
ASHRAE TECHNICAL PROGRAM – QUEBEC CITY

UPDATED JUNE 19, 2006

SUNDAY, 6/25 7:45 a.m.–9:15 a.m.

Transactions 1

Room: 2000 A

RP-1311: Window Analysis

Sunday, June 25, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 04.01 Load Calculation Data and Procedures; TC 04.05 Fenestration, TC 04.07 Energy Calculations

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

ASHRAE 1311-RP will enable the analysis of windows with shading attachments in the context of building energy analysis. Progress has been made on all levels from framework to component models. Three pieces of research are presented.

1. Solar Absorption by Each Element in a Glazing/Shading Layer Array (RP-1311) (QC-06-001)

John L. Wright, Member and Nathan A. Kotey, Student Member, University of Waterloo, Waterloo, ON, Canada

2. Thermal Resistance of a Window with an Internal Venetian Blind: Guarded Heater Plate Measurements (RP-1311) (QC-06-002)

Ned Y.T. Huang, John L. Wright, Ph.D., Member and Michael R. Collins, Ph.D., Associate Member, University of Waterloo, Waterloo, ON, Canada

3. Calculating Performance Indices for Windows with a Diathermanous Layer (RP-1311) (QC-06-003)

Michael R. Collins, Ph.D., Associate Member and John L. Wright, Ph.D., Member, University of Waterloo, Waterloo, ON, Canada

Seminar 1

Room: 202

Back to Basics: The HVAC System Selection Process

Sunday, June 25, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 09.01 Large Building Air-Conditioning Systems

Chair: Dennis J. Wessel, P.E., Fellow, Member, P. Eng, Karpinski Engineering, Cleveland, OH

Using the first five chapters of ASHRAE Handbook, Systems and Equipment, this seminar discusses how a system selection is finalized, emphasizing the differences between centralized and decentralized HVAC systems. The presentation uses the system analysis process flow diagram to take attendees through developing the system design with its pros and cons, economics issues, tricks-of-the trade, and tools to document the approach.

1. Choose the Right System Type for your Client

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

2. System Selection for Centralized Heating and Cooling Systems

Howard McKew, P.E., Member, RDK Engineers, Andover, MA

3. System Selection for Decentralized Heating and Cooling Systems

John L. Kuempel Jr., P.E., Member, DeBra-Kuempel/EMCOR, Cincinnati, OH

Seminar 2

Room: 2000 D

Critical Facilities, Business Continuity and CHP

Sunday, June 25, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 01.10 Cogeneration System

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

Recent weather-related disasters such as hurricanes Katrina, Rita and Wilma demonstrate catastrophic results, which can impact the safety and well-being of people and the economy if the electric infrastructure is lost for any extended period of time. There have been numerous examples of how combined heat and power (CHP) systems have kept hospitals, nursing homes, industrial firms and schools/universities online and operating during prolonged energy emergencies. This seminar covers operating performance during disasters of key CHP systems and their

future implications for energy security.

1. Montreal District Energy's CHP Plant Performance during the 1998 Eastern Ontario/Quebec Ice Storm
Jay Jayaraman, Enbridge Consumers Gas, Ottawa, ON, Canada
 2. Planning for the Next Ice Storm: Design of East Hartford High School CHP Plant
Timothy Wagner, Member, United Technologies Research Center, East Hartford, CT NY
 3. Hurricane Katrina: Baptist Memorial Hospital's CHP Plant Operation
Louay Chamra, Member, Mississippi State University, Starkville, MS
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Seminar 3

Room: 203

Historical Developments With Ground and Water Source Heat Pumps

Sunday, June 25, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 06.08 Geothermal Energy Utilization; TC 09.04 Applied Heat Pump/Heat Recovery Systems

Chair: Carl F. Huber, P.E., Member, Water Furnace International Inc., Fort Wayne, IN

This seminar provides an overview of advances made in the ground and water source industry since 1975. Equipment enhancements, performance levels, system design, standards development and rating methods are reviewed. Improvements with compressors, heat exchangers, motors and controls are discussed along with refinements in loop, piping and pumping system design. A chronology of rating standards development from the original ARI-320 to the current ISO-13256-1 is covered as well as seasonal performance ratings for ground source equipment.

1. Ground and Water Source Equipment: A Historical Perspective
Robert R. Brown, Member, Water Furnace International Inc., Ft. Wayne, IN
 2. Ground Loops, Piping Networks and Pumping
Steve Kavanaugh, Ph.D., Member, The University of Alabama, Tuscaloosa, AL
 3. There and Back Again: An Industry Tale of Standard Development in a Regulated Industry
Joel G. Solis, Associate Member, Air-Conditioning and Refrigeration Institute, Arlington, VA
 4. Ground Source Seasonal Efficiency Ratings
Dan Ellis, Member, Climate Master, Inc., Oklahoma City, OK
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Seminar 4

Room: 207

Recent Canadian Energy Storage Projects

Sunday, June 25, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 06.09 Thermal Storage

Chair: Edward L. Morofsky, Ph.D., P.E., Member, P. Eng., Public Works and Government Services Canada, Gatineau, QB, Canada

This seminar presents three Canadian energy storage projects that illustrate the range of cost-effective applications for various conditions. The first presentation shows how storage can be integrated into an energy efficient new building with a ground source heat pump system for heating and cooling. The second presentation integrates ice storage with a ground source system for a small church. And the third presentation shows how a campus cooling system used chilled water TES to avoid new chiller capacity while meeting increasing cooling loads and saving both operating and capital costs.

1. Energy Storage in a New Energy Efficient Building in Montreal
Maxime St-Denis, PWGSC, Montreal, QB, Canada
 2. Geothermal System with Ice Storage in a Winnipeg Church
Ed Lohrenz, Ice Kube Systems Ltd., West St. Paul, MB, Canada
 3. 60,000 Ton-hour Stratified Thermal Energy Storage (TES): Capturing Million of Dollars in Capital and Operating Savings for a Major University in Canada
John S. Andrepont, Member, The Cool Solutions Co., Lisle, IL
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Seminar 5

Room: 2000 B

Research in Radiant Based HVAC Systems

Sunday, June 25, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 06.05 Radiant and In-space Convective Heating and Cooling.

Chair: Robert Bean, Associate, Indoor Environmental Comfort, Calgary, AB, Canada

A partnership research project is discussed, comparing radiant floor heating system with forced-air heating systems performance: energy efficiency, thermal comfort and ventilation. Includes a discussion of software simulation of the performance of radiant and forced-air systems and an application of a commercial radiant based HVAC system.

1. Radiant / HVAC Research Campus

James T. Reardon, Ph.D., Ph.D., Member, Institute for Research in Construction, Ottawa, ON, Canada

2. Comparing Radiant to Forced Air Systems

Boualem K. Ouazia, Ph.D., Ph.D., National Research Council Canada, Ottawa, ON, Canada

3. Simulation of Radiant Systems

Kamel Haddad, Ph.D., Ph.D., Natural Resources Canada, Ottawa, ON, Canada

4. Radiant Based LEED Project

Geoff McDonell, P.Eng., P.E., OMICRON, Vancouver, BC, Canada

Seminar 6

Room: 206 B

Small Building System Commissioning

Sunday, June 25, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 07.09 Building Commissioning

Chair: Richard M. Rose, Member, Mechanical Technology Inc., Billings, MT

Concepts regarding the commissioning process differ and can vary from project to project depending on the budget. This seminar addresses approaches to smaller buildings commissioning and solutions to problems that may be encountered.

1. How to Turn a Mess into a Big Success

Jeff J. Traylor, Member, EMCOR Facilities Services, Durham, NC

2. Applying the Building Cx Process to Higher Education Renovation Projects

Richard B. Casault, P.E., Member, Casault Engineering, Seattle, WA

3. Applying the Building Cx Process to New Small Facilities

H. Jay Enck, Member, Commissioning & Green Building Services LLC, Commerce, GA

Seminar 7

Room: 2000 C

Web-Based Simulations for Design: Give Me a Minute and Your Analysis Is Done!

Sunday, June 25, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 01.05 Computer Applications

Chair: Nicholas B. Rajkovich, Associate, Cornell University, Ithaca, NY

This seminar presents the latest Web-based simulation tools that engineers can use during the design process. From energy calculations to green building design, this session gives practicing engineers an idea of the tools and analysis available through the Internet.

1. Development of a Web-based Residential (IECC) and Commercial (ASHRAE) Code Compliance Calculator for Texas

Jeff S. Haberl, Ph.D., P.E., Member, Texas A&M University, College Station, TX

2. Myths and Realities of Web-based Simulation for Energy Code Compliance

Krishnan Gowri, Member, Pacific Northwest National Laboratory, Richland, WA

3. Go From 3D-CAD/BIM Models to Dozens of DOE-2 Simulation Results and Energy Plus Files in Less Than an Hour Using the Green Building Studio Web Service

John F. Kennedy, Member, Green Building Studio Inc., Santa Rosa, CA

SUNDAY, 6/25 9:30 a.m.–10:30 a.m.

Transactions 2

Room: 206 B

Evaluating and Improving Performance of Window Assemblies

Sunday, June 25, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 04.05 Fenestration

Chair: Anil Parekh, P.E., Member, P. Eng, Natural Resources Canada, Ottawa, ON, Canada

Significant efforts have been made to optimize the thermal and optical performance of complex fenestration systems. Design and performance evaluations of different window components are key aspects for augmenting the overall energy efficiency benefits. This session presents results of a laboratory evaluation of performance of spacer bar and frame/sash components. The second paper deals with an innovative thermal and optical performance characterization of complex skylights.

1. Assessment of Spacer Bar Design and Frame Material on the Thermal Performance of Windows (QC-06-004)

Hakim Elmahdy, Ph.D., Member, National Research Council of Canada, Ottawa, ON, Canada

2. Validation of Skylight Performance Assessment Software (QC-06-005)

Abdelaziz Laouadi, Ph.D., Member and Chantal Arsenault, National Research Council, Ottawa, ON, Canada

Transactions 3

Room: 203

Long Term Operating Experiences of Ground-Source Heat Pumps

Sunday, June 25, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 06.08 Geothermal Energy Utilization

Chair: Kirk Mescher, P.E., Member, CM Engineering, Columbia, MO

This session shares information from the field for systems operating for a minimum of five years. One paper quantifies the cost savings for a ground-source heat pump system. The second paper presents an analytical method for estimating the long-term ground temperature changes due to the installation of a vertical closed-loop system.

1. Ten Years: A New England School and Geothermal Standing Column Wells (QC-06-006)

Carl D. Orio, Member, Carl N. Johnson, Ph.D., P.E., Member and Kristine D. Poor, Associate Member, Water Energy Distributors, Inc., Plaistow, NH

2. Estimating the Energy, Demand and Cost Savings from a Geothermal Heat Pump ESPC Project at Fort Polk, LA through Utility Bill Analysis (QC-06-007)

John A. Shonder, Member and Patrick J. Hughes, P.E., Member, Oak Ridge National Laboratory, Oak Ridge, TN

Seminar 8

Room: 207

Advanced Cycles and Systems For Air Conditioning, Refrigeration And Power

Sunday, June 25, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 01.01 Thermodynamics and Measurements

Chair: Laura A. Schaefer, Ph.D., Associate, University of Pittsburgh, Pittsburgh, PA

Recently, there have been significant advances in our understanding and application of thermodynamic cycles and systems for air conditioning, refrigeration, and power applications. These include hybrid systems and non-vapor-compression cycles. It is important to assess these emerging technologies for their potential as sustainable, energy-efficient alternatives to conventional systems.

1. Performance and Size Optimization of Vapor-Compression Refrigeration Systems Employing Two-Phase Rotary-Vane Expanders

S.A. Sherif, Ph.D., Fellow, University of Florida, Gainesville, FL

2. Rankine Bottoming Cycles for Transportation Systems

Anthony M. Jacobi, Ph.D., Member, University of Illinois, Urbana, IL

Seminar 9

Room: 2000 B

Distinguished Lecturer: Achieving your IAQ and Energy Conservation Goals

Sunday, June 25, 2006 9:30 a.m.–10:30 a.m.

Sponsor: Society Program Committee

Distinguished Lecturer: Christopher O. Muller, Member, Purafil, Inc., Doraville, GA

The public's increased awareness of IAQ issues and their demand to be able to work in a healthy environment, along with building owners' and managers' desires to keep energy consumption to a minimum, has fostered a growing need for economical and effective solutions. Fortunately, ventilation standards, mechanical codes, and air cleaning technologies have evolved to the point that the HVAC engineer has a viable means of providing a healthy, comfortable indoor air environment while conserving energy.

This presentation will review the applicable provisions of Standard 62.1-2004, discuss indoor air quality models in use, and provide examples where it has been used as part of an energy conservation program.

Seminar 10

Room: 202

Smoke Control and the Codes, Part 1

Sunday, June 25, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 05.06 Control of Fire and Smoke; TC 05.09, Enclosed Vehicular Facilities

Chair: George Hadjisophocleous, Ph.D., Member, P. Eng., Carleton University, Ottawa, ON, Canada

In recent years, there have been numerous changes in building codes, standards and guidelines used for the design of smoke control systems. This seminar highlights these changes as well the approaches used in building codes in Canada, Hong Kong and China.

1. NFPA 92B: The Atrium Smoke Control Standard

John H. Klote, Ph.D., P.E., Fellow, JHK, Inc., Leesburg, VA

2. NFPA Life Safety Code & Building Code Smoke Control Provisions

William A. Webb, P.E., Fellow, Schirmer Engineering Corp., Deerfield, IL

Forum 1

Room: 2000 D

Guideline 14R, Measurement of Energy and Demand Savings

Sunday, June 25, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 07.06 Systems Energy Utilization

Moderator: John D. Cowan, Member, P. Eng, Environmental Interface Limited, Toronto, ON, Canada

What has been your experience been in applying ASHRAE Guideline 14, Measurement of Energy and Demand Savings? What changes would you like to see in the guideline? A revision committee welcomes your input.

Forum 2

Room: 2000 A

Handbook Chapter for Combustion Turbine Inlet Air Cooling

Sunday, June 25, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 08.07 Combustion Gas Turbine Inlet Air Cooling Systems

Moderator: Dharam V. Punwani, Member, Avalon Consulting, Inc., Naperville, IL

For the first time, a separate chapter on combustion turbine inlet air cooling is being incorporated into the *ASHRAE Handbook*. This forum discusses the contents of the chapter developed and seeks input.

Forum 3

Room: 2000 C

Proper Use of Particle Counters

Sunday, June 25, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 02.04 Particulate Air Contaminants and Particulate Contaminant Removal Equipment

Moderator: Carolyn (Gemma) Kerr, Ph.D., Member, InAIR Environmental Ltd., Ottawa, ON, Canada

Particle counters are widely used for determining the efficiency of air filters as described in ASHRAE Standard 52.2, and for assessing levels of small particles that can affect the lungs in building environments. However, they are tricky to calibrate, the terminology relating to specification and use is often misunderstood, and they do not give obvious indications to users when malfunctioning. This forum provides an opportunity to discuss the instrument strengths and limitations, and to learn from people experienced in laboratory and field usage of particle counters.

Transactions 4

Room: 2000 A**Air-to-Air Energy Recovery Research Topics**

Sunday, June 25, 2006 10:45 a.m.–12:15 p.m.

*Sponsor: TC 05.05 Air-to-Air Energy Recovery**Chair: Bert G. Phillips, P. Eng, UNIES Ltd., Winnipeg, MB, Canada*

A new transient test method for determining the effectiveness of air-to-air energy wheels is introduced in papers presented in this session. The transient test significantly reduces test times, equipment costs and space requirements compared to the current steady-state test, while maintaining a comparable accuracy. The new test method and apparatus may be applied energy wheel quality control, field testing, certification and selecting wheel rotational speed.

1. Transient Temperature Measurements and Characteristics for Temperature Sensors and Energy Wheels (QC-06-008)

Oyetope Abe, Halliburton Energy Service, Grand Prairie, AB, Canada; Yi Heng Wang, Altex Industries, Inc., Edmonton, AB, Canada; Carey J. Simonson, Ph.D., Member, Robert W. Besant, Fellow and Wei Shang, Ph.D., University of Saskatchewan, Saskatoon, SK, Canada

2. Relationship between Energy Wheel Speed & Effectiveness & Its Transient Response, Part 1 (QC-06-009)

Oyetope O. Abe, Halliburton Energy Service, Grande Prairie, AB, Canada; Robert W. Besant, Fellow, Carey J. Simonson, Ph.D., Member and Wei Shang, Ph.D., University of Saskatchewan, Saskatoon, SK, Canada

3. Relationship between Energy Wheel Speed & Effectiveness & Its Transient Response, Part 2 (QC-06-010)

Oyetope O. Abe, Halliburton Energy Service, Grande Prairie, AB, Canada; Robert W. Besant, Fellow, Carey J. Simonson, Ph.D., Member and Wei Shang, Ph.D., University of Saskatchewan, Saskatoon, SK, Canada

Seminar 11

Room: 206 B**End-Users Report on Fault Detection and Diagnostics, Part 1**

Sunday, June 25, 2006 10:45 a.m.–12:15 p.m.

