
ASHRAE ANNUAL MEETING – LONG BEACH, CALIFORNIA – JUNE 2007

Program Theme: *Conserving Natural Resource Use in Buildings*

TECHNICAL PROGRAM (NOTE: This program is subject to change and was updated May 15, 2007)

PDH credit is granted for every session attended. (No PDH credit for New York licenses.)



Approved for AIA (American Institute of Architecture) Learning Units (1.5 units)

SUNDAY, 6/24

8 a.m. – 9:30 a.m.

Transactions Session 1 (Intermediate)

Track: *Fundamentals*

Room: 101 A

How Low Can You Go? Case Studies of Low-Energy Buildings

Sunday, June 24, 2007 8 a.m. – 9:30 a.m.

Sponsor: TC 02.08 Building Environmental Impacts and Sustainability; TC 04.07 Energy Calculations, TC 07.06 Systems Energy Utilization and TC 07.01 Integrated Building Design

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 now been constructed. But do we know how these buildings are 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 performance. This is part of a series on the operating performance of low-energy buildings worldwide.

1. Post-Occupancy Performance of Five Low-Energy Schools in the UK (LB-07-001)

Ian Pegg, Buro Happold, London, UK; Andrew Cripps, Ph.D., Buro Happold Consulting Engineers, London, UK; Maria Kolokotroni, Ph.D., Member, Brunel University, Middlesex, UK

2. Evaluations and Comparisons of the Achieved Energy and Environmental Performance of Two Exemplar-Design Library Buildings in England and Sweden (LB-07-002)

Robert Cohen, Ph.D., Energy for Sustainable Development, Neston, Corsham, Wiltshire, UK; William Bordass, Ph.D., William Bordass Associates, London, UK; Adrian Leaman, Building Use Studies Ltd., York, UK

Seminar 1 (Intermediate)

Track: *Fundamentals*

Room: 201 B

Chilled Beams: Research and Case Studies of Benefits

Sunday, June 24, 2007 8 a.m. – 9:30 a.m.

Sponsor: TC 05.03 Room Air Distribution

Chair: Duncan Phillips, Ph.D., P.E., Member, P. Eng, Rowan Williams Davies & Irwin, Guelph, ON, Canada

In general, the impact of energy gain within a space is controlled by three mechanisms. The use of tempered supply air, building thermal mass, and/or actively chilled building components (e.g. ceilings) all provide a means to control the temperature increases, or the perception of temperature increases, within an occupied region. It has been shown that the use of ventilation air to control temperature within a room is less efficient than using cooled building components. Using research and case studies, this seminar provides practical information on the use of chilled beams as part of an energy-efficient building thermal management system.

1. Passive Chilled Beams, An Effective Alternative to Fan Terminals for UFAD Perimeter Cooling Applications

Ken Loudermilk, P.E., Member, Trox-USA, Alpharetta, GA

2. Airflow Pattern in Rooms with Exposed Chilled Beams: Impact of Heat Load Strength and Distribution

Risto Kosonen, Ph.D., Halton Oy, Kausala, Finland

3. Thermal Comfort in Rooms with Chilled Beams: Physical Measurements and Human Response

Arsen Melikov, Ph.D., Member, International Centre for Indoor Environment and En, Lyngby, Denmark

4. Chilled Beams Application Cases

Dr. Andrey Livchak, Ph.D., Member, Halton Group Americas, Scottsville, KY

Seminar 02

Seminar 2 (Intermediate)

Room: 101 B

Emission Offsets and Reductions: Reducing Our Environmental Footprint

Sunday, June 24, 2007 8 a.m. – 9:30 a.m.

Sponsor: Greening ASHRAE Meetings and Expositions (GAME) Ad-hoc Committee

Chair: Monte G. Troutman, P.E., Member, B.C. Engineering, Inc., Evansville, IN

Emission offsets? Carbon reduction? Pollution credits? We hear these words everyday but what do they mean and how do they impact us? This seminar defines these terms and explains where the money goes when offsets are purchased. It also covers worldwide carbon reduction schemes and how those are affecting industries within the states. The ASHRAE Presidential Ad Hoc Committee on Greening ASHRAE Meetings and Expositions (GAME) is discussed.

