif, Ph.D., P.E., Associate Member, North Carolina A&T State University, Greensboro, NC

3. Model-Predictive Controls for Efficient Mixed-Mode Cooling of Buildings (SA-12-C039)

Jianjun Hu, Student Member and Panagiota Karava, Ph.D., Associate Member, Purdue University, West Lafayette, IN

4. Contaminants in Hotel Room Exhaust Air (SA-12-C040)

W. Brad M. Stanley and Bryan K. Ligman, AAF International, Doraville, GA

Conference Paper Session 14 (Basic)

Energy Efficiency Strategies

Track: HVAC&R Fundamentals and Applications

Room: 007B

Chair: Michael Deru, Ph.D., Member, National Renewable Energy Laboratory, Golden, CO

1. Evaluation of Thermal Comfort in Low Load Homes Supplied by High Sidewall Air Jets (SA-12-C041)

El Hassan Ridouane, Ph.D., Member, National Renewable Energy Laboratory, Golden, CO

2. Experimental Study on Ceiling Radiant Cooling Panel System with Personal Floor Diffuser (SA-12-C042)

Sei Ito¹, Minoru Kawashima, Ph.D., Member¹, Yoshito Arai¹, Michiya Suzuki, Ph.D.¹, Koji Murakami¹ and Tatsuo Nobe, Ph.D., Member², (1)Shimizu Corporation, Tokyo, Japan, (2)Kogakuin University, Tokyo, Japan

3. Determining the Cost-Effectiveness of Various Energy Sub-Metering Strategies (SA-12-C043)

Christine Maurer, P.E., Member¹, Peter Rojeski, Ph.D., P.E., Life Member² and Matt Davey¹, (1)Advanced Energy, Raleigh, NC, (2)M and V Services, Pleasant Garden, NC

Seminar 63 (Intermediate)

Designing Heat Recovery Heat Pumps to Meet Today's Requirements for High Performance Buildings

Track: Integrated Energy Systems

Room: 103B

Sponsor: 06.08 Geothermal Heat Pumps and Energy Recovery Applications

Chair: Cary Smith, Associate Member, Energy Center of Wisconsin, Madison, WI

Heat pumps and chillers are increasingly an effective option for producing useful heating in addition to their normal cooling production. Dedicated heat recovery, geothermal applications, and heat recovery chiller systems are some different configurations that include this technology. But there are many ways to configure and control a heat recovery chiller or heat pump; this seminar discusses some of the more effective approaches.

1. From Hockey Rink to Ground Loop

Ed Lohrenz, Member, Geo-Xergy Systems, Inc., Winnipeg, MB, Canada

2. Using Multiple Chillers In a Cascading Operation with a Geothermal Loop

Mike Filler, Member, Trane Company, Pueblo, CO

3. Using Heat Recovery Heat Pumps to Recover Heat from a Chiller to Heat Service Water

Frank Pucciano, Member, Sabot 6, Atlanta, GA

Seminar 64 (Intermediate)

How Smoke Control Systems Contribute to Sustainability Goals

Track: HVAC&R Fundamentals and Applications

Room: 007C

Sponsor: 05.06 Control of Fire and Smoke
Chair: Paul Turnbull, Member, Siemens Building Technologies, Inc, Buffalo Grove, IL

Smoke control systems require coordinated integration between the building's fire alarm system and its mechanical equipment controls to provide the intended life safety functions. Some building owners view smoke control systems as an unavoidable cost. This seminar explains how smoke control systems can support a building owner's sustainability goals. Presentations describe how different choices can lead to more sustainable smoke control system designs, and how operation of a smoke control system minimizes the environmental impact during a fire emergency. Case studies are presented showing how smoke control systems helped achieve LEED innovation credits and LEED energy usage credits.