*Sponsor: TC 07.05 Smart Building Systems; TC 01.04 Control Theory and Application**Chair: Mark J. Cherniack, Associate, New Buildings Institute, White Salmon, WA*

Building energy systems can be optimized for performance related to both energy use/cost and occupant comfort through a combination of intelligent controls and fault detection and diagnostic (FDD) capabilities. The enhanced functionality of including FDD, either integrated with or external to the controls framework, provides an effective toolset for managing ongoing, overall building performance. User experience with existing and new FDD tools is growing. Time to take a good look at what's new out there and how things are actually working from the end users point of view.

1. Building Control Efficiency Improvement through Remote Diagnostics of Intelligent Systems

Tom Sumner, Honeywell Home and Building Solutions, Atlanta, GA

2. Automated FDD for VAVs and Integration with Automated CMMS Work Orders

Louis M. Coughenour, P.E., Enovity LLC, San Francisco, CA

3. Specifying, Implementing and Using Diagnostic Tools

Curtis J. Klaasen, P.E., Iowa Energy Center, Ankeny, IA

Seminar 12

Room: 2000 B**Four Dimensions of Standard 55 Comfort Sensing: Temperature, Humidity, Air Flow and Radiant**

Sunday, June 25, 2006 10:45 a.m.–12:15 p.m.

*Sponsor: TC 01.04 Control Theory and Application; SSPC 55, TC 06.05 Radiant and In-space Convective Heating and Cooling**Chair: James W. Gartner, Member, LEED AP, Four Seasons Environmental, Inc., Monroe, OH*

Total thermal comfort conditions include not only ambient temperature and humidity, but the evaporative effect of air flow across the skin and the radiant effect resulting in operative temperature adjustments. Weather reports now inform us of what it feels like when we venture outside; with the wind chill factor, and shade or direct sun's effects. How can new developments provide more accurate and complete comfort indoors, given the various types of HVAC systems? This seminar addresses these issues.

1. Temperature and Humidity Sensor Performance and New Technologies

J. Christopher Larry, P.E., Member, Siemens Building Technologies, Inc., Bridgeville, PA

2. An Update on Air Flow and Measurement Technology
Mike Schell, Member, AirTest Technologies, Inc., Santa Barbara, CA
 3. Using Standard 55 PMV Scale: Radiant and Variables Control
Peter Simmonds, Ph.D., Member, IBE Consulting Engineers, Sherman Oaks, CA
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Seminar 13

Room: 2000 D

Greening the ASHRAE HQ Building

Sunday, June 25, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 02.08 Building Environmental Impacts and Sustainability; TC 01.05 Computer Applications

Chair: Tim Dwyer, Member, CEng, London South Bank University, London, UK

Designed and constructed in a period when energy was relatively cheap and the role of building services engineers was to take an architects scheme and provide “comfort,” the ASHRAE Headquarters falls short of modern standards, let alone those that ASHRAE members target for future, sustainable buildings. This seminar responds to the challenge “what could be done to ASHRAE HQ to make it green.” Three presenters offer approaches to help achieve a sustainable refurbishment. These approaches are radical and appeal to all members with solutions considering alternative technologies and even comparing the Atlanta-based options with international methods answering the question “how does American green compare to elsewhere.”

1. Greening the ASHRAE HQ HVAC and Controls Systems
Steven T. Taylor, P.E., Fellow, Taylor Engineering, LLC, Alameda, CA
 2. Green Refurbishment of the ASHRAE HQ
Nigel Banks, Student, Faber Maunsell, Leeds, Yorkshire, UK
 3. A Green ASHRAE HQ: UK Style
Frank Mills, P.E., Member, Environmental Design Consultants, Chorley, Lancashire, UK
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Seminar 14

Room: 207

Exergy Analysis and Sustainability, Part 1: Fundamentals

Sunday, June 25, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TG 1 Exergy Analysis for Sustainable Buildings; TC 01.01 Thermodynamics and Psychrometrics

Chair: Eric B. Ratts, Ph.D., Member, University of Michigan–Dearborn, Dearborn, MI

International Energy Agency Annex 37 recognizes that building exergy-efficient buildings with low-exergy systems and equipment is the most important step for the next-generation green buildings, sustainable development and environment. Currently, there is a lack of transforming fundamental knowledge of exergy into practice and disseminating its importance and relevance, particularly for green buildings and sustainable development. This seminar focuses on the exergy-based relationship of buildings with the environment, raises the exergy awareness among engineers, and provides fundamental information and basic tools for the implementation of exergy-efficient designs.

1. Why Exergy?
Ibrahim Dincer, Ph.D., Member, University of Ontario Institute of Technology, Oshawa, ON, Canada
 2. An Exergy Perspective for Combined Heat and Power Options for Green Buildings
Biröl I. Kilikis, Ph.D., Fellow, Watts Radiant and Greenway Technologies, Vienna, VA
 3. Exergy for Better Sustainable Development
Ibrahim Dincer, Ph.D., Member, University of Ontario Institute of Technology, Oshawa, ON, Canada
 4. Exergy Analyses in the Built Environment: Results from the IEA ECBCS Annex 37 and Related Studies
Dietrich Schmidt, Fraunhofer Institute for Building Physics, Kassel, Germany
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Seminar 15

Room: 203

Instruments and Procedures for Measurements of Oil Circulation Rate

Sunday, June 25, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TG10.MOC Immiscible Oil Refrigerant Systems

Chair: Chris Seeton, Student, University of Illinois, Urbana, IL

This seminar discusses methods to measure the oil circulation rate in systems at real time. These methods can be used for system control, fault detection, and measure oil return to the compressor. Knowing the amount of oil in circulation aids heat exchanger designers in determining the optimal configuration of heat exchanger tubes, and aids the compressor manufactures and system operators in optimizing overall system performance.

1. Oil Concentration Measurement of Refrigerant/Oil Mixture by Refractive Index Sensor
Mitsuhiro Fukuta, Ph.D., Member, Shizuoka University, Hamamatsu, Japan
 2. Oil Concentration Measurement of Refrigerant/Oil Mixture by Ultraviolet Light Absorption Method
Kiyoharu Kustuna, Denso, Aichi-ken, Japan
 3. Oil Concentration Measurement of CO2/PAG Mixture by Capacitance Sensor
Yunho Hwang, Ph.D., Member, University of Maryland, College Park, MD
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Seminar 16

Room: 202

Smoke Control and the Codes, Part 2

Sunday, June 25, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 05.06 Control of Fire and Smoke; TC 05.09 Enclosed Vehicular Facilities

Chair: George Hadjisophocleous, Ph.D., Member, P.Eng., Carleton University, Ottawa, ON, Canada

In recent years, there have been numerous changes in building codes, standards and guidelines used for the design of smoke control systems. This seminar highlights these changes as well the approaches used in building codes in Canada, Hong Kong and China.

1. NFPA 92A–Smoke Control in Compartmented Spaces
Paul G. Turnbull, Member, Siemens Building Technologies, Inc., Buffalo Grove, IL
 2. Smoke Management Concepts in the IBC
Jeffrey S. Tubbs, P.E., Member, Arup, Westborough, MA
 3. National Building Code of Canada and Smoke Control
Ahmed Kashef, Ph.D., Member, National Research Council, Ottawa, ON, Canada
 4. *Smoke Control and the Codes in China and Hong Kong*
W.K. Chow, Ph.D., Member, The Hong Kong Polytechnic University, Kowloon, Hong Kong, China
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Seminar 17

Room: 2000 C

Three International Climate Change Programs of Relevance to ASHRAE Members

Sunday, June 25, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 02.05 Global Climate Change

Chair: David F. Lewis, Member, Lennox International Inc., Dallas, TX

This seminar focuses on three unique climate programs: Canada has earmarked \$4 billion to reach its Kyoto commitments. Discussion focuses on where this money will be spent, how the results of the program will be measured and the expected results. The Asian Pacific Partnership brings a new approach to the global warming issue by showing how six countries are aggressively working together voluntarily. The UK buildings program is reviewed showing how it will contribute toward meeting overall EU (Kyoto) targets.

1. The \$4 Billion Budget for Canadian Climate Programs: How It Is Going to Be Used, Measured and Expected Results
Louis Marmen, Natural Resources Canada, Ottawa, Canada
 2. Asia Pacific Partnership (Australia, India, Japan, China, South Korea and United States): A Program to Address Climate Change Initiative on Buildings and Energy Efficiency Initiative
Charles A. Samuels, Mintz Levin, Washington, D.C.
 3. The UK Climate Emissions Program for Buildings, in Conformance with the EU Climate Targets
Bill Jolly, PWA Parker Wilson, Manchester, UK
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SUNDAY, 6/25 12:20 p.m.–1:20 p.m.

Forum 4

Room: 2000 A

Quarantine Stations: What Is Needed?

Sunday, June 25, 2006 12:20 PM - 1:20 PM

Sponsor: TC 09.06 Health Care Facilities; AD Hoc Committee on Homeland Security

Moderator: Carl N. Lawson, Member, Systems Solution Consultants, Zephyrhills, FL

With the various epidemics we are facing and the seriousness those particular epidemics are causing, we are being challenged to identify quarantine station locations and types of stations and with this forum we anticipate some definite areas to identify and hopefully research projects or ASHRAE position documents can be identified and developed

Forum 5

Room: 206 B

Trends in Centrifugal Chiller Applications: VFD, High Voltage, Packaged Chiller Plants

Sunday, June 25, 2006 12:20 PM - 1:20 PM

Sponsor: TC 08.02 Centrifugal Machines

Moderator: Rick M. Heiden, Member, Trane, La Crosse, WI

Trends in chilled water plant applications are moving manufacturers, engineers and operators into new regions of technical challenges. This forum is intended to pose several questions associated with these trends to help guide TC 8.2 in developing appropriate program and research priorities that are relevant to the direction the industry is moving.

Forum 6

Room: 207

Can Clean Be Green? How Can Clean Room-Based Industries Climb Aboard the Green Train?

Sunday, June 25, 2006 12:20 PM - 1:20 PM

Sponsor: TC 09.11 Clean Spaces; TC 02.8 Building Environmental Impacts and Sustainability

Moderator: E. Mitchell Swann, P.E., Member, MDC Systems, LLC, Berwyn, PA

Green building design has gathered considerable momentum and many adherents among owners, designers and contractors. The goal has been to reduce the footprint of buildings on the environment. Clean room-based industries (microelectronics, pharmaceuticals, aerospace, etc.) create some of the deepest footprint buildings in the marketplace through use of lots of energy, water and other resources. Reducing energy and resource utilization in clean rooms would have a much greater impact per square foot than commercial buildings. This forum investigates the issues and challenges in making clean rooms green.

Forum 7

Room: 202

Should We Limit the Number Of Patient Rooms on One Air Handling Unit?

Sunday, June 25, 2006 12:20 PM - 1:20 PM

Sponsor: TC 9.06 Subcommittee on SARS Issues

Moderator: Kenneth E. Gill, P.E., Member, JJA Engineering Consultants, Dallas, TX

Screening of patients upon admission is not a foolproof process and some patients with infectious diseases can be admitted to general patient rooms. Outbreaks can also develop on general patient floors. The number of patient rooms on any given air handling unit is currently without limit. Would limiting the number of rooms on an air handling unit help to contain outbreaks of airborne diseases in health care facilities?

SUNDAY, 6/25 1:30 p.m.–3 p.m.

Transactions 5

Room: 2000 A

Measured Performance Of Novel Fenestration Systems

Sunday, June 25, 2006 1:30 p.m.–3:00 p.m.

Sponsor: TC 04.05 Fenestration

Chair: Michael R. Collins, Ph.D., Associate Member, University of Waterloo, Waterloo, ON, Canada

Of late, a number of novel fenestration systems have been tested to assess their solar and thermal performance in the built environment. This session presents the results of these measurements.

1. Solar Heat Gain Coefficient Measurement for Seven Glazing Product Types in Combination with Nine Interior Window Attachment Product Types (QC-06-011)

Dave B. Tait, Member, Tait Solar Co., Tempe, AZ

2. Monitored Energy Performance of Electrochromic Windows Controlled for Daylight and Visual Comfort (QC-06-012)

Eleanor S. Lee, Ph.D., Dennis L. DiBartolomeo, Joseph H. Klems, Ph.D., Member, Mehry Yazdanian and Stephen E. Selkowitz, Member, Lawrence Berkeley National Laboratory, Berkeley, CA

3. Solar Heat Gain Coefficients for Three High-Mass Glazing Blocks (QC-06-013)

Dave B. Tait, P.E., Member, Tait Solar Co., Tempe, AZ

Seminar 18

Room: 202

Canadian Solutions to Sustainable Design for Cold Climates, Part 1

Sunday, June 25, 2006 1:30 p.m.–3:00 p.m.

Sponsor: TC 07.01 Integrated Building Design

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

This seminar is to start at the design stage all the way through energy efficiency regulation, with experience shared regarding how to approach design to meet sustainable targets. Whole building performance analysis is at the heart of a successful and energy efficient design, so a public, web-enabled tool used in Canada is presented. Discussion also includes how a proposed revision of energy efficiency regulations can be made supportive to innovation vs. restrictive.

1. Designing to Meet Sustainable Targets in Canada

Stephen Pope, Natural Resources Canada, Ottawa, ON, Canada

2. How We Swayed the Canadian Commercial Buildings Market Towards EE

Mark Newman, Natural Resources Canada, Ottawa, ON, Canada

3. Daring to Introduce a New Energy Code for Commercial Building in Canada?

François Dubrous, Member, Natural Resources Canada, Ottawa, ON, Canada

Seminar 19

Room: 206 B

End-Users Report on Fault Detection and Diagnostics, Part 2

Sunday, June 25, 2006 1:30 p.m.–3:00 p.m.

Sponsor: TC 07.05 Smart Building Systems; TC 01.04 Control Theory and Application

Chair: Adrienne Thomle, Member, Honeywell, Inc., Golden Valley, MN

Building energy systems can be optimized for performance related to both energy use/cost and occupant comfort through a combination of 'intelligent' controls and fault detection and diagnostic (FDD) capabilities. The enhanced functionality of including FDD, either integrated with or external to the controls framework, provides an effective toolset for managing ongoing, overall building performance. User experience with existing and new FDD tools is growing.

1. Using Fault Detection on Small Boiler and Chiller Plants

Darrel Hatley, Battelle/Pacific Northwest National Laboratory, Richland, WA

2. Site Testing FDD: Developing a Standard Test Regime

Steve Blanc, P.E., Member, Pacific Gas & Electric Co., San Francisco, CA

3. Bringing FDD Down to Earth So Customers Can Actually Use It!

Patrick J. O'Neill, Member, NorthWrite, Minneapolis, MN

4. Real Energy Savings with Automated Monitoring of HVAC Systems

TBA

Seminar 20

OPEN SESSION—No badge required.

Room: 204 B

First Time at an ASHRAE Meeting? This Program is for You!

Sunday, June 25, 2006 1:30 p.m.–3:00 p.m.

Sponsor: Society Program Committee

Chair: Frank Schambach, Member, Total Building Concepts, Metairie, LA

This seminar familiarizes first-time meeting attendees with the committee structure of ASHRAE, networking opportunities within the Society and ways to get the most out of ASHRAE meetings.

1. Membership: How to Get the Most Out of an ASHRAE Meeting and Exposition

Alan C. Veeck, Member, MVA Inc., Virginia Beach, VA

2. Technical Committees, Standing Committees and Programs
William K. Klock, Member, EEA Consulting Engineers, Inc., Austin, TX
 3. The Fun Side of ASHRAE Meetings
C. Brian Wandling, Member, Control Specialists, Inc., Evansville, IN
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Seminar 21

Room: 2000 C

Life Cycle Costing of Existing Building Projects

Sunday, June 25, 2006 1:30:00 p.m.–3:00:00 p.m.

Sponsor: TC 07.08 Owning and Operating Costs

Chair: Bruce B. Lindsay, P.E., Member, TEMP-AIR, Burnsville, MN

ASHRAE has funded research to develop an interactive database for operating and maintenance costs of existing buildings, which will allow users to evaluate regional (and other) differences in costs and service life of a range of HVAC equipment.

This seminar presents data on maintenance costs from the database as well as O&M cost data derived from retro-commissioning projects in existing buildings, including those performed as part of LEED-EB services.

1. Maintenance Cost Data from the Interactive Web-based Owning and Operating Cost Database

John A. Shonder, Member, Oak Ridge National Laboratory, Oak Ridge, TN

2. Retro-Commissioning Commercial Buildings for LEED-EB

Jim Poulos, P.E., Member, Servidyne Systems, LLC, Atlanta, GA

Seminar 22

Room: 2000 D

New Technologies for Refrigeration Applications

Sunday, June 25, 2006 1:30 p.m.–3:00 p.m.