1. Defining Emission Offsets and Reduction

Michael Army, Leonardo Academy, Madison, WI

2. What Does ASHRAE Think?

Sheila J. Hayter, P.E., Member, National Renewable Energy Laboratory, Golden, CO

3. International, Federal and State Perspectives on Carbon Reduction Schemes

Thomas E. Werkema, Jr., Member, Arkema, Inc., Philadelphia, PA

4. Are U.S. Industries Doing Their Part?

Adam W. Hinge, P.E., Member, Sustainable Energy Partnerships, Tarrytown, NY

Seminar 3 (Intermediate)

Room: 204

Emulators in Building Control: Developments and Experience

Sponsor: TC 07.04 Building Operation Dynamics

Chair: Steven L. Blanc, P.E., Member, Pacific Gas and Electric Co., San Francisco, CA

Emulators are hybrid systems—partly simulation and partly real hardware—whose applications include product development and testing as well as education and training. Emulators for HVAC building systems have been a subject of research internationally for 20 years. During this time, a number of significant developments have occurred that indicate increasing practicality for emulators in building control and fault detection and diagnosis applications. This seminar focuses on recent development and uses of emulators and the implications for future development.

1. The NIST Virtual Cybernetic Building Testbed

Steven T. Bushby, Member, National Institute of Standards and Technology, Gaithersburg, MD

2. Control System Pre-Commissioning using Hardware-in-the-Loop Simulation: Methods and Case Study of a Naturally-Ventilated Office Tower

Philip Haves, Ph.D., ASHRAE Fellow, Lawrence Berkeley National Laboratory, Berkeley, CA

3. An Emulator for Testing Wireless HVAC Controls

Clifford Federspiel, Ph.D., P.E., Associate, Federspiel Controls, Albany, CA

Seminar 4 (Basic)

Room: 102 B

Finding the Funds for Good O&M: Success Stories, Part 1

Sunday, June 24, 2007 8 a.m. – 9:30 a.m.

Sponsor: TC 07.03 Operation and Maintenance Management

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

How can you operate and maintain a building and its systems with constant pressure to reduce costs and staffing for operation and maintenance (O&M)? Many building operation teams face this situation. Yet, some organizations maintain or even improve their building operations, finding market value in improving their O&M. High quality O&M is a necessary cornerstone of high-performance buildings as we strive to make buildings more sustainable. Drawing from examples from health care, office buildings, and other facilities, speakers provide insight into processes for justifying and procuring the funding needed for high quality O&M.

1. Reengineering O&M Services to Deliver on Corporate Sustainability Goals

Ronald Herbst, P.E., CB Richard Ellis (CBRE), Seattle, WA

2. Establishing an Infrastructure Renewal Program as an O&M Future Cost Avoidance Measure: A Health Care Facility Case Study

Ron Saporta, Saint Michael's Hospital, Toronto, ON, Canada and Ellis Robyn, Saint Michael's Hospital, Toronto, ON, Canada

3. Facility Assessment Studies for Effective Equipment Renewal Programs

Michael Kwok, VFA, Boston, MA

Seminar 5 (Intermediate)

Track: Applications

Room: 103 B

Natural Ventilation in Schools: Boon or Bust?

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

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

Natural ventilation in schools is used to lower cooling and ventilation costs. However, uncontrolled ventilation can allow contaminants to bypass filters and permit the introduction of excess moisture. Further, with the number of schools located in non-attainment areas for one or more of the U.S. Environmental Protection Agency's priority pollutants, natural ventilation can actually present increased health risks to a large segment of the student population. This program looks at ventilation in schools from the standpoint of outdoor air quality, air cleaning requirements of ASHRAE Standard 62.1-2004, and presents a case study highlighting one school district's experiences.

1. Mechanical vs. Natural Ventilation in Schools: Less Can Be More

W. Brad M. Stanley, Member, Purafil, Inc., Doraville, GA

2. Ventilation Considerations in Areas with Elevated Ozone Levels

Michael G. Apte, Ph.D., Member, Lawrence Berkeley National Laboratory, Berkeley, CA

3. Applying the IAQ Procedure to Reduce Mechanical Ventilation Requirements in Schools

Jerry Lamping, Member, North East Independent School District, San Antonio, TX



Seminar 6 (Intermediate)

Track: Fundamentals

Room: 202 AB

Moisture Performance of Details, Part 1: Claddings, Flashings, Wall Penetrations, Etc.