1. How Smoke Control Contributes to Sustainability

William A. Webb, P.E., Fellow ASHRAE, WEBB FIRE Protection Consulting, LLC, Brooksville, FL

2. An Overview of Sustainability and Smoke Control

John H. Klote, Ph.D., P.E., Fellow ASHRAE, Fire and Smoke Consulting, Leesburg, VA

3. Case Studies: Using Fire Engineering to Achieve Sustainable Designs

Jeffrey Tubbs, P.E., Member, Arup, Cambridge, MA

Seminar 65 (Intermediate)

Impacts of Environmental Change on Building Design and Their HVAC Systems

Track: HVAC&R Fundamentals and Applications

Room: 103A

Sponsor: 04.02 Climatic Information, 02.05 Global Climate Change

Chair: Steve Cornick, Member, National Research Council Canada, Ottawa, ON, Canada

The environment is changing. The consensus is that the climate is getting warmer. How are engineers and architects going to design buildings to cope with a changing environment? Global Climate and Regional Climate models can make predictions of future climate while Canyon Air Temperature models are capable of predicting temperatures in a street canyon for extended periods. This seminar will show how a changing environment can be accounted for in the design of buildings either by making provisions in advance through design or mitigating the impact after the fact.

1. Can I Predict the Future? Generating Future Climatic Data

Drury Crawley, Ph.D., Member, Bentley Systems, Inc, Washington, DC

2. Climate Change and Its Effect On Design Load Calculations

Charles S. Barnaby, Member, Wrightsoft Corporation, Lexington, MA

3. Climate Change Adaptation – Will There Be Any Consequences for the Built Environment?

Kelly Kalvelage, Iowa State University, Ames, IA

4. Accounting for Urban Microclimate In Computer Simulation of Building Energy Performance

Evyatar Erell, Ph.D., Member, Ben Gurion University of the Negev, Beer-Sheva, Israel

Seminar 66 (Intermediate)

Refrigerated Warehouse Efficiency Regulations for CA and Beyond

Track: Refrigeration Applications

Room: 007D

Sponsor: 10.05 Refrigerated Distribution and Storage Facilities

Chair: Daniel J. Dettmers, Member, Industrial Refrigeration Consortium-U.W. Madison, Madison, WI

Large commercial and industrial refrigeration systems found in supermarkets and refrigerated warehouses are coming under the umbrella of energy efficiency regulation. The process started and continues to evolve in California through their Title 24 Energy Efficiency Standard. Similar measures are being explored and adapted at the national level. Even ASHRAE's Standard 90.1 is exploring what steps can be taken in these areas. This seminar is designed to update the audience on the current advances in energy efficiency regulation for the supermarket and refrigerated warehouse industries so they can make informed commentary to the ASHRAE 90.1 committee.

1. 2013 California Title 24 Building Energy Efficiency Standards for Supermarkets

Brian Dobbs, Associate Member, VaCom Technologies, San Luis Obispo, CA

2. 2013 California Title 24 Building Energy Efficiency Standards for Refrigerated Warehouses

Brian Dobbs, Associate Member, VaCom Technologies, San Luis Obispo, CA

3. ASHRAE Standard 90.1 and Commercial Refrigeration

James P. McClendon, P.E., Member, Walmart Stores Inc., Bentonville, AR

Seminar 67 (Intermediate)

U.S. General Services Administration's New Performance-based Facilities Standards

Track: Integrated Energy Systems

Room: 001A

Sponsor: MTG.BPM Building Performance Metrics

Chair: Martin Weiland, P.E., Member, General Services Administration, Washington, DC

GSA's PBS-P100, "Facilities Standards for the Public Buildings Service", has prescribed better-than-code buildings for decades. Recently, in response to the need to allow designers more flexibility to meet escalating goals, with robust means to verify the results, it was transformed into a performance-based standard. The new standard incorporates four performance tiers, from better-than-code to true high performance. A new process, incorporating a breadth of professionals in technical committees, keeps its development and revision continuous, with quarterly published updates. Issues encountered in the development of the standard, and its implementation in a large organization, will be covered.

1. GSA's New Performance-Based Facilities Standard

Martin Weiland, P.E., Member, General Services Administration, Washington, DC

2. Performance-Based HVAC and Lighting Requirements

Bose Thomas, P.E., Member, US General Services Administration, Washington, DC

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