Sponsor: TC 10.07 Commercial Food and Beverage Cooling Display and Storage

Chair: Cynthia L. Gage, Ph.D., Member, U.S. Environmental Protection Agency, Research Triangle Park, NC

Large refrigeration systems, such as in supermarkets, ice rinks and curling rinks, offer significant opportunities for innovation and improvement. Recent technological advancements for these systems are leading to enhancements in performance and reductions in energy use and environmental burden. Topics discussed in this seminar include advancements at the component level with the application of fiber optics in supermarket display cases; advancements at the system level with the application of secondary loop refrigeration systems; and advancements at the building level with integrated HVAC&R systems.

1. Results from Field Demonstration of Fiber Optic Lighting in Low Temperature Reach-in Display Cases

Ramin Faramarzi, P.E., Associate Member, Southern California Edison, Irwindale, CA

2. Secondary Loop Refrigeration with Extensive Heat Recovery: Loblaw's Repentigny Case Study

Daniel Giguere, P.E., Natural Resources Canada, Varennes, QB, Canada

3. Refrigeration Action Program for Buildings

Sophie Hosatte, Ph.D., Natural Resources Canada, Varennes, QB, Canada

Seminar 23

Room: 207

Transit and Highway Ventilation Systems: Latest Research, Regulations and Developments for Equipment and Maintenance

Sunday, June 25, 2006 1:30:00 p.m.–3:00:00 p.m.

Sponsor: TC 05.09 Enclosed Vehicular Facilities; 05.01

Chair: Robert Z. Smith, Member, FlaktWoods (USA), Niles, MI

Requirements and systems for ventilating underground transit and highway facilities are becoming increasingly stringent and complicated. This seminar reviews the latest research, publications, regulations and developments in equipment and maintenance. Topics include the latest research on the heat rejection rates of transit equipment; new publications from the World Road Association (PIARC); new regulations in the EU for certifying high temperature emergency ventilation fans; and new strategies for the maintenance of underground facility equipment.

1. The Latest Fire and Smoke Control Publications by the World Road Association

Arthur G. Bendelius, P.E., Member, A&G Consultants, Inc, Big Canoe, GA

2. European High Temperature Certification of Fans for Tunnel Ventilation Applications

A. G. (Geoff) Sheard, Ph.D., FlaktWoods, Colchester, England

3. Maintenance Overview—Planning, Staffing, Resources and Tools Required for Effective Maintenance

Sudhir K. Agrawal, P.E., Member, Wilson and Co., Inc., Pasadena, CA

4. Real-time Measurement of Heat Rejection from Train Brake Grid Resistor Unit
(Don) Guan Yanzheng, Ph.D., Member, ARUP NY, New York, NY

Seminar 24

Room: 2000 B

Ultraviolet Germicidal Irradiation (UVGI) Inactivation of Infectious Microorganisms

Sunday, June 25, 2006 1:30 p.m.–3:00 p.m.

Sponsor: TC 02.04 Particulate Air Contaminants and Particulate Contaminant Removal Equipment

Chair: Stephen B. Martin, Jr., P.E., Member, CDC/NIOSH, Morgantown, WV

Ultraviolet germicidal irradiation (UVGI) has been used to inactivate infectious microorganisms and control airborne disease transmission since the 1930s. Today, UVGI is frequently used as a tuberculosis control strategy. However, with bioterrorism becoming an increasing concern, UVGI can be used to effectively inactivate many other airborne respiratory pathogens. This seminar demonstrates the effectiveness of UVGI and discuss newly updated Centers for Disease Control guidelines for its use in controlling tuberculosis and other airborne infectious diseases.

1. Application of Upper Room UVGI to Control Airborne Disease: Lessons Learned

Richard L. Vincent, Associate Member, St. Vincents Hospital Manhattan, New York, NY

2. Use of UVC in HVAC Ducts: Issues in Control of Infectious Disease

Karin Foarde, Member, Research Triangle Institute, Research Triangle Park, NC

3. What's New in the 2005 CDC Guidelines for Preventing the Transmission of Mycobacterium Tuberculosis in Health-Care Settings

Paul A. Jensen, Ph.D., P.E., Member, CDC/NCHSTP, Atlanta, GA

SUNDAY, 6/25 3:15 p.m.–4:45 p.m.

Seminar 25

Room: 202

Canadian Solutions to Sustainable Design for Cold Climates, Part 2

Sunday, June 25, 2006 3:15 p.m.–4:45 p.m.

Sponsor: TC 07.01 Integrated Building Design

Chair: François Dubrous, Member, Natural Resources Canada, Ottawa, ON, Canada

This seminar illustrates how the Canadian market is responding to the LEED Canada rating system. It also shows how advanced technologies such as a building-integrated PV system and glazed double wall curtain wall systems can perform in cold Canadian climate.

1. Energy and LEED Canada-NC1.0 Rating System: The Canadian Building Industry's Response

Ian Theaker, Canada Green Building Council, Victoria, BC, Canada

2. Taking Building Integrated Photovoltaic Curtainwall to New Lows: A True Canadian North Story

Mike Lubun, Natural Resources Canada, Ottawa, ON, Canada

3. A Canadian Proposal for Double Skin Walls in Office Buildings

Stephen Pope, Natural Resources Canada, Ottawa, ON, Canada

Seminar 26

Room: 207

Operational Performance Strategies for Energy Recovery Systems

Sunday, June 25, 2006 3:15:00 p.m.–4:45:00 p.m.

Sponsor: TC 05.05 Air-to-Air Energy Recovery

Chair: Carol Marriott, Member, P. Eng, McQuay International, Minneapolis, MN

This seminar highlights different strategies for optimum performance of air-to-air energy recovery systems. The speakers address operational performance for residential and commercial applications. Performance and control of air-to-air energy recovery systems without the use of dampers are discussed.

1. Control Strategies for Residential and Small Commercial Systems

Peter Grinbergs, Member, Nutech, London, ON, Canada

2. Commercial Energy Wheel Control

Ronnie Moffitt, P.E., Member, The Trane Company, Lexington, KY

3. Using Fans Without Dampers to Control Outdoor Air Intake In An Energy Recovery System: Does It Work?

Klas Haglid, P.E., Member, Haglid Engs & Assoc., Ridgewood, NJ

Seminar 27

Room: 206 B

Thermal Comfort: Exploring Displacement and Underfloor Air Systems

Sunday, June 25, 2006 3:15 p.m.–4:45 p.m.

Sponsor: ASHRAE Standard 55

Chair: Michael McDermott, Associate Member, Environmental Systems Design, Chicago, IL

This seminar explores air distribution technologies of displacement and underfloor ventilation as they relate to thermal environmental conditions for human occupancy. It begins with an overview of the ASHRAE Standard 55-2004, definition and factors of metabolic rate, clothing insulation, air temperature, radiant temperature, air speed and humidity. It also examines displacement and underfloor ventilation air distribution system concepts by comparing and contrasting system benefits, applications, air diffusers, CFD modeling case studies and video smoke tests.

1. How does ASHRAE Define Thermal Comfort?

Peter V. Nielsen, Ph.D., Aalborg University, Aalborg, Denmark

2. Displacement and Underfloor Ventilation Case Studies on Comfort

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

3. Displacement Ventilation Concepts for Kitchen and Classroom Comfort

Andrey Livchak, Ph.D., Member, Halton USA, Scottsville, KY

4. Underfloor Air Concepts for Office Comfort

Kurt Karnatz, P.E., Associate Member, Environmental Systems Design, Chicago, IL

5. Thermal Comfort Displacement and Underfloor Air System Smoke Tests

Julian Rimmer, Associate Member, Price Industries, Winnipeg, MB, Canada

MONDAY, 6/26 7:45 a.m.–9:15 a.m.

Transactions 6

Room: 202

Reduced-Order Modeling Of Indoor Airflows

Monday, June 26, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 04.10 Indoor Environmental Modeling

Chair: H. Ezzat Khalifa, Ph.D., Member, Syracuse University, Syracuse, NY

This session covers advances in reduced-order modeling of indoor air and contaminant flows: models that can provide reasonable fidelity at a much lower expenditure of computing resources and time for design optimization or near-real-time environmental control. The focus is on methods that reduce the order of complex indoor flow problems through simplification of physical models, and/or use of mathematical techniques to extract reduced-order models from experimental or detailed CFD data. Such models include improved zonal models, coarse grid CFD, proper orthogonal decomposition of experimental or CFD data, and combinations.

1. Real-time Prediction of Rack-Cooling Performance (QC-06-014)

James W. VanGilder, P.E., Member, American Power Conversion Corp., Billerica, MA; Saurabh K. Shrivastava, Student Member, State University of New York at Binghamton, Binghamton, NY

2. A New Generation of Zonal Models (QC-06-015)

Teshome E. Jiru, Student Member and Fariborz Haghighat, Ph.D., P.E., Member, Concordia University, Montreal, QB, Canada

3. An Integrated Zonal Model to Predict Transient Indoor Humidity Distribution (QC-06-016)

Etienne Wurtz, University of Savoie, Cedex, France; Fariborz Haghighat, Concordia University, Montreal, QB, Canada; Laurent Mora, Ph.D., Université de La Rochelle, Cedex, France; Katia C. Mendonca, Pontifical Catholic University of Parana, Curitiba, PR, Brazil; Chadi Maalouf, Université de La Rochelle, Cedex, France; Hui Zhao, Concordia University, Montreal, QB, Canada

Seminar 28

Room: 2000 C

Absorption/Sorption Heat Pump and Refrigeration Systems

Monday, June 26, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 08.03 Absorption and Heat Operated Machines

Chair: Vikas Patnaik, Ph.D., Member, Trane, La Crosse, WI

Absorption/sorption heat pumps and chillers play a crucial role in integrated energy systems that hold promise for greatly improved energy efficiency. This seminar presents recent experimental and analytical studies related to absorption/sorption technologies. Topics include novel thermally-activated cycles, innovative heat pump/chiller applications, modeling techniques, and working fluids.

1. Gas-Engine-Driven VRA: A Further Enhancement of Double-Effect Absorption Chillers
William Worek, Ph.D., Member, University of Illinois at Chicago, Chicago, IL
2. Droplet and Film Absorption Rates in Horizontal-Tube Lithium Bromide/Water Absorbers
Srinivas Garimella, Ph.D., Member, Georgia Institute of Technology, Atlanta, GA
3. Extending the Boundaries of Aqua Ammonia Absorption Cycle Applications
Don Erickson, Member, Energy Concepts Co., Annapolis, MD

Seminar 29

Room: 203

Demand Response: How to Get the Untapped Savings in Your Electric Bill

Monday, June 26, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 01.09 Electrical Systems

Chair: Steven Faulkner, Member, Georgia Power, Union City, GA

As some sections of the electric grid become loaded to capacity during peak conditions, concerns about blackouts and price spikes occur. Demand response (using controls, energy storage, on-site renewable energy sources, or curtailment of non-essential energy use) is a resource that building owners can sell to the electric utility, reducing the building utility bills while also helping to prevent power outages. This session describes strategies that system designers or building facilities operators can use to take advantage of this, along with some reality checks.

1. How to Change Your Building's Electric Use Characteristics and Why
Lawrence C. Markel, Fellow, Sentech, Inc., Knoxville, TN
2. How to Match Your Building's Peak Reduction with the Utility's Peak and Get Paid for It
Frank J. Pucciano, Member, W.W. Williams, Atlanta, GA
3. Impacts of Efficiency Standards on Demand Response: How Much Can You Really Do?
Steven J. Rosenstock, P.E., Member, Edison Electric Institute, Washington, D.C.
4. Effective Demand Response through Creative Rate Making
Jim Earley, P.E., Member, Georgia Power Co., Atlanta, GA

Seminar 30

Room: 2000 B

Heat Recovery Application for Centrifugal Chillers: Utilization of ASHRAE Standard 90.1

Monday, June 26, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 08.02 Centrifugal Machines; TC 7.06 Systems Energy Utilization

Chair: Vinod P. Gupta, P.E., Member, P. Eng, 3M Company, St. Paul, MN

A huge amount of heat energy is sent to the atmosphere through cooling towers. Not only is every BTU collected in building or processes sent but another 25 percent in compressor and accessory work is added. For a typical large building, this amounts to 4 million ton hours per year. Wouldn't it be great to reclaim this energy and use it in the building? ASHRAE Standard 90.1 requires that a way to use this energy for service hot water and building reheat be discussed and applied. This seminar covers application and case study of a chiller heat recovery system.

1. Chiller Heat Recovery: Theories, Definitions and Applications
Ray Good, P.E., York International, York, PA
2. The Effects of ASHRAE Standard 90.1P on Condenser Water Heat Recovery
Julian R. De Bullet, P.E., Fellow, McQuay International, Potomac Falls, VA
3. Chiller Heat Recovery System Success: A Case Study
Mick Schwedler, P.E., Member, Trane Company, La Crosse, WI

Seminar 31

Room: 206 B

Lessons Learned in the Design, Start-up and Operation of Underfloor Systems

Monday, June 26, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 05.03 Room Air Distribution

Chair: Robert Linder, P.E., Member, P. Eng, Karges-Faulconbridge, Inc., St. Paul, MN

This seminar provides first-hand information on the design, start-up and operation of underfloor systems. Experiences from both manufacturer and design engineer viewpoints are reviewed.

1. Design and Control of Underfloor Air Systems

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

2. Start-up and Commissioning

Tom Webster, P.E., Member, UC Berkeley, Berkeley, CA

3. Operation

Mike Filler, Associate, York International, York, PA

4. Use of Floor Cavity for Supply Plenum

Ken Loudermilk, Member, Trox, Alpharetta, GA

Seminar 32

Room: 207

New Requirements for Refrigeration System Safety

Monday, June 26, 2006 7:45 a.m.–9:15 a.m.

Sponsor: SSPC 15

Chair: Douglas T. Reindl, Ph.D., P.E., Member, University of Wisconsin-Madison, Madison, WI

This session discusses new requirements in ASHRAE Standard 15-2004 and under development for 15-2006. Included are detailed discussions on changes being addressed with regard to refrigerant concentration limits that may trigger specific requirements, such as location of equipment in machinery rooms or special machinery rooms.

1. ASHRAE Standard 15: An Overview of the Present Standard

Dennis R. Dorman, Member, The Trane Co., La Crosse, WI

2. Development and Use of New Refrigerant Concentration Limits (RCLs)

James M. Calm, P.E., Fellow, Engineering Consultant, Great Falls, VA

3. New Requirements for Safety Relief Systems

Todd B. Jekel, Ph.D., P.E., Member, University of Wisconsin-Madison, Madison, WI

Seminar 33

Room: 2000 A

Tonal Noise in HVAC Equipment

Monday, June 26, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 02.06 Sound and Vibration Control

Chair: William B. Rockwood, Member, Trane Co., LaCrosse, WI

Issues related to noise generated by HVAC equipment at discrete frequencies, or “tones,” are reviewed. Noise sources can have effects on sound quality, which are not adequately accounted for by standard metrics such as dBA or NC level. Methods for detecting, measuring and quantifying the strength of tones are presented. Practical applications include fans and screw compressors.

1. Detecting Tones in HVAC Equipment

Jerry G. Lilly, P.E., Member, JGL Acoustics, Inc., Issaquah, WA

2. Fan Tonal Noise: Causes and Effects

Mark W. Fly, P.E., Member, Governair Corp., Oklahoma City, OK

3. Tonal Noise in Screw Compressors

Patrick C. Marks, P.E., Member, York International, York, PA

Seminar 34

Room: 2000 D

Update in Standard 180: Standard Practice for Inspection and Maintenance of HVAC Systems

Monday, June 26, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 09.06 Healthcare Facilities; TC 09.08 Large Building Air-Conditioning Applications

Chair: Carl N. Lawson, Member, Systems Solutions Consultants, Zephyrhills, FL

Many building owners allow HVAC systems to run until they fail and then are forced to pay large maintenance bills as a result. This seminar seeks to illustrate why this is the wrong direction to go with HVAC maintenance. Also discussed is the need to have a planned and positive inspection and maintenance program, giving building owners a sense of relief of knowing their systems are being inspected and maintained in a

professional manner.

1. Establishing a "Raised Bar" to Obtain Quality Contractors and Quality Installations
Glen Hourahan, Member, Air Conditioning Contractors of America, Arlington, VA
2. What is Inspection and Maintenance
Robert G. Baker, Member, BBJ Environmental, Ruskin, FL
3. Measurement, Documentation and Validation/Verification
Jim Noe, Member, ePlus Environmental Solutions, Leawood, KS
4. Developing a Maintenance Plan from Scratch
Thomas R. Coker, Member, Cumberland Gap Tunnel Authority, Middlesboro, KY

MONDAY, 6/26 9:30 a.m.–10:30 a.m.

Transactions 7

Room: 207

Central Chiller Circuitry: Primary/Secondary, Primary Variable Flow and Beyond

Monday, June 26, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 06.01 Hydronic and Steam Equipment and Systems

Chair: Thomas E. Cappellin, P.E., Member, Hammel, Green and Abrahamson, Inc., Milwaukee, WI

Recent concepts in chilled water circuitry of central chiller plants are challenging application of conventional constant-flow-primary-circuit/variable-flow-secondary-circuit systems, which have been the system of choice for many design engineers. These new concepts include primary-pump/variable-flow of chillers in parallel and primary-pump/variable-flow of chillers in series. The development of new circuitry has been spurred on by a search for better energy efficiency, simpler circuitry configuration and lower cost of chilled water circuitry for the central chiller plant.