Sponsor: TC 04.04 Building Materials and Building Envelope Performance

Chair: Wahid Maref, Ph.D., Member, National Research Council Canada, Ottawa, ON, Canada

Proper detailing of a building envelope is critical for providing adequate moisture control and performance. Water infiltration is often encountered during the service life of a building. Any opening in an envelope is a potential risk for water ingress that can lead to mould growth and wood decay. In this seminar, speakers give examples of good and poor detailing based on case studies from the field, laboratory experiments and hygrothermal modeling. They focus on envelope failures, symptoms, causes and remedial measures.

1. Performance of Wall/Window Interface Details

Michael Lacasse, Ph.D., National Research Council Canada, Ottawa, ON, Canada

2. The Complicated Science of Detailing the Building Enclosure

Paul E. Totten, P.E., Member, Simpson Gumpertz & Heger Inc., Rockville, MD

3. Moisture Performance of Details

Guylaine Desmarais, Patenaude-Trempe Inc., Varennes, QB, Canada

Seminar 7 (Intermediate)

Track: Applications

Room: 201 A

Testing and Using Radiant Heating and Cooling Systems

Sponsor: TC 06.05 Radiant Space Heating and Cooling

Chair: Peter Simmonds, Ph.D., ASHRAE Fellow, IBE Consulting Engineers, Sherman Oaks, CA

The applications of radiant heating and cooling systems are becoming more widespread. With this comes the need for ASHRAE to update relevant Handbook chapters. This seminar previews revisions being made to Handbook chapters on radiant heating and cooling applications. Revised calculations methods and control techniques are presented by authors.

1. Performance of Radiant Ceiling Panels as Tested in Accordance to European Standards

Michael Leung, IBE Consulting Engineers, Sherman Oaks, CA

2. Generation and Use of Handbook Spreadsheets for Radiant System Projects

Neil Alexander, IBE Consulting Engineers, Sherman Oaks, CA

3. Controls for Radiant Systems

Bungane Mehlamakulu, IBE Consulting Engineers, Sherman Oaks, CA

SUNDAY, 6/24

9:45 a.m. – 10:45 a.m.

Room: 202 AB

Technical Plenary Speaker— Engineers Without Borders

Bernard Amadei, University of Colorado, Boulder, CO

With an estimated population increase of 2 billion people in the next two decades, unprecedented demand will exist for energy, food, water, land, transportation, waste disposal, health care and infrastructure. The role of engineers will be critical in fulfilling those demands from remote small communities to large urban areas. Amadei says a new generation of engineers must be trained who can better meet the challenges of the developing world and address the needs of the most destitute people on the planet. His presentation focuses on the challenges and opportunities with practicing engineering as well as the education of engineering. Also, he addresses the importance of integrating engineering with non-engineering disciplines when addressing the needs of developing communities.

SUNDAY, 6/24

11 a.m. – 12:30 p.m.

Transactions Session 2 (Intermediate)

Room: 101 A

Automated Fault Detection and Diagnostics (FDD)

Sponsor: TC 07.05 Smart Building Systems

Chair: John House, Ph.D., Member, Natural Resources Canada, Varennes, QC, Canada

Automated fault detection and diagnostics refers to the use of software to detect and diagnose operational problems in HVAC equipment and systems. This session presents three papers on the topic. The first presents a method developed for detecting and diagnosing faults in chillers. The second describes a generic automated commissioning process and presents examples of detailed logic for one aspect of this process, automated proactive testing for fault isolation. The third paper presents a model-based approach for estimating whole building energy use and describes how this estimate can be utilized to identify operational changes in buildings.