This session provides design engineers with comparative data to guide them in laying out their next central chiller plant.

1. Chilled Water Plant Retrofit: A Case Study (QC-06-017)

Steven T. Taylor, P.E., Fellow, Taylor Engineering, LLC, Alameda, CA

2. Energy Use and Economic Comparison of Chilled Water Pumping System Alternatives (QC-06-018)

William P. Bahnfleth, Ph.D., P.E., Fellow, Penn State University, University Park, PA; Eric B. Peyer, Grumman/Butkus Associates, Inc., Evanston, IL

Transactions 8

Room: 2000 B

High Density Cooling Issues Update: Summer 2006

Monday, June 26, 2006 9:30 a.m.–10:30 a.m.

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

Chair: Michael K. Patterson, Ph.D., P.E., Member, Intel, Hillsboro, OR

Cooling of high density electronic equipment installations such as data centers and telecommunication facilities are addressed. Power densities of 1000 watts per square meter or higher are increasingly commonplace. Issues of recent concern are provision, distribution and control of adequate airflow, the possibility of a return to liquid cooling, and transitional technologies for cooling.

1. Thermal Profile of World's 3rd Fastest Supercomputer: IBM's ASC Purple Cluster (QC-06-019)

Roger R. Schmidt, Ph.D., P.E., Member and Madhusudan Iyengar, Ph.D., Member, IBM Systems & Technology Group, Poughkeepsie, NY; Stephen Mayhugh, Lawrence Livermore National Laboratory, Livermore, CA

2. Airflow Management in a Liquid-Cooled Data Center (QC-06-020)

Tahir Cader, Ph.D., and Levi J. Westra, ISR, Liberty Lake, WA; Kevin Regimbal and Ryan Mooney, Pacific Northwest National Laboratory, Richland, WA

Transactions 9

Room: 202

HVAC Is for People

Monday, June 26, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 02.01 Physiology and Human Environment

Chair: Lily M. Wang, Ph.D., Member, University of Nebraska, Omaha, NE

This session is part of a series related to human thermal comfort and productivity. Not only is there concern for what is comfort but also to what extent temperature/humidity extremes can be tolerated while being productive. Survival is at stake in these extremes. Papers presented provide insight into basic and practical research being done in the world.

1. Human Responses to Intermittent Work While Wearing Encapsulating Chemical-biological Protective Clothing with Personal HVAC (QC-06-021)

Larry G. Berglund, Ph.D., P.E., Fellow, Leslie Levine, Bruce S. Cadarette and Margaret A. Kolka, Ph.D., U.S. Army Research Institute of Environmental Medicine, Natick, MA

2. Thermal Insulation of Arabian Gulf Male Clothing: Measurements Using a Thermal Manikin (QC-06-022)

Farraj Al-ajmi, Member, College of Technological Studies, Shuwaikh, Kuwait; Dennis L. Loveday, Ph.D., Member and George Havenith, Environmental Ergonomics Research Centre, Leicestershire, UK

Seminar 35

Room: 2000 C

HVAC&R Research Journal, Part 1

Monday, June 26, 2006 9:30:00 a.m.–10:30:00 a.m.

Sponsor: HVAC&R Research Journal

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

Authors present their papers published in the April and July 2006 issues of HVAC&R Research.

1. A Robust Fault Detection and Diagnosis Strategy for Centrifugal Chillers

Shengwei Wang, Ph.D., Member, Hong Kong Polytechnic University, Kowloon, Hong Kong, China

2. Performance of a Run-Around System for HVAC Heat and Moisture Transfer Applications Using Cross-Flow Plate Exchangers and Coupled with Aqueous Lithium Bromide

Carey Simonson, Ph.D., Member, University of Saskatchewan, Saskatoon, SK, Canada

Forum 8

Room: 203

Commissioning vs. Test and Balance: What Should Be Included in the Respective Specifications?

Monday, June 26, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 07.07 Testing and Balancing

Moderator: Gerald J. Kettler, P.E., Member, AIR Engineering and Testing, Inc., Dallas, TX

Commissioning and testing, adjusting and balancing (TAB) are closely associated. Provider agencies sometimes perform both services, but often commissioning and TAB is performed by separate agencies. In order to properly specify each service in separate specifications, the requirements and procedures must be separated in understandable terms. This forum discusses the differences between commissioning and TAB, and how to properly separate the specification requirements and develop proper specification documents.

Forum 9

Room: 206 B

Data Centers and Direct Evaporative Cooling: Are They Compatible?

Monday, June 26, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 05.07 Evaporative Cooling; TC 09.09 Mission Critical Facilities, Technology Spaces and Electronic Equipment

Moderator: Michael S. Sherber, P.E., Member, EMCOR Facilities Services, Inc., Arlington, VA

Co-moderator: C. Mike Scofield, P.E., Life Member, Conservation Mechanical Systems, Sebastopol, CA

Chapter 17, "Data Processing," in the 2003 ASHRAE Handbook, Applications, discusses coupling a direct evaporative component to central air-handling systems in order to use data center return air heat to develop free humidification in winter months. What is the potential for this same humidifier device to develop free cooling ton-hours when ambient dry bulb conditions are above the 55 F supply air set point for a 24/7 mission critical application in various parts of North America? Can it serve as a cooling backup system in the event of refrigeration failure? This forum seeks more information on how the application of evaporative cooling might lead to reduced energy costs for data centers.

Forum 10

Room: 2000 D

Ice Surfacing Equipment and Arena Air Quality: Are They Compatible?

Monday, June 26, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 10.02 Automatic Icemaking Plants and Skating Rinks

Moderator: John P. Scott, Member, Natural Resources Canada, Varennes, QB, Canada

Co-moderator: Wane A. Baker, P.E., Member, Michaels Engineering Inc., La Crosse, WI

Ice resurfacing equipment powered by internal combustion engines emits a variety of air contaminants. Levels within enclosed arenas may pose a health risk, particularly for skaters. Such exposures also may be of special concern for children and other sensitive spectators. While alternative equipment is available, the engine-driven equipment continues to be widely used. How prevalent is their use? What are the constituents of these emissions? What are the possible health effects? What levels have been measured in arenas? What can be done in the way of contaminant capture and/or dilution ventilation? What should codes and standards require?

Forum 11

Room: 2000 A

What Is the Future of the U-factor and Solar Heat Gain Tables in Chapter 31 Fenestration of the ASHRAE Handbook?

Monday, June 26, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 04.05 Fenestration

Moderator: Hakim Elmahdy, Ph.D., P.E., Member, National Research Council of Canada, Ottawa, ON, Canada

How should guidance on fenestration be presented in the ASHRAE Handbook? In the past, when the window's shading coefficient and a value from the solar heat gain factor tables were all that was needed to estimate the peak load contribution of a window, all information needed to manually perform these calculations was included. In the future, engineers may only have to select a location, orientation and building type, and a computer will calculate the solar loads and automatically identify the peak load times and best window types. How should these new proposed methodologies be included in the Handbook?

MONDAY, 6/26 10:45 a.m.–12:15 p.m.

Seminar 36

Room: 2000 D

Advances in Fan Analysis And Design Methods

Monday, June 26, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 05.01 Fans; TC 05.09 Enclosed Vehicular Facilities

Chair: Asesh Raychaudhuri, P.E., Member, FMC, Inc., Sharon, MA

Aerodynamic efficiency and noise estimation using the state-of-the-art analytical/computational techniques are discussed. Design of high-efficiency industrial ceiling fans including the use and validity of CFD tools are addressed, along with a combined CFD and experimental program designed to address the fluid mechanics of flow-interaction between an axial flow fan and a high resistance medium (HRM). In particular, the physics of fan performance alteration in the presence of the HRM is included. This seminar also addresses the basics of axial fan acoustics including a computational model that addresses the interaction between inflow velocity distortion and fan geometry.

1. Design Methods to Increase Efficiency of Large Industrial Ceiling Fans

Richard Aynsley, Ph.D., Member, Big Ass Fans, Lexington, KY

2. Fluid Dynamics of Highly-Coupled Fan and Filter/Heat-Exchanger

Thong Dang, Ph.D., Syracuse University, Syracuse, NY

3. Axial Fan Acoustics: Basic Principles to Applications

Michael Brendel, Ph.D., Member, Lau Industries, Dayton, OH

Seminar 37

Room: 2000 C

Cleanroom Design and CFD Simulation

Monday, June 26, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 09.11 Clean Spaces; TC 04.10 Indoor Environmental Modeling

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

The latest cleanroom design issues and CFD simulation technologies are addressed in this seminar. Updated cleanroom standards and new development are discussed. Primary-secondary-tertiary air handling systems commonly used in cleanrooms to achieve tightly-controlled indoor conditions and use energy efficiently are analyzed. In CFD simulation, modeling methods of particle transport and distributions in enclosed spaces are compared and analyzed; and cleanroom airlock operation optimization and decontamination effectiveness is explored beyond its initial research.

1. Clean Room Standards: An Update

Pete Gardner, P.E., Member, Torcon, Inc, Westfield, NJ

2. Design Strategies of Primary, Secondary and Tertiary Air Handling Systems for Cleanrooms

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

3. Comparison of the Eulerian and Lagrangian Methods for Predicting Particle Transport in Enclosed Spaces

Qingyan (Yan) Chen, Ph.D., Fellow, Purdue University, West Lafayette, IN

4. Further Development of Cleanroom Airlock CFD Simulation to Analyze Decontamination Effectiveness

Kishor Khankari, Ph.D., Member, Fluent, Inc, Ann Arbor, MI

Seminar 38

Room: 2000 B

Exergy Analysis and Sustainability, Part 2: Applications

Monday, June 26, 2006 10:45 a.m.–12:15 p.m.

Sponsor: Sponsor: TG 1 Exergy Analysis for Sustainable Buildings; TC 06.05 Radiant and In-space Convective Heating and Cooling

Chair: Birol Kilkis, Ph.D., Fellow, Watts Radiant and Greenway Technologies, Vienna, VA

In the midst of the energy, environment, humankind, and economy struggle toward sustainable development, Part 2 of this seminar deals with practical aspects of green building design with main emphasis to low-exergy building concept and next-generation of exergy conscious equipment.

1. Overview of Low Exergy HVAC System in Europe

Peter Novak, Ph.D., Fellow, Life Member, Energotech d.o.o., Ljubljana, Slovenia

2. Advanced Low Exergy Systems for Heating and Cooling of Buildings Results and Ongoing Work of the German Alliance Project LowEx

Dietrich Schmidt, Ph.D., Fraunhofer Institute for Building Physics, Kassel, Germany

3. An Exergy Analysis After Katrina: The Need for Green Buildings

Siir Kilkis, Student, Georgetown University, Washington, D.C.

4. An Exergy Analysis of an Automotive Air-Conditioning System

Eric B. Ratts, Ph.D., Member, University of Michigan–Dearborn, Dearborn, MI

Seminar 39

Room: 203

Issues Update: Integrated Building Design to Performance

Monday, June 26, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 07.01 Integrated Building Design; TC 07.09 Building Commissioning

Chair: James W. Gartner, Member, Four Seasons Environmental, Inc., Monroe, OH

The integration of all parties involved in completing a successful building project is becoming critical. From the preliminary phases of design, through the bidding process, then equipment supply and construction, all the way to the final acceptance and warranty period, potential gaps and lack of coordination wreak havoc on performance. As HVAC industry professionals and engineers, our resulting systems are most vulnerable to these shortcomings. This seminar addresses these issues, and helps provide greater success in bottom line facility performance.

1. Addressing the Totality: From Initial Design to Sustainable Building Performance

Gail Ann Lindsey, Design Harmony, Inc., Wake Forest, NC

2. Commissioning: Assuring Integrated Design Performance

Gerald J. Kettler, P.E., Member, AIR Engineering and Testing, Inc., Dallas, TX

3. IBD in Canada: Is Actual Building Performance Delivering the Goods?

Roland Charneau, P.E., Fellow, Pageau Morel and Assoc., Montreal, QB, Canada

Seminar 40

Room: 206 B

Mold Risk Reduction Strategies for New Energy Efficient Homes

Monday, June 26, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 01.12 Moisture Management in Buildings; TC 04.04 Building Materials and Building Envelope Performance

Chair: Carl N. Lawson, Member, Systems Solutions Consultants, Zephyrhills, FL

Avoiding mold in buildings is simple in principle: keep everything dry and mold cannot grow. But we build our homes outdoors. And all buildings leak both air and water. So given time, the odds favor some things getting wet indoors, which means most buildings have some risk of having a mold problem. This seminar provides recommendations on energy efficient residential building assemblies and practices that reduce mold risk. The discussions include a three-part strategy for builders to reduce mold risk, application in production homes, and analytical modeling of energy efficient wall assembly options.

1. A Builder's Guide to Reducing Mold Risk

Lewis G. Harriman, Member, Mason-Grant Consulting, Portsmouth, NH

2. Demonstration of Mold Risk Reduction Strategies in Energy Efficient New Homes

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

3. What's Behind the Stucco? An Evaluation of Exterior Wall Moisture Issues

Christine E. Walker, Ph.D., Associate Member, University of Illinois at Chicago, Chicago, IL

Seminar 41

Room: 2000 A

Preparing for the Next Pandemic: Controlling Transmission of Infectious Diseases in Hospitals

Monday, June 26, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 09.06 Health Care Facilities

Chair: Michael R. Keen, Member, P. Eng., St. Michael's Hospital, Toronto, ON, Canada

Recent outbreaks such as the SARS outbreak in 2003 have shown that transmission of infectious diseases occurs prevalently in hospitals. This seminar series presents theories and experimental results of transmission of airborne and droplet infectious diseases, such as SARS, multidrug-resistant tuberculosis and avian influenza. Applications for effective design of hospital spaces, ventilation systems and environmental conditions are reviewed, including isolation rooms, surgical suites and entire isolation care facilities.

1. Airborne/Droplet Transmission of Infectious Diseases and Effectiveness of Isolation Room Ventilation

Qian Hua, The University of Hong Kong, Hong Kong, China

2. Full-Scale Experimental Apparatus to Study MDR-TB Transmission

Sidney A. Parsons, Member, CSIR Building & Construction Technology, Silverlakes, Gauteng, South Africa

3. Surgical Isolation Suites

Carl C. Schultz, P.E., Member, URS Corp., Columbus, OH

4. Hospital Renovation for SARS: Some Experience from Taiwan

Yie-Zu Robert Hu, Ph.D., Fellow, Industrial Technology Research Institute, Chutung, Hsinchu, Taiwan

Seminar 42

Room: 202

The State of the Art In Liquid Desiccants

Monday, June 26, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 08.12 Desiccant Dehumidification Equipment and Components

Chair: Andrew L. Mongar, Member, American Genius Corp., Lancaster, PA

This seminar examines the state-of-the-art in liquid desiccant air conditioning from a range of perspectives. Presentations cover theoretical modeling, the development of low flow techniques, the use of corrosion inhibitors, the varied applications of new liquid desiccant technologies to commercial and residential outside air treatment, and the new application of liquid desiccants to low temperature cooling. This is a new technology that offers energy saving advantages in outside air treatment and humidity reduction.

1. Test Results from a Low Flow Lithium Chloride Conditioner and Regenerator

Andrew Lowenstein, Ph.D., Member, AIL Research, Princeton, NJ

2. Corrosion Inhibitors for Liquid Desiccant Systems

Bruce M. Urban, Associate Member, FMC Lithium, Charlotte, NC

3. Recent Advances in Refrigerated Warehouse Cooling Using Liquid Desiccant Equipment

William C. Griffiths, Ross Air Systems, Somerville, NJ

4. The Varied Methods of Application of Liquid Desiccant Air Conditioning

Seminar 43

Room: 207

Ventilation and IAQ: The New Standard 62.1 User's Manual

Monday, June 26, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 04.03 Ventilation Requirements and Infiltration; SSPC 62.1

Chair: Brian A. Rock, Ph.D., P.E., Fellow, The University of Kansas, Lawrence, KS

ASHRAE 62.1-2004 includes many improvements compared to previous versions of the standard. For example, the ventilation rate procedure has new calculation methods, and the indoor air quality procedure is more fully described. This seminar presents the new 62.1 User's Manual; both the seminar and the manual will help HVAC designers and others use the new standard.

1. User's Manual and 62's Equipment, O&M and Construction Requirements
Lawrence J. Schoen, P.E., Fellow, Schoen Engineering Inc., Columbia, MD
 2. Standard 62.1 User's Manual: Using the VRP and Demand Controlled Ventilation
Steven T. Taylor, P.E., Fellow, Taylor Engineering, LLC, Alameda, CA
 3. Air Cleaning Requirements in Standard 62.1 and Application of the IAQ Procedure
Christopher O. Muller, Member, Purafil, Inc., Doraville, GA
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TUESDAY, 6/27 7:45 a.m.–9:15 a.m.

Transactions 10

Room: 203

Evacuation Analysis Methods for Mass Transit Facilities and Tunnels

Tuesday, June 27, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 05.09 Enclosed Vehicular Facilities; TC 05.06 Control of Fire and Smoke

Chair: Jeffrey Tubbs, P.E., Member, Arup, Westborough, MA

Below-grade rail stations and tunnels pose unique fire and life safety challenges. Egress systems for these facilities need to balance the depth below grade, connections to safe areas, accessibility of exits, and the time and distance needed to traverse the egress system with the emergency ventilation system and fire service operations. This session provides an overview of an NFPA standard for these facilities (NFPA 130: Standard for Fixed Guideway Transit and Passenger Rail Systems), and address how it can be used to develop exiting designs to compliment the emergency ventilation system design.

1. Timed Egress Requirements for Transit and Passenger Rail Station Evacuation as Described in NFPA 130 (QC-06-023)
Robert C. Till, Ph.D., P.E., John Jay College of Criminal Justice, New York City, NY
 2. Tunnel Emergency Egress and the Mid-Train Fire (QC-06-024)
Mark P. Colino, P.E., Member and Elena B. Rosenstein, Parsons Brinkerhoff Inc., New York, NY
 3. Application of NFPA-130 for Emergency Evacuation in a Mass Transit Station (QC-06-025)
Kai Kang, Ph.D., Member, Hatch Mott MacDonald, Inc., New York, NY
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Transactions 11

Room: 2000 A

Near Zero Energy Homes with Solar

Tuesday, June 27, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 06.07 Solar Energy Utilization

Chair: Svein O. Morner, Ph.D., P.E., Member, Sustainable Engineering Group, Madison, WI

This session presents technologies that can be used to achieve net zero energy buildings along with case studies showing how these technologies have been used to achieve real world results. The papers focus on solar technologies, and energy efficiency technologies and other renewable technologies are presented.

1. Energy Efficiency, SIPS, Geothermal and Solar PV Team Up to Small Near Zero Energy House (QC-06-026)
Jeffrey Christian, Member, Oak Ridge National Laboratory, Oak Ridge, TN; Lauren Richards, Cornell University, Ithaca, NY; Phil Childs, Jerry

Atchley and Hyeun Moon, Oak Ridge National Laboratory, Oak Ridge, TN

2. Design and Optimization of Net-Zero Energy Solar Homes (QC-06-027)

Remi Charron, CANMET Energy Technology Centre–Varenes, Varenes, QB, Canada; Andreas Athienitis, Ph.D., Concordia University, Montreal, QB, Canada

3. An Evaluation of Affordable Prototype Houses at Two Levels of Energy Efficiency (QC-06-028)

Robert Hendron, Associate Member, National Renewable Energy Laboratory, Golden, CO; Ed Hancock and Greg Barker, Mountain Energy Partnership, Boulder, CO; Paul Reeves, Partnership for Resource Conservations, Boulder, CO

4. Systems Design of the Canadian Solar Decathlon House (QC-06-029)

Mark A. Pasini and Andreas Athienitis, Concordia University, Montreal, QB, Canada

Seminar 44

Room: 2000 B

Gas-Phase Air Filtration Case Studies, Part 1

Tuesday, June 27, 2006 7:45:00 a.m.–9:15:00 a.m.

Sponsor: TC 02.03 Gaseous Air Contaminants and Gas Contaminant

Chair: Christopher O. Muller, Member, Purafil, Inc., Doraville, GA

Gas-phase air filtration in various forms is used for applications as varied as airports, archives and museums, control of automobile exhaust, semiconductor cleanrooms, general odor control, hospitals, in-vitro fertilization clinics, outdoor air cleaning, schools and universities, and for energy conservation under the IAQ procedure of ASHRAE Standard 62.1.

This seminar presents case studies describing the application and use of gas-phase air filtration. Presentations provide descriptions of the problems/applications, design considerations, rationale for the selection of gas-phase media/filters/systems, and performance data.

1. Removal of Ozone from Outdoor Air Supply for Occupant Health, Building Material Preservation, and Equipment

Hal Levin, Fellow, Building Ecology Research Group, Santa Cruz, CA

2. Real Life Efficiency of Gas-phase Filters Used in General Ventilation

Alain Ginstet, CETIAT, Villeurbanne, France

3. Case Studies in Indoor Environmental Performance and Energy Management

Barney Burroughs, Presidential Member, Building Wellness Consultancy, Inc., Alpharetta, GA

Seminar 45

Room: 206 B

Heating Load Calculations

Tuesday, June 27, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 04.01 Load Calculation Data and Procedures

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

Heating calculations are an essential part of any heating design. This session describes Canadian heating load calculation methods for heat loss through basements and slabs, systems heating loads and European heat load calculations methods.

1. Heat Losses through Basement and Slab-on-Grade Foundations

Ian Beausoleil-Morrison, Ph.D., Member, CANMET Energy Technology Centre, Ottawa, ON, Canada

2. Heating System Loads

Christopher Wilkins, P.E., Member, Hallam Associates, South Burlington, VT

3. European Perspective in Heating Load Calculation

Olli Seppänen, Ph.D., P.E., Fellow, Helsinki University of Technology, Espoo, Finland

Seminar 46

Room: 202

HVAC&R Research Journal, Part 2

Tuesday, June 27, 2006 7:45:00 a.m.–9:15:00 a.m.

Sponsor: HVAC&R Research Journal

Chair: Reinhard Radermacher, Ph.D., Member, ME Dept/University of Maryland, College Park, MD

Authors present papers published in the April 2006 and July 2006 issues of ASHRAE's HVAC&R Research Journal.

1. Performance of Personalized Ventilation in Conjunction with Mixing and Displacement Ventilation

Arsen Krikor Melikov, Ph.D., Fellow, Technical University of Denmark, Lyngby, Denmark

2. Simulation of a Double-Effect Absorber Cooling System Operating at Elevated Vapor Recompression Levels

William Worek, Ph.D., Member, University of Illinois–Chicago, Chicago, IL

Seminar 47

Room: 2000 D

Mold in Canada

Tuesday, June 27, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 01.12 Moisture Management in Buildings

Chair: Elia Sterling, Member, Theodor Sterling Associates, Vancouver, BC, Canada

With mold an ongoing problem in Canada and the United States, this seminar addresses ways to identify and clean up the situation in both residential and commercial structures.

1. Mold and Buildings: Differences Between Residential and Non-residential Buildings

Ken Ruest, Canada Mortgage and Housing Corp., Ottawa, ON, Canada

2. The Investigation and Abatement of Mold

Michael Glassco, Theodor Sterling Associates, Vancouver, BC, Canada

3. Sensor Technologies for the Detection and Prevention of Mold

Mike Schell, Member, AirTest Technology, Inc., Santa Barbara, CA

Seminar 48

Room: 2000 C

Multi-Vendor Control Integration: Recent Experiences

Tuesday, June 27, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 01.04, Control Theory and Application

Chair: James J. Coogan, P.E., Associate, Siemens Building Technology, Buffalo Grove, IL

Integration of intelligent devices from multiple vendors in one building automation system has become common. Building by building, designers, vendors, integrators and facility operators meet the challenges and find ways to make things work. This session presents up-to-date experience and results from many points of view.

1. Moving Towards Effective Controls Integration

Thomas Hartman, P.E., Member, The Hartman Co., Georgetown, TX

2. Migrating Integrated Systems of the Past

Shirley Hall, Associate, Siemens Building Technology, Buffalo Grove, IL

3. Ups and Downs of Integrating BACnet over the City of Vancouver WAN

David M. Cousins, P.E., Associate, City of Vancouver, Vancouver, BC, Canada

Seminar 49

Room: 207

Refrigeration Loads: From the Floor Up

Tuesday, June 27, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 10.08 Refrigeration Load Calculations

Chair: John Topliss, Member, Refrigeration Components Canada Ltd., Delta, BC, Canada

This seminar addresses refrigeration cooling load requirements, use of calculation methods and selection of equipment and system design.

1. Refrigerated Cooler Floor Loads

Donald Fenton, Ph.D., P.E., Fellow, Kansas State University, Manhattan, KS

2. How Defrost Loads Effect System Capacity

Douglas Reindl, Ph.D., P.E., Member, University of Wisconsin-Madison, Madison, WI

3. Cold Storage Design: Keeping the Cold In and the Moisture Out

Garry A. Peakman, Associate Member, Zeroloc Enterprises Ltd., Richmond, BC, Canada

Seminar 50**Room: 2000 C****Learning from Our Mistakes: An Analysis of Building Envelope Failures**

Tuesday, June 27, 2006 9:30 a.m.–10:30 a.m.

*Sponsor: TC 04.04 Building Materials and Building Envelope Performance**Chair: Sean M. O'Brien, P.E., Associate, Simpson Gumpertz & Heger, Inc., New York, NY*

When designing building enclosures, knowing what details and systems will not work in particular applications can be more valuable than knowing what will. This seminar examines a series of building envelope failures, illustrating how simple design mistakes can lead to significant problems over the life of a building. Questions such as “do I really need an air barrier,” or “is flashing really that important” are answered by reviewing examples of failures involving those components. Cases involving bulk water leakage, moisture migration, and uncontrolled airflows in a variety of commercial and residential buildings are examined.

1. Stumbling Blocks in Multi-unit Residential Projects: Learning from the Mistakes of Others*Robert Bombino, P.E., Member, RDH Building Sciences, Inc., Seattle, WA***2. Avoiding Condensation Problems within Building Envelopes***Garth D. Hall, Member, Raths, Raths & Johnson, Inc., Willowbrook, IL***3. The Cost of Doing It Wrong: Why It Pays to Get it Right the First Time***Sean M. O'Brien, P.E., Associate, Simpson Gumpertz & Heger, Inc., New York, NY*

Seminar 51**Room: 2000 B****ANSI/SMACNA 2005 HVAC Duct Construction Standards**

Tuesday, June 27, 2006 9:30 a.m.–10:30 a.m.

*Sponsor: TC 05.02 Duct Design**Chair: Stephen A. Idem, Ph.D., Member, Tennessee Technological University, Cookeville, TN*

The newly revised SMACNA HVAC Duct Construction Standards 3rd Edition 2005 provides a more user friendly and reorganized document including a new engineering and design chapter; new double-wall duct construction details; expanded pressure class tables; new detailed tables for TDC and TDF joints; expanded midpanel tie rod applications; expanded round duct construction tables and new figures highlighting the conditions of use and limitations for transverse joints, longitudinal seams and external reinforcements.

1. Evolution of the SMACNA HVAC Duct Construction Standards*Eli P. Howard III, Member, SMACNA, Chantilly, VA***2. New ANSI/SMACNA HVAC Duct Construction Standards 3rd Edition***Robert Wasilewski, Member, SMACNA, Chantilly, VA*

Seminar 52**Room: 2000 D****Energy Efficient Data Center Design, Part 1**

Tuesday, June 27, 2006 9:30 a.m.–10:30 a.m.

*Sponsor: TC 09.09 Mission Critical Facilities, Technology Spaces and Electronic Equipment**Chair: Reinhard Seidl, P.E., Associate Member, Taylor Engineering, LLC, Alameda, CA*

The power density per unit area of modern data centers is 50 to 500 times that of traditional office buildings. Also, these facilities run 24/7. The energy efficiency opportunities in these facilities are huge: benchmarking has shown conventional cooling designs with a range of 1.4 watts of cooling energy per watt of server load down to 0.5 watts of cooling energy per watt of server load. Emerging technologies offer the ability to reduce the cooling energy even further. This seminar addresses the tools and techniques needed to achieve energy efficient data centers.

1. Achieving HVAC Efficiency in Data Centers: Obstacles and Opportunities.*Mark Hydeman, P.E., Member, Taylor Engineering, LLC, Alameda, CA***2. Energy Efficiency and Effective Equipment Cooling in Data Centers***Magnus Herrlin, Ph.D., Member, ANCIS Inc., San Francisco, CA***3. A Study of the Effects of Supply Air Temperature on Overall Data Center Energy Usage***Vali Sorell, P.E., Syska Hennessy, San Francisco, CA*

Seminar 53

Room: 202

Fundamentals of Fan Systems

Tuesday, June 27, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 05.01 Fans; TC 05.09 Enclosed Vehicular Facilities

Chair: Asesh K. Raychaudhuri, P.E., Member, FMC, Inc., Sharon, MA

Several criteria exist for fan selection for a specific application, including high thermodynamic efficiency, low sound, low cost, high temperature construction, balancing, low vibration and maintenance. Of course, no one fan can satisfy all the above. This seminar discusses the process to achieve the best selection for the specific application.

1. Fan Selection Basics for Different Applications

Rad Ganesh, Ph.D., P.E., Member, Twin City Fan Companies, Plymouth, MN

2. Mechanical Aspects of Fan Selection

John Cermak, Ph.D., P.E., Member, ACME Engineering & Manufacturing, Muskogee, OK

Seminar 54

Room: 2000 A

Mechanical Integrity for Refrigerant Piping and Vessels

Tuesday, June 27, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 10.01 Custom Engineered Refrigeration Systems

Chair: Daniel J. Dettmers, Member, U.W. Madison, Madison, WI

This seminar discusses many of the failure mechanics that befall refrigerant piping and vessels, particularly the steel items used in industrial refrigeration. Speakers discuss technology and methods to detect and identify these problems. The seminar focuses on meeting OSHA's process safety management requirements.

1. Refrigerant Piping and Vessel Failure Mechanics

Daniel J. Dettmers, Member, University of Wisconsin-Madison, Madison, WI

2. Nondestructive Testing Methods

James Kovarik, Lixi, Inc., Huntley, IL

Seminar 55

Room: 207

MicroCHP—Integrated Space Conditioning and Power Production In Homes, Part 1

Tuesday, June 27, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 01.10 Cogeneration System

Chair: Ronald Fiskum, Member, U.S. Department of Energy, Washington, D.C.

MicroCHP is the coproduction of electric power in home heating systems. A range of technical approaches are under development in North America and Europe to achieve this, including Rankine cycles, Stirling engines, and small gas engines. These systems are typically heat-led and power production is in the 1 kW range. Development activities, energy and environmental benefits, and the economic outlook are discussed.

1. Microgeneration: Technology Options and Economic Perspectives

Evguenly Entchev, Ph.D., CANMET Energy Technology, Ottawa, ON

2. Design Challenges for Micro-CHP

Robert Zogg, Member, TIAX LLC, Cambridge, MA

Forum 12

Room: 203

Role of Residential Forced-Air Systems During Extraordinary Events

Tuesday, June 27, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 06.03 Central Forced Air Heating and Cooling Systems; TC 02.04 Particulate Air Contaminants and Particulate Contaminant Removal Equipment

Moderator: Jeffrey A. Siegel, Ph.D., Member, The University of Texas at Austin, Austin, TX

In case of extraordinary events, including industrial accidents, wildfires, acts of bioterrorism, and natural disasters, some large buildings

have adopted shelter-in-place and other procedures. Occupants of smaller buildings, particularly residences, often have no plan in place to cope with release of contaminants in outdoor air. Further complicating the issue are conflicting information from federal, state and local agencies about appropriate response strategies and the value of occupant actions such as turning on a central HVAC system. This forum explores appropriate strategies for occupant protection.

Forum 13

Room: 206 B

Ventilation of Nail and Beauty Salons on Main Streets and in Malls

Tuesday, June 27, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 09.08 Large Building Air-Conditioning Applications

Moderator: Frank Mills, P.E., Member, P. Eng, Environmental Design Consultants, Chorley, Lancashire, UK

Nail and beauty salons are popular venues, offering a range of beauty therapies and treatments. The use of nail polish and cleaning solvents and chemicals creates smells and causes indoor air quality problems. What guidance on these venues should be included in the ASHRAE Handbook and how should the information be presented? Is this area of retail likely to increase and use more substances requiring ventilation? How can comfort and IAQ be achieved without destroying the unique atmosphere of these centers?

Tuesday, 6/27 10:45 A.M.–12:15 P.M.

Transactions 12

Room: 203

How Low Can You Go? Low-Energy Buildings through Integrated Design

Tuesday, June 27, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 02.08 Building Environmental Impacts and Sustainability

Chair: Drury B. Crawley, Member, U.S. Department of Energy, Washington, D.C.

With recent interest in green buildings, a number of buildings designed to save significant amounts of energy have been constructed. But how are these buildings operating? This session brings together case studies of low-energy, sustainability, and integrated design in residential and commercial buildings. Topics include evaluation of individual technologies, design process, lessons learned, and long-term measured energy performance. This is the second in a series about the operating performance of low-energy buildings worldwide.

1. Case Study on the Energy Performance of the Zuckerman Institute for Connective Environmental Research (The ZICER Building) (QC-06-030)
Charlotte H. Turner and Norman K. Tovey, Ph.D., University of East Anglia, Norwich, UK
2. Analysis of Residential Systems Targeting Least-Cost Solutions Leading to Net Zero Energy Homes (QC-06-031)
Ren Anderson, Ph.D., Member and Craig Christensen, National Renewable Energy Laboratory, Golden, CO; Scott Horowitz, University of Colorado, Golden, CO
3. High-Performance Retail Store with Integrated HVAC Systems (QC-06-032)
Frederic Genest, P.E., Member, Pageau Morel and Associates, Montreal, QC, Canada; Vasile Minea, Ph.D., P.E., Member, Hydro-Quebec, Shawinigan, QC, Canada
4. BigHorn Home Improvement Center Energy Performance (QC-06-033)
Michael Deru, Ph.D., Member, Shanti D. Pless, Member and Paul A. Torcellini, Ph.D., P.E., Member, National Renewable Energy Laboratory, Golden, CO

Transactions 13

Room: 202

Validation of Building Simulation Programs

Tuesday, June 27, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 04.07 Energy Calculations

Chair: Charles S. Barnaby, Member, Wrightsoft, Lexington, MA

Validation allows identification and correction of errors in engineering models and their implementation in building simulation programs. ASHRAE Standard 140, Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs, defines a set of validation techniques for assessing core program capabilities. These presentations address Standard 140 methodology and application plus additional validation efforts.

1. Model Validation and Testing: The Methodological Foundation of ASHRAE Standard 140 (QC-06-034)
Ronald D. Judkoff, Member, National Renewable Energy Laboratory, Golden, CO; Joel Neymark, Member, J. Neymark & Associates, Lakewood, CO
2. Accuracy Tests for Simulations of VAV Dual Duct, Single Zone, Four Pipe Fan Coil and Four Pipe Induction Air Handling Systems (865-RP)

(QC-06-035)

Grenville K. Yuill, Ph.D., Fellow, Life Member, University of Nebraska-Lincoln, Omaha, NE; J.S. Haberl, Ph.D., P.E., Member, Texas A&M University, College Station, TX; J.S. Caldwell, Member, James Posey Associates

3. Integrated Comparative Validation Tests as an Aid for Building Simulation Tool Users and Developers (QC-06-036)

Paul A. Strachan, Ph.D., Georgios Kokogiannakis and Iain Macdonald, University of Strathclyde, Glasgow, Scotland, UK; Ian Beausoliel-Morrison, CANMET Energy Technology Centre, Ottawa, ON, Canada

4. A Comparison of DOE-2.1E Daylighting and HVAC System Interactions to Actual Building Performance (QC-06-037)

Peter G. Loutzenhiser, Student Member, and Gregory M. Maxwell, Ph.D., Member, Iowa State University, Ames, IA

Seminar 56

Room: 2000 A

Can the Results of Saving Energy Also Satisfy Occupants?

Tuesday, June 27, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 02.01 Physiology and Human Environment

Chair: Jaap Hogeling, Member, ISSO: Dutch Building Services Research Institute, Rotterdam, The Netherlands

In recent years, concerns about climate change and decreasing supplies of non-renewable fuel have increased research attention on the energy efficiency of ventilating, heating and cooling buildings. At the same time, providing satisfactory, healthy and productive spaces for occupants continues to be an important concern. At present there is some debate on whether these two goals are mutually exclusive. This seminar explores whether, and how, energy-efficiency and work spaces that do not reduce occupant performance can be achieved.

1. Energy-efficient and Satisfactory to Occupants? Two Examples of Competing Goals as Applied to Temperature Ramping Strategies and Personal Environmental Controls

Kate E. Charles, Ph.D., National Research Council Canada, Ottawa, ON, Canada

2. Comfort and Productivity: Both Are Too Variable and Multi-functional to Allow Reliable Linkage

Ralph F. Goldman, Ph.D., Fellow, Comfort Technology, Inc., Plymouth, MA

3. Using ASHRAE Standard 55 to Save Energy

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

Seminar 57

Room: 2000 B

Condensation Control and Air Quality Issues in Pool Enclosures

Tuesday, June 27, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 08.10 Mechanical Dehumidification Equipment and Heat Pipes

Chair: Timothy A. Sechrist, Associate Member, PoolPak International, York, PA

Indoor swimming pools have unique requirements for HVAC designers, architects and users. This seminar identifies potential problem areas and proposes solutions. Selection of the equipment is not the first step in proper natatorium design. Consideration of the building design, proper control of pool water chemistry and proper distribution of the conditioned air are mandatory. Designing a natatorium is not the same as an office building, and design professionals must be familiar with these issues.

1. Building Envelope Design Natatoriums

Edwin M. Wallover, III, Wallover Architects, Inc., Lancaster, PA

2. Sizing and Application of Dehumidifiers for Poolroom Humidity Control

Craig Burg, Associate Member, Desert Aire Corp., Milwaukee, WI

3. Indoor Swimming Pools: How Important Is Air Distribution?

Patrick A. Reynolds, PoolPak International, York, PA

4. Pool Chemistry and Air Quality: The Dehumidifier Is Not the Cure All

Mick Nelson, USA Swimming, Colorado Springs, CO

Seminar 58

Room: 2000 D

Energy Efficient Data Center Design, Part 2

Tuesday, June 27, 2006 10:45 a.m.–12:15 p.m.

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

Chair: Reinhard Seidl, P.E., Associate Member, Taylor Engineering, LLC, Alameda, CA

The power density per unit area of modern data centers is 50 to 500 times that of traditional office buildings. Also, these facilities run 24/7. The energy efficiency opportunities in these facilities are huge: benchmarking has shown conventional cooling designs with a range of 1.4 watts of

cooling energy per watt of server load down to 0.5 watts of cooling energy per watt of server load. Emerging technologies offer the ability to reduce the cooling energy even further. This seminar addresses the tools and techniques needed to achieve energy efficient data centers.

1. Best Practices Identified through Benchmarking Data Centers

William Tschudi, Member, Lawrence Berkeley National Laboratory, Berkeley, CA

2. Liquid Cooling Technologies: Energy and Performance Comparisons

Fred Stack, Associate Member, Liebert, Columbia, OH

3. Energy Considerations in Selecting Cooling Equipment in Data Centers

Mukesh Khattar, Ph.D., Member, Oracle, Redwood Shores, CA

Seminar 59

Room: 206 B

Energy Reduction in Ice Rink Design

Tuesday, June 27, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 10.02 Automatic Icemaking Plants and Skating Rinks

Chair: John Topliss, Member, Refrigeration Components Canada Ltd., Delta, BC, Canada

This seminar deals with methods to reduce energy in ice rinks. Refrigeration systems consume a large percentage of energy in skating facilities. Strategies to reduce power usage with new technologies are outlined.

1. Energy Reduction in Skating Rink Design

Ted Martin, P.E., Member, CIMCO Refrigeration, Toronto, ON, Canada

2. Applying Geothermal Technology to Ice Rinks

Roger Taliotis, Associate Member, Ice Kube Systems, Waterloo, ON, Canada

3. Advances in Ice Rink Research

John Scott, Member, Natural Resources Canada, Varennes, QB, Canada

Seminar 60

Room: 207

MicroCHP: Integrated Space Conditioning and Power Production in Homes, Part 2

Tuesday, June 27, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 06.10 Fuels and Combustion; TC 01.10 Cogeneration Systems

Chair: Ronald Fiskum, Member, U.S. Department of Energy, Washington, D.C.

MicroCHP is the coproduction of electric power in home heating systems. A range of technical approaches are under development in North America and Europe to achieve this, including Rankine cycles, Stirling engines, and small gas engines. These systems are typically heat-led and power production is in the 1 kW range. Development activities, energy and environmental benefits, and the economic outlook are discussed.

1. Predicted Energy and Cost Savings of Residential Micro-CHP

Joseph Gerstmann, Member, Advanced Mechanical Technology, Inc., Watertown, MA

2. Practical Technology for Residential Combined Heat and Power

Eric Guyer, Associate Member, Climate Energy LLC, Medfield, MA

3. Micro Cooling, Heating, and Power Development for Residential Applications

Benoit Olsommer, United Technologies Research Center, E. Hartford, CT

Seminar 61

Room: 2000 C

Recent Regulatory Developments in Domestic Refrigeration

Tuesday, June 27, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 08.09 Residential Refrigerators and Food Freezers

Chair: Paul V. Sikir, Associate, Sub-Zero Freezer Co., Madison, WI

Topics discussed in this seminar include emissions of HFCs, DOE standards priority setting, and comparison of global minimum efficiency standards for refrigerators/ freezers.

1. Recommended Practices to Reduce the Emissions of HFCs from Refrigerator-Freezer Factories

Lawrence R. Wethje, P.E., Member, Association of Home Appliance Manufacturers, Washington, D.C.

2. Assessment of Changes to Energy Conservation Standards for Residential Refrigerator-Freezers

Detlef Westphalen, Ph.D., P.E., TIAX LLC, Cambridge, MA

3. Comparison of Global Minimum Efficiency Standards for Refrigerators/Freezers

Pradeep K. Bansal, Ph.D., Member, The University of Auckland, Auckland, New Zealand

Poster Session 11:00 a.m.–1:00 p.m.**Room: 200 C****A Thermal and Moisture Property Database for Common Building and Insulation Materials (RP-1018) (QC-06-044)**

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

*Sponsor: TC 04.04 Building Materials and Building Envelope Performance**Mavinikal K. Kumaran, Ph.D., National Research Council Canada, Ottawa, ON, Canada*

ASHRAE RP-1018 has resulted in a unique database containing hygrothermal properties of common building and insulation materials used in North America. Properties include thermal conductivity, equilibrium moisture content, water vapor transmission characteristics, water absorption coefficient, moisture diffusivity and airflow characteristics. The paper lists basic information on the materials and summarizes the principles of the experimental procedures.

Air Distribution in a Room with Ceiling-Mounted Diffusers: Comparison with Wall-Mounted Diffuser, Vertical Ventilation and Displacement Ventilation (QC-06-045)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Peter V. Nielsen, Ph.D., Fellow and Thomas Heby, Bertil Moeller-Jensen, Ramboell Denmark, Aalborg

The flow of air through the porous media used as building insulation has the potential to recover energy normally lost through the building envelope via conduction. To examine the potential for energy recovery, ASHRAE research was conducted through laboratory work with constructed wall sections and field studies with a test building. Results, outlined in this paper, show that the energy recovery potential is strongly dependent on air flow rate, crack geometry and flow direction. The work indicated that air flowing through insulated cavities could result in significant changes in the apparent thermal resistance of wall sections.

Air Quality in Transportation Cabins, Part 1: How Much Do We Know About It? (QC-06-046)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Xiaoying Cheng, Student Member, Zhongchao Tan, Associate Member and Richard Tay, University of Calgary, Calgary, AB, Canada

Recent field studies of air quality in transportation cabins are summarized in this paper. Overall, limited field data are available to the public. A comparison of methodologies showed that no common instrumentation was used in the field measurements, even for the identical indoor air quality (IAQ) parameters. Therefore, care should be exercised when comparing the results from different studies. There were limited field data available in ground transportation cabins, and no data have been reported for commercial truck cabins.

Air Quality in Transportation Cabins, Part 2: Field Measurement of In-Truck Air Quality (QC-06-047)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Zongchao Tan, Associate Member, Xiaoying Cheng, Student Member and Richard Tay, University of Calgary, Calgary, AB, Canada

A portable air quality monitoring system was developed to monitor the indoor air quality in a truck cabin used for in-city transportation. Temperature, relative humidity, and the levels of various airborne contaminants were measured. Comparison with the field data in motorcars and air planes showed that the concentrations of CO and NO₂ were higher in the truck cabin than in other transportation cabins.

Calculation of the Thermal Loads of an Ice Rink Using a Zonal Model and TRNSYS (QC-06-048)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Ahmed Daoud, M.Sc. and Nicolas Galanis, Ph.D., Universite de Sherbrooke, Sherbrooke, QB, Canada

A municipal ice rink in Montreal was modeled and its transient thermal behavior evaluated for a typical year using a zonal model coupled to building energy simulation software. Results show the seasonal effects as well as those of the occupation and the resurfacing on the temperature of the ice, of the air and on the average and maximum monthly load transmitted towards the brine. They also show the effect of the air flow in the interior of the building on the temperatures and loads.

Cooling Load and Environmental Measurements in a Canadian Ice Rink (1289-RP) (QC-06-049)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

*Sponsor: TC 10.02 Automatic Icemaking Plants and Skating Rinks**M. Ouzzane, Ph.D., CANMET Energy Technology Centre, Varennes, QB, Canada; R. Zmeureanu, Ph.D., Member, P.Eng., Concordia University, Montreal, QB, Canada; J. Scott, Member, R. Sunye, Ph.D., D. Giguere, P.Eng., and O. Bellache, Ph.D., CANMET Energy Technology Centre, Varennes, QB, Canada*

This paper presents preliminary measurements performed in an indoor ice rink. The results include the cooling load, the air temperature variation at several locations, the ice temperature and the brine temperature. The measured data will be used for the verification and calibration of a new numerical model that was developed for the research project 1289-RP.

Development and Performance of a Retrofittable, High-Efficiency, Grease Filter System for Kitchen Hoods (QC-06-050) (WITHDRAWN)

Experimental and Numerical Investigation on Cooling Characteristics of Partition Air Supply System (QC-06-051)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Kybum Jeong, Yuhan College, Bucheon, Kyungki, Korea; Zhiqiang Zhai, and Moncef Krarti, University of Colorado, Boulder, CO

This paper evaluates the cooling performance of a personalized partition air supply system, a ceiling air supply system, and an under-floor air supply system using results obtained from full-scale chamber experiments and CFD simulations. Experimental and simulation results indicate that the partition supply system provides better indoor thermal comfort levels than the ceiling supply system and the under-floor supply system.

Fenestration Performance Maps (QC-06-052)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Jeet T. Sengupta, Kirby S. Chapman and Ali Keshavarz, Kansas State University, Manhattan, KS

This paper discusses the development of a fenestration performance map to help building system designers cross examine a code compliant fenestration system from the human comfort standpoint. Human thermal comfort is influenced by the presence of a fenestration system due to different thermal and optical properties it possesses in comparison to the walls. Thus, sizing the fenestration system from the thermal comfort standpoint remains a challenge for designers. This paper presents a possible solution with the map to help designers make judicious choices when selection a fenestration system.

Heat Transfer Pathways in Underfloor Air Distribution (UFAD) Systems (QC-06-053)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Fred S. Bauman, P.E., Member, Hui Jin, Ph.D. and Tom Webster, P.E., Member, University of California, Berkeley, CA

This paper reports on investigation of primary pathways for heat to be removed from a room with UFAD under cooling operation. A model was used to compare the relative magnitudes of the heat being removed through two primary pathways: heat extraction via warm return air exiting the room at ceiling level or through the return plenum, and heat entering the underfloor supply plenum through the slab from the floor below or raised floor panels from the room above. Results showed that up to 40 percent of the cooling load is transferred into the supply plenum while 60 percent is accounted for by the return air extraction rate.

Testing and Modeling of Underfloor Air Supply Plenums (QC-06-054)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Hui Jin, Ph.D., Fred Bauman, P.E., Member and Tom Webster, P.E., Member, University of California, Berkeley, CA

The use of an underfloor plenum to deliver conditioned air directly into the occupied zone of the building distinguishes underfloor air distribution (UFAD) systems from conventional ducted overhead systems. This paper describes the development, validation, and application of a computational fluid dynamics (CFD) model for predicting the airflow and thermal performance of underfloor air supply plenums. Implications for the design and operation of underfloor air supply plenums are discussed.

Improved Supermarket Refrigeration and Heat Recovery Systems (QC-06-055)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Vasile Minea, Ph.D., P.E., Member, Hydro-Quebec, Shawinigan, QC, Canada

The main issues facing the supermarket refrigeration industry are the phase-out of ozone-depleting refrigerants and the improvement of refrigeration waste heat recovery. The system presented in this paper involves secondary fluid loops on both condensing and refrigerating sides, with water-to-air heat recovery heat pumps. This improved concept has demonstrated its ability to reduce by at least 82% the quantity of primary refrigerant required. It has also a considerable potential to reduce combined refrigeration and HVAC energy use in stores located in northern climates compared to multiplex refrigeration systems with more conventional heat recovery approaches.

Infiltration Heat Recovery, Part 1: Field Studies in an Instrumented Test Building (RP-1169) (QC-06-056)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Sponsor: TC 05.12 Ventilation Requirements and Infiltration

Mark Y. Ackerman, James D. Dale and David J. Wilson, University of Alberta, Edmonton, AB, Canada

The flow of air through the porous media used as building insulation has the potential to recover energy normally lost through the building envelope via conduction. This paper shows that the energy recovery potential is strongly dependent on the fraction of the building envelope that participates in the exchange process. Given the unknowns, number of cracks or holes, crack geometry and location, the traditional methods used to calculate component U-value are adequate. No allowance for air infiltration, other than the traditional methods of calculating the energy impact, are needed.

Infiltration Heat Recovery, Part 2: Laboratory Studies of Two Test Panel Geometries (RP-1169) (QC-06-057)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Sponsor: TC 05.12 Ventilation Requirements and Infiltration

Mark Y. Ackerman, James D. Dale and David J. Wilson, University of Alberta, Edmonton, AB, Canada

The flow of air through the porous media that is used as building insulation has the potential to recover energy normally lost through the building envelope via conduction. This paper shows that the energy recovery potential is strongly dependent on air flow rate, crack geometry and flow direction. The work indicated that air flowing through insulated cavities could result in significant changes in the apparent thermal resistance of the wall sections.

Optimal Daylight Factor for Energy Efficient Toplighting System (QC-06-058)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Younju Yoon, Ph.D., Student Member, William P. Bahnfleth, Ph.D., P.E., Fellow; and Martin Moeck, Ph.D., Member, R. Mistrick, Ph.D., P.E., Penn State University, University Park, PA

Skylights can introduce considerable heat gain and loss that may offset the benefits of electric light savings and cause an increase in yearly net energy use. This study examines the impacts of aperture size for four combinations of toplighting strategies and glazing types on the total yearly energy loads for a prototypical open office space in four climates. The study shows that toplighting systems designed to meet a 2 percent daylight factor are not optimal. The optimum daylight factor varies depending on toplighting type, local climate, and the thermal and solar heat gain properties of the glazing.

Performance Analysis of Standing Column Well Ground Heat Exchanger Systems (QC-06-059)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Zheng Deng O'Neill, Ph.D., P.E., Member, Cimetrics, Boston, MA; Jeffrey D. Spittle, Ph.D., P.E., Fellow, Oklahoma State University, Stillwater, OK; Simon J. Rees, Ph.D., Member, C.Eng., De Montfort University, Leicester, UK

Simulation studies are presented to examine the thermal and economic performance of standing column well with and without groundwater bleed in different locations in the United States. The annual simulations are based on a simplified standing column well model, which has been integrated into an hourly building energy simulation program. The required design depth and energy costs from standing column well systems are compared with that of single U-tube closed-loop systems. Results show that the standing column well systems require the less length of borehole. A comparative life cycle cost analysis is conducted considering 20-year system operation.

Poultry Slaughtering Plants: Concentrations of Microbial Aerosols in Poultry Slaughtering and Processing Plants (RP-834) (QC-06-060)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Sponsor: TC 10.09 Refrigeration Application for Foods and for Beverages

Albert J. Heber, Ph.D., P.E., Member, Michael W. Peugh, Member, Neil J. Zimmerman, Ph.D., P.E. and Richard H. Linton, Ph.D., Purdue University, West Lafayette, IN

Concentrations of airborne microorganisms were measured at four poultry slaughtering plants during four one-day visits using Anderson single- and six-stage viable particle (bioaerosol) samplers. Nonselective bioaerosols including total aerobic mesophilic bacteria, psychotropic bacteria, and yeasts and molds were measured at approximately 40 sites in and around each plant. Bioaerosol concentrations were highest in shackling and defeathering areas and decreased with product flow through the plant until they approached outside levels in packaging areas.

Proposed Methodology and Application of Simulated Wind-Driven Rain Infiltration in Building Envelope Experimental Testing (QC-06-061)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Anik D. Teasdale-St. hilaire, Ph.D., Student Member, P.Eng., Morrison Hershfield Ltd., Vancouver, BC, Canada; Dominique Derome, Ph.D., Concordia University, Montreal, QB, Canada

One of the building envelope's functions is to control rain infiltration into the back wall. But due to the complexity of envelope junctions, water may find its way past the weather barrier and into the stud space, possibly causing damage to materials found within. This shows a need to devise methods to study the capacity of wall assemblies to deal with the ability of walls to sustain small quantities of water infiltration. A wetting methodology was developed to simulate driving rain infiltration for large-scale building envelope testing.

Risk Assessment of a Power Plant: Evaluating the Security of a Supervisory Control and Data Acquisition (SCADA) System (QC-06-062)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Scott D. Lathrop, Christopher L. Gates, Darrell D. Massie, Ph.D., P.E., and John M.D. Hill, Ph.D., United States Military Academy, West Point, NY

With the increased potential of a bona fide cyber terrorist attack and the possibility of a future "war in the wires," networks connected to critical infrastructures must continue to be sterilized. This paper provides a risk assessment of an existing operational computer network used to control a boiler system generating power and heat for an installation. The methodology used in evaluating the security of the system is described along with specific recommendations for minimizing the risk associated with connecting the network to the Internet for the purposes of remote data collection and administration.

Selection Charts for Sizing Adiabatic Capillary Tubes (QC-06-063)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Somchai Wongwises and Worachest Pirompugd, King Mongkut's University of Technology Thonburi, Bangkok, Thailand

The paper provides new selection charts for the sizing of adiabatic capillary tubes operating with alternative refrigerants. The selection charts are presented for some alternative refrigerants and a wide range of operations. They can be used to select the capillary tube size from the flow rate and flow condition or to determine mass flow rate directly from a given capillary tube size and flow condition.

Solar Irradiation and Coincident Dry Bulb Temperature Selection for Load Calculations (QC-06-064)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Geoff Levermore and David Chow, Ph.D., Manchester University, Manchester, UK

Traditionally in the determination of heat loads in summer, internal solar heat gains are calculated using near-extreme solar irradiation data. The latter are typically from the ASHRAE Handbook clear sky model. Combining independent near extreme-values and modeled data can lead to more severe design conditions than are likely in reality. A method of determining solar and synoptic near-extreme values from measured values is proposed based on examination of the cumulative distribution functions. Examination shows the method to be robust and sensitive to changes in weather parameters. Such a method is also likely to provide more realistic design conditions.

Study on Comfort and Energy Consumption of Comfort and IAQ Based Air-Conditioner Control (QC-06-065) (WITHDRAWN)

Tracer Study of Airborne Disease Transmission in an Aircraft Cabin Mockup (QC-06-066)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Aijun Wang, Ph.D., Associate Member; and Yuanhui Zhang, University of Illinois at Urbana-Champaign, Urbana, IL; Jennifer L. Topmiller, James S. Bennett and Kevin H. Dunn, National Institute for Occupational Safety and Health, Cincinnati, OH

This paper reports a study on the airborne transmission of the infectious diseases in the mockup of a Boeing 767-300 aircraft cabin. Results show that the close proximity between occupants increased the exposure risk, and that the location of the release source affected airborne transmission. In real aircrafts, one way to decrease exposure risk would be to move the release source from the center to the sides or from the back seats to the front seats. This would result in discharging a larger portion of the pollutants directly to the return air duct before they spread to other locations. Increasing the total air supply rate could also lower the exposure risk.

Two-Dimensional Transient Model of Airflow and Heat Transfer in Ice Rinks (1289-RP) (QC-06-067)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Sponsor: TC 10.02 Automatic Icemaking Plants and Skating Rinks

Omar Bellache, Ph.D., CANMET Energy Technology Centre, Varennes, QB, Canada; Nicolas Galanis, Ph.D., Universite de Sherbrooke, Sherbrooke, QB, Canada; Mohamed Ouzzane, Ph.D., Roberto Sunye, Ph.D. and Daniel Giguere, P.Eng., CANMET Energy Technology Centre, Varennes, QB, Canada

A transient two-dimensional model of air movement as well as heat and mass transfer in an ice rink was developed and tested by comparing its predictions with measured values in a Montreal municipal ice rink. It was then used to predict the daily heat flux profiles into the ice by convection, radiation, condensation and resurfacing operations for a representative configuration and average steady periodic meteorological conditions. The heat loads from the ground and dissipation in the floor pipes were also calculated. The effects of climate and some design parameters or operating conditions on the daily loads were evaluated and analyzed.

Use of First Law Energy Balance as a Screening Tool for Building Energy Data I C Methodology (QC-06-068)

Tuesday, June 27, 2006 11:00 a.m.–1:00 p.m.

Xiaojie Shao and David E. Claridge, Ph.D., P.E., Texas A&M University, College Station, TX

This paper presents a new methodology for screening measured data from buildings where heating, cooling and electricity consumption are separately recorded. It defines energy balance load (EBL) as the difference between the heating requirements plus the electric gains in the building and the cooling coil loads. It then applies first law energy balance in conjunction with the concepts of analytical redundancy, trend checking, sensitivity and uncertainty analysis to develop a methodology using measured values of EBL to identify bad data. This paper presents the theoretical basis for the methodology and illustrates its use on samples of measured building data.

TUESDAY, 6/27 12:30 p.m.–1:30 p.m.

Forum 14

Room: 202

Energy Efficient Commercial Kitchen Ventilation Designs: Do Government Agencies Help or Hurt

Tuesday, June 27, 2006 12:30 PM - 1:30 PM

Sponsor: TC 05.10 Kitchen Ventilation

Moderator: Stephen L. Brown, Member, LCSysytems, Dublin, OH

The Canadian Gas Research Institute published reports in 1996 that documented food service facilities as the commercial building sectors highest per square foot user of energy. These reports also documented commercial kitchen ventilation (CKV) systems as one of the major energy

consumers in many food service facilities. This forum discusses the ways governing and code agencies can help or impede implementation of energy saving CKV technologies as well how ASHRAE can promote responsible energy conscious codes, standards and policies.

Forum 15

Room: 207

Selecting the Best Ultraviolet Lighting System for the Application

Tuesday, June 27, 2006 12:30 PM - 1:30 PM

Sponsor: TC 2.3 Gaseous Air Contaminants and Gas Containment Removal Equipment

Moderator: Morton H. Blatt, Fellow, Energy Utilization Consultant, Mountain View, CA

The forum continues a recent series of successful seminars and forums on ultraviolet lighting as an emerging technology for improving the indoor environment. There are several types of ultraviolet lighting systems deployed to improve air quality, health, productivity and energy use in commercial buildings. This forum invites proponents of UVC systems used for: cleaning the air in ducts; upper room disinfection; and coil and surface cleaning; to explore the relative advantages and disadvantages of each system. The applications best suited to each of these types of systems will be discussed as well as guidelines for their installation and operation.

WEDNESDAY, 6/28 7:45 a.m.–9:15 a.m.

Seminar 62

Room: 202

An Update on Environmental Health Research and Applications

Wednesday, June 28, 2006 7:45 a.m.–9:15 a.m.

Sponsor: Environmental Health Committee

Chair: Wane A. Baker, P.E., Member, Michaels Engineering Inc., La Crosse, WI

The range of work within environmental health is highlighted in this seminar. This includes field data from recent studies on particulate matter concentrations in commercial buildings; the prevention of Legionellosis in health care settings (see special June issue of the ASHRAE Journal focusing on health care); an expert practitioner's view on the direction and application of environmental health research; and a review of emerging contaminant control technologies.

1. Particulate Levels in Commercial Buildings

Wayne R. Thomann, Duke University Medical Center, Durham, NC

2. Preventing Legionellosis in Healthcare Facilities

William F. McCoy, Ph.D., Member, Phigenics, LLC, Naperville, IL

3. Practical Applications in Environmental Health

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

4. Overview of UV and Photocatalytic Oxidation Technologies

Ronald J. Kessner, P.E., Member, Phoenix Integrated Technologies, Ponte Verda Beach, FL

Seminar 63

Room: 207

Cooling Effects of Elevated Local Air Velocities

Wednesday, June 28, 2006 7:45 a.m.–9:15 a.m.

Sponsor: SSPC 55

Chair: Richard M. Aynsley, Ph.D., Member, Big Ass Fans, Lexington, KY

Cooling effects of local air velocity are provided for in ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy. These provisions offer a means to increase cooling energy efficiency in air-conditioned spaces and enhance summer thermal comfort in naturally conditioned spaces. Information in Standard 55 is limited compared to a similar standard ISO 7730-2005. Speakers expand on information in Standard 55 to enable professionals to better use these energy-saving provisions.

1. Estimating Cooling Effects of Elevated Local Air Velocities

Richard M. Aynsley, Ph.D., Member, Big Ass Fans, Lexington, KY

2. Local Air Supply at Workstations for Energy-Efficient Summer Comfort

Hans F. Levy, P.E., Life, Argon, Naples, FL

Seminar 64

Room: 2000 B

Gas-Phase Air Filtration Case Studies, Part 2

Wednesday, June 28, 2006 7:45:00 a.m.–9:15:00 a.m.

Sponsor: TC 02.03 Gaseous Air Contaminants and Gas Contaminant

Chair: Christopher O. Muller, Member, Purafil, Inc., Doraville, GA

Gas-phase air filtration in various forms is used for applications as varied as airports, archives and museums, control of automobile exhaust, semiconductor cleanrooms, general odor control, hospitals, in-vitro fertilization clinics, outdoor air cleaning, schools and universities, and for energy conservation under the IAQ procedure of ASHRAE Standard 62.1. This seminar presents case studies describing the application and use of gas-phase air filtration. Presentations provide descriptions of the problems/applications, design considerations, rationale for the selection of gas-phase media/filters/systems, and performance data.

1. Creating a True "Preservations Environment" for Our Cultural Heritage

Christopher O. Muller, Member, Purafil, Inc., Doraville, GA

2. Purifying Air in ETS Environmenta for Free

Jeff Roseberry, ProMark Associates, Inc., Skokie, IL

3. Overview of Gas-Phase Filtration for Building Protection

Brian Krafthefer, Fellow, Honeywell Automation and Control Solutions, Minneapolis, MN

Seminar 65

Room: 2000 D

How to Apply ASHRAE Standard 62.1 to Existing Buildings

Wednesday, June 28, 2006 7:45 a.m.–9:15 a.m.

Sponsor: SSPC 62.1

Chair: Hoy Bohanon, P.E., Member, Bohanon Engineering PLLC, Winston-Salem, NC

ASHRAE Standard 62.1-2004 is the new minimum standard for ventilation and acceptable indoor air quality. In the past, ventilation standards were applied to new buildings by incorporation of ventilation rates into building codes that apply to new construction. This standard contains mandatory language applying to topics beyond the ventilation rates, including equipment and system design, operations and maintenance. Some mandatory requirements clearly apply to existing buildings while application of other requirements may be optional.

1. What Does ASHRAE Standard 62.1-2004 Say About Existing Buildings and Why?

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

2. Using ASHRAE 62.1-2004 in Acquisition, Operations and Maintenance of Existing Buildings

Francis M. Gallo, P.E., Member, Brandywine Realty Trust, Harleysville, PA

3. Applying ASHRAE Standard 62.1 in Building Renovation and Tenant Upfit Projects

Michael S. Sherber, P.E., Member, Emcor Facilities Services, Inc., Arlington, VA

Seminar 66

Room: 203

New Directions in Climate Information and Modeling

Wednesday, June 28, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 04.02, Weather Information

Chair: Y. Joe Huang, Ph.D., Member, Lawrence Berkeley National Laboratory, Berkeley, CA

This session examines new and evolving technologies and modeling techniques for climatic data acquisition, including microclimatic effects of the urban street canyon as compared to local recorded weather station data, use of satellite remote sensing for gathering radiation and weather data for the buildings and renewable energy industries, and other virtual modeling techniques to improve accuracy of meteorological data.

1. A Computer Model for Predicting Air Temperature in Urban Street Canyons from Measured Data at a Standard Weather Station

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

2. Application of WMO/NASA Radiation and Weather Data to the Buildings and Renewable Energy Industries

Charles H. Whitlock, Ph.D., P.E., Associate, NASA Langley Research Center, Hampton, VA

3. The Virtual Met Tower and Mesoscale Modeling

Ronald L. Petersen, Ph.D., Member, CPP, Inc., Ft. Collins, CO

Seminar 67

Room: 206 B

Residential Load Calculation Practicality

Wednesday, June 28, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 09.05 Residential and Small Building Applications

Chair: Charles H. Culp, Ph.D., P.E., Fellow, Texas A&M, College Station, TX

How can the design/academic communities and residential contractors agree on the method of doing load calculations? This seminar explores the contractor, manufacturer and design/academic perspectives and needs for load calculations. Can the current methods be practical for contractors? This seminar covers issues and identifies where common ground may exist with presentations from three differing sets of needs and points of view.

1. Residential Loads Calculations: When Do You Need a Computer?

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

2. Contractor's Perspective on Load Calculations

John Sedine, Engineered Heating and Cooling, Walker, MI

3. Load Calculations from the Manufacturer's Perspective

Steven Hancock, Trane, Tyler, TX

Seminar 68

Room: 2000 C

Sustainability Is Not Just a Design Problem

Wednesday, June 28, 2006 7:45 a.m.–9:15 a.m.

Sponsor: TC 07.03 Operation and Maintenance Management

Chair: William J. McCartney, Member, Isotherm Engineering Ltd., Mississauga, ON, Canada

Sustainability must be taken to its fullest extent. If the owners and operators of buildings are intent on "run to failure," then the concept of design for sustainability cannot be truly fulfilled. The sustainability design must include the life cycle costing approach that would draw into the design, the O & M considerations. Therefore the eventual user of the building will receive this information as part of the design intent.

1. Run to Failure #1

John Rydzewski, Member, E.I. Dupont, Newark, DE

2. Run to Failure #2

John D. Warfield, Member, MD Environmental Inc., Wilmington, DE

3. Run to Failure #3

Bob Baker, Member, BBJ Environmental, Ruskin, FL

Seminar 69

Room: 2000 A

Using the ASHRAE HQ as An Exemplar in the Handbook

Wednesday, June 28, 2006 7:45 a.m.–9:15 a.m.

Sponsor: Technical Activities Committee; Handbook Committee

Chair: Frank Mills, P.E., Member, Environmental Design Consultants, Chorley, UK

Members have asked for more examples in the Handbooks to illustrate use of ASHRAE guidance and technology. Rather than use a variety of buildings to develop example solutions, the ASHRAE Headquarters provides an ideal exemplar being well known to most members. The Society has plenty of base information about the building—plans, specs, elevations, sections etc—and pictures to suit. Handbook authors are being encouraged to use the building in their chapters to enhance the guidance given. This seminar shows how this can be achieved with specific examples of the type of information being developed.

1. Using the ASHRAE HQ as an Example Building in the Handbook

Bill Fleming, P.E., Member, Jacwill Services Inc., St. Petersburg, FL

2. Load Calculations for the ASHRAE HQ Example Building

Steve Bruning, P.E., Member, Newcomb and Boyd, Atlanta, GA

3. Natural Ventilation Design Applied to the ASHRAE HQ Building

Daniel Fitzpatrick, Student Member, Environmental Design Consultants, Chorley, Lancashire, UK

Transactions 14

Room: 207

Evaluating and Measuring Performance of Air Cleaning Devices

Wednesday, June 28, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 02.03 Gaseous Air Contaminants and Gas Contaminant Removal Equipment

Chair: Fariborz Haghighat, Ph.D., P. Eng., Member, Concordia University, Montreal, QB, Canada

This session explores research and advances in gas-phase filtration for use in in-duct air cleaning devices and room air cleaners, and methods and techniques for evaluating the performance of these devices. These devices may be used in ASHRAE Standard 62's IAQ procedure, and can have a major impact on building energy consumption and indoor air quality.

1. Laboratory Testing of Full-Scale In-Duct Gas Air Cleaners (QC-06-038)

Douglas W. VanOsdell, Ph.D., Member, M. Kathleen Owen and Charles E. Rodes, RTI International, Research Triangle Park, NC

2. VOC Removal Performance of Pellet/Granular Type Sorbent Media-Experimental Results (QC-06-039)

Bing Guo, Ph.D., Jianshun S. Zhang, Ph.D., Member, Sunil Nair, Student Member, Wenhao Chen, Student Member and James Smith, Syracuse University, Syracuse, NY

3. Experimental Evaluation of the Performance of Gas Phase Air Filters Using a Dynamic Closed-loop Test System (QC-06-040)

Chang-Seo Lee, Ph.D. and Fariborz Haghighat, Ph.D., Member, Concordia University, Montreal, QB, Canada; Jean-Pierre Farant, Ph.D., McGill University, Montreal, QB, Canada; Behnoush Y. Talab, Concordia University, Montreal, QB, Canada

Seminar 70

Room: 2000 C

Accounting and Business Management for Engineers, Part 1

Wednesday, June 28, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 01.07 Business, Management & General Legal Education

Chair: Michael C. Connor, P.E., Member, GRG Inc., Alpharetta, GA

This session outlines general accounting principles, corporate finance and banking relationships, and improving cash flow in small to medium sized engineering firms. Methods to reduce a line of credit, increase the rate of invoicing and improving accounts receivable also are reviewed. Further, tying cash flow into project profitability and providing cash flow incentives to bookkeepers and project managers are outlined.

1. Accounting Principles for Engineering Firms

Jeanette Peppers, Jeanette Peppers CPA PC, Atlanta, GA

2. Finance and Banking Relationships for Engineers

Richard Cardenas, Earl Walls Associates, San Diego, CA

Seminar 71

Room: 2000 A

Air and Contaminant Flow in the Personal Microenvironment, Part 1

Wednesday, June 28, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 04.10, Indoor Environmental Modeling

Chair: H. Ezzat Khalifa, Ph.D., Member, Syracuse University, Syracuse, NY

Human exposure to indoor contaminants and thermal comfort are strongly influenced by the flow within the personal microenvironment (PME)—the flow sub-domain closest to the person. This seminar addresses computational and experimental advances in the study of the transport of gaseous and particulate contaminants within the PME, especially the human thermal plume. Of special interest is the effect of human activity (breathing, coughing, motion, etc) and type of ventilation systems on air and contaminant flow in the PME.

1. Benchmark Test of CFD of Airflow Around Human Body in a Room with Displacement Ventilation

Shinsuke Kato, Ph.D., Member, University of Tokyo, Tokyo, Japan

2. Quantifying Pollutant Trajectories Around a Seated Person in Aircraft Cabins

Yuanhui Zhang, Ph.D., Member, University of Illinois, Urbana-Champaign, IL

Seminar 72

Room: 2000 D

Climate-Sensitive Air Conditioner Designs, Part 1

Wednesday, June 28, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 08.11, Unitary and Room Air Conditioners and Heat Pumps

Chair: Gregory J. Rosenquist, Member, Lawrence Berkeley National Laboratory, Berkeley, CA

Air-conditioning systems are generally designed to perform in a variety of climates. However, greater comfort or energy savings may be possible if systems are designed for specific regional climates. For example, California is sponsoring development of a system for hot-dry climates in order to reduce peak power demand. In addition, there are efforts to develop a unit optimized for humid conditions to increase dehumidification. Part 1 of this seminar presents government-sponsored research to develop systems for hot-dry and humid climates. The suitability of a manufacturer's designs to varied climates is presented.

1. Air Conditioning for Hot Dry Climates

John P. Proctor, P.E., Member, Proctor Engineering Group, Ltd., San Rafael, CA

2. Evaluating Key Design Features for a Humid Climate Air Conditioner

Hugh I. Henderson, P.E., Member, CDH Energy Corp., Cazenovia, NY

Seminar 73

Room: 2000 B

Operating Energy-Efficient CKV Systems in Northern Climates, Part 1

Wednesday, June 28, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 05.10 Kitchen Ventilation

Chair: Douglas J. Horton, D. J. Horton and Associates, Inc., Batavia, IL

This seminar highlights technologies and practices for operating energy efficient commercial kitchen ventilation systems, particularly in northern climates. These practices include control of makeup air heating temperature, demand ventilation, direct-fired vs. indirect gas makeup (design considerations when used with a VAV system), and the issues with grease-rich exhaust from cooking.

1. Reducing Makeup Air Heating Loads

Donald R. Fisher, P.E., Member, Fisher-Nickel, Inc., San Ramon, CA

2. Finding Energy Efficiency in Real Foodservice Operations

Mario Rousseau, Energinox Inc., Charlesburgs, QB, Canada

Forum 16

Room: 202

ASHRAE Temperature Measurement Standard: What Types of Revisions Are Needed?

Wednesday, June 28, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 01.02 Instruments and Measurement

Moderator: Charles C. Wright, Member, TSI, Inc., Shoreview, MN

In its current form, first published in 1986, ASHRAE Standard 41.1, Standard Method of Temperature Measurement, is broad in its reach (intended for use in testing HVAC&R equipment and components), media (air, water, brine and volatile and non-volatile refrigerants), application (steady-state and transient temperature conditions) and range (-40° to 400°F; -40 to 204°C). Is the standard perfect as is? If not, what revisions would you recommend?

Forum 17

Room: 206 B

How Can ASHRAE Address Water Conservation in Sustainable Design?

Wednesday, June 28, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 06.06 Service Water Heating

Moderator: Wayne Webster, P.E., Member, P. Eng., Princess Towers Inc, Ottawa, ON, Canada

Several ASHRAE technical committees have expertise in water usage in buildings. Other professional associations have addressed their constituencies' interests. Recent initiatives within ASHRAE to address energy performance in buildings via standards, guidelines, green building publications, and integrated building design, have identified gaps for dealing with one of the three largest building utility costs—water. This forum seeks ideas as to how ASHRAE can, and whom should, be addressing water conservation in buildings.

Forum 18

Room: 203

Humidification Control: Humidistat or Dew Point Sensor?

Wednesday, June 28, 2006 9:30 a.m.–10:30 a.m.

Sponsor: TC 05.11 Humidifying Equipment

Moderator: Larry J. Hughes, P.E., Member, Alpha Engineering, Inc., Bear, DE

Chapter 20, "Humidifiers," of the ASHRAE Handbook, Applications, needs added language for humidity low limit control to meet comfort, electrostatic discharge and product requirements. This forum focuses on ways to accomplish low humidity control, specifically the residential and industry techniques being employed and their effectiveness. Information gathered will be used for the Handbook chapter.

WEDNESDAY, 6/28 10:45 a.m.–12:15 p.m.

Transactions 15

Room: 207

Fluorocarbon Refrigerant Flammability

Wednesday, June 28, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 03.01 Refrigerants and Secondary Coolants

Chair: Bill Walter, Member, Carrier Corp., Syracuse, NY

The use of flammable fluorocarbons as refrigerants is being considered in order to protect the ozone layer and reduce global warming. In order to properly evaluate the risks associated with the use of these compounds it is important that we understand the rate at which the chemicals burn and the combustion products that are produced when they burn.

1. Burning Velocity of 1, 1-Difluoroethane (R-152a) (QC-06-041)

Greg Linteris, Ph.D., National Institute of Standards and Technology, Gaithersburg, MD

2. Reaction Stoichiometry for Combustion of Fluoroethane Blends (QC-06-042)

Kenji Takizawa, Ph.D., Akifumi Takahashi, Ph.D., Kazuaki Tokuhashi, Shigeo Kondo, Ph.D., Akira Sekiya, Ph.D., National Institute of Advanced Industrial Science and Technology, Tsukuba, Ibaraki, Japan

3. Coil-Icing and Other Opportunities Within Freezer/Anteroom Complexes (QC-06-043)

George R. Smith, P.E., Life Member, HCR Inc., Lewiston, MT

Seminar 74

Room: 2000 C

Accounting and Business Management for Engineers, Part 2

Wednesday, June 28, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 01.07 Business, Management & General Legal Education

Chair: Michael C. Connor, P.E., Member, GRG, Inc., Alpharetta, GA

In this part of the seminar, attendees are introduced to business growth strategies either through acquisition of other businesses or hiring of star players. Other issues address are identifying healthy businesses, business valuation techniques, surviving a government tax audit, collection of accounting data, tips on how to receive a good grade, and interaction with IRS agents.

1. Cash Flow Management for Engineers

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

2. Business Growth Strategies for Engineers

Robert Bissell, Esq., GRG, Inc., Maitland, FL

3. Enduring a Tax Audit: A Survivor's Perspective

Michael C. Connor, P.E., Member, GRG, Inc., Alpharetta, GA

Seminar 75

Room: 2000 A

Air and Contaminant Flow in the Personal Microenvironment, Part 2

Wednesday, June 28, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 04.10 Indoor Environmental Modeling

Chair: H. Ezzat Khalifa, Ph.D., Member, Syracuse University, Syracuse, NY

Human exposure to indoor contaminants and thermal comfort are strongly influenced by the flow within the personal microenvironment (PME)—the flow sub-domain closest to the person. This seminar addresses computational and experimental advances in the study of the transport of gaseous and particulate contaminants within the PME, especially the human thermal plume. Of special interest is the effect of human activity (breathing, coughing, motion, etc) and type of ventilation systems on air and contaminant flow in the PME.

1. The Interaction of Breathing Flow Between People

Peter V. Nielsen, Ph.D., Fellow, Aalborg University, Aalborg, Denmark

2. Personalized Micro-Environment Airflows Interaction at the Vicinity of Occupants and Its Impact on Inhaled Air Quality and Transport of Contaminants

Arsen K. Melikov, Ph.D., Member, Technical University of Denmark, Lyngby, Denmark

3. Experimental Measurement of Particle Transport by Foot Traffic: Tracking and Resuspension

Mark R. Sippola, Lawrence Berkeley National Laboratory, Berkeley, CA

4. Transient Flow Fields in Micro and Near Field Human Environment

Hiroshi Higuchi, Ph.D., Syracuse University, Syracuse, NY

Seminar 76

Room: 2000 D

Climate-Sensitive Air Conditioner Designs, Part 2

Wednesday, June 28, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 08.11 Unitary and Room Air Conditioners and Heat Pumps

Chair: Gregory J. Rosenquist, Member, Lawrence Berkeley National Laboratory, Berkeley, CA

Part 2 of this seminar presents a manufacturer's design for addressing hot and humid climates and new approaches for rating the performance of climate-sensitive air conditioners.

1. Comparative Performance of Currently Available System Designs in Different Climates

Roy Crawford, Ph.D., Member, Trane Co., Tyler, TX

2. Residential Space Conditioning in Hot and Humid Climates

Robert B. Dutch Uselton, P.E., Fellow, Lennox Industries Inc., Carrollton, TX

3. Standards and Rating for Climate-Sensitive Air Conditioners

Harvey M. Sachs, Ph.D., Member, American Council for an Energy-Efficient Economy, Washington, D.C.

Seminar 77

Room: 202

Flow Distribution Issues in Heat Exchangers

Wednesday, June 28, 2006 10:45 a.m.–12:15 p.m.

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

Chair: James Bogart, Member, FlatPlate, Inc., York, PA

This seminar discusses air side and refrigerant side flow distribution related issues and their impact on the performance of heat exchangers.

1. Refrigerant Flow Distribution in Plate and Shell and Tube Evaporators

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

2. Impact of Non-uniform Refrigerant Mass Flow and Air Flow Distributions on Unitary System Performance

Eckhard A. Groll, Ph.D., Member, Purdue University, West Lafayette, IN

3. Mal-distribution of Air Flow in Condensers

Srinivas Garimella, Ph.D., Member, Georgia Tech University, Atlanta, GA

Seminar 78

Room: 206 B

IAQ and Carbon Monoxide Issues Related to Attached Residential Garages

Wednesday, June 28, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 04.03 Ventilation Requirements and Infiltration; SSPC 62.2

Chair: Bernardo Cardenal, Member, Rocamar Engineering Services, Delray Beach, FL

Garages attached to residences may contain numerous sources of air contaminants. Air frequently flows from the garage into the attached

building. This seminar reports the current state of knowledge on contaminant sources, transport mechanisms between garage and house, air tightness of garage-house separating walls and methods of intervening to prevent exposures in the house and the garage.

1. Attached Garages and IAQ: Introduction and Canadian Results

Don Fugler, Member, CMHC, Ottawa, ON, Canada

2. Exploring Dangers of CO Migration from an Attached Garage

James B. Cummings, Member, Florida Solar Energy Center, Cocoa, FL

3. Simulation of Garage-Related IAQ Problems and Potential Solutions

Steven J. Emmerich, Member, National Institute of Standards and Technology, Gaithersburg, MD

Seminar 79

Room: 2000 B

Operating Energy Efficient CKV Systems in Northern Climates, Part 2

Wednesday, June 28, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 05.10 Kitchen Ventilation

Chair: Douglas J. Horton, D. J. Horton and Associates, Inc., Batavia, IL

This seminar highlights technologies and practices for operating energy efficient commercial kitchen ventilation systems, particularly in northern climates. These practices include control of makeup air heating temperature, demand ventilation, direct-fired vs. indirect gas makeup (design considerations when used with a VAV system), and the issues with grease-rich exhaust from cooking.

1. Efficiency of Direct Fired Gas Makeup Heating

Robert Utech, Greenheck, Schofield, WI

2. Challenge of Grease-Rich Emissions in Cold Climate

F. M. (Tim) Farrell, Associate Member, Phillips Plastics Corp., Prescott, WI

3. Update on Demand Ventilation Systems

Ted Owen, Melink Corp., Milford, OH

Seminar 80

Room: 203

System Chemistry with Alternate Refrigerants

Wednesday, June 28, 2006 10:45 a.m.–12:15 p.m.

Sponsor: TC 03.02 Refrigerant System Chemistry; TC 3.04

Chair: Kenneth C. Lilje, Ph.D., Member, CPI Engineering Services, Inc., Midland, MI

Alternate refrigerants (e.g., ammonia, carbon dioxide, hydrocarbons) are continuing to see increased usage. These refrigerants require different lubricants than do HFC refrigerants. The use of these alternative working fluids can potentially lead to system chemistry issues. This seminar presents various system chemistry issues from actual experience.

1. System Chemistry Evaluation of CO₂ Refrigerant: What are the Challenges?

Joseph A. Karnaz, Member, Tecumseh Products Co., Tecumseh, MI

2. Issues with Low Viscosity Refrigeration Oil in Compressors for Hydrocarbon Refrigerant

Alice Riemer, Associate, Danfoss Compressors GmbH, Flensburg, Germany

3. Corrosion Products Using Alternate Refrigerants

Rich Cavestri, Ph.D., Member, Imagination Resources, Inc., Columbus, OH