1. The Development and Evaluation of a Simple Model-Based Automated FDD Method Suitable for Process Faults of Large Chillers (LB-07-003)

Agami Reddy, Ph.D., P.E., Member, Drexel University, Philadelphia, PA

2. Automated Proactive Fault Isolation: A Key to Automated Commissioning (LB-07-004)

Srinivas Katipamula, Ph.D., Member and Michael Brambley, Member, Pacific Northwest National Laboratory, Richland, WA

3. Whole Building Commercial HVAC Systems Simulation for Use in Energy Consumption Fault Detection (LB-07-005)

Frank L. Painter, U.S. Army Corps of Engineers, Fort Sam Houston, TX; Seung Lee and David Claridge, Texas A&M University, College Station, TX



Seminar 8 (Basic)

Track: Applications

Room: 204

Acoustics for Green Buildings

Sponsor: TC 02.06 Sound and Vibration Control

Chair: Kenneth P. Roy, Ph.D., Member, Armstrong World Industries, Lancaster, PA

The LEED® program supports leadership in energy and environmental design. Manufacturers are responding with products and systems that support green and sustainability goals. How do LEED designs work with other design goals? We need additional assurance beyond LEED certification that our buildings actually work for their intended purposes. We must also focus on construction materials used to control sound and vibration, mechanical equipment that affect noise levels, and interior environment assessments regarding comfort and performance.

1. IEQ and Occupant Satisfaction in Naturally Ventilated Buildings

Gail S. Brager, Ph.D., ASHRAE Fellow, University of California - Berkeley, Berkeley, CA

2. Green Materials and Sustainability

Anita L. Snader, Armstrong World Industries, Lancaster, PA

3. HVAC Acoustics for Green Buildings

J. Mike Filler, Member, Trane Co., Pueblo, CO

Seminar 9 (Intermediate)

Track: Applications

Room: 103 B

Application of Simulation in the 2007 Solar Decathlon Competition

Sponsor: TC 04.07 Energy Calculations

Chair: Kamel Haddad, Ph.D., Member, Natural Resources Canada, Ottawa, ON, Canada

In the Solar Decathlon, organized by the U.S. Department of Energy and sponsored by ASHRAE, teams of college students compete to

design, build and operate highly energy-efficient, completely solar-powered houses that incorporate building integrated photovoltaics. This seminar presents the application of computer simulation in the design of several participating teams.

1. Overview of the Role of Simulation in the Solar Decathlon Competition

Sheila Hayter, P.E., National Renewable Energy Laboratory, Golden, CO

2. Application of Simulation in the Design of Santa Clara University Solar-Powered House

Jorge Gonzalez, Ph.D., Santa Clara University, Santa Clara, CA

3. Use of Computer Simulation in the Design of the Texas A&M University Solar Decathlon House

Jeff Haberl, Ph.D., Texas A&M University, College Station, TX

4. Use of Simulation in the Design of the University of Colorado Solar House

Michael Brandemuehl, Ph.D., University of Colorado, Boulder, CO

Seminar 10 (Basic)

Room: 102 B

Finding the Funds for Good O&M: Success Stories, Part 2

Sunday, June 24, 2007 11 a.m. – 12:30 p.m.

Sponsor: TC 07.03 Operation and Maintenance Management

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

How can you operate and maintain a building and its systems with constant pressure to reduce costs and staffing for operation and maintenance (O&M)? Many building operation teams face this situation. Yet, some organizations maintain or even improve their building operations, finding market value in improving their O&M. High-quality O&M is a necessary cornerstone of high-performance buildings as we strive to make buildings more sustainable. Drawing from examples from health care, office buildings, and other facilities, speakers provide insight into processes for justifying and procuring the funding needed for high quality O&M.

1. Managing an Energy Program That Affects the Bottom Line

Mike J. Moran, Jr., Pacific Northwest National Laboratory, Richland, WA

2. Economic Benefits of Preventive Maintenance on HVAC Equipment

David R. Burggren, Carrier Corp., Beaverton, OR

3. Air Handler Restoration Repays Cost Many Times Over

Robert G. Baker, Member, BBJ Environmental Solutions, Tampa, FL

Seminar 11 (Intermediate)

Track: Systems and Equipment

Room: 201 A

Impact of Prefiltration and Filter Selection for Energy Savings and Reduced Maintenance Expenditures

Sunday, June 24, 2007 11 a.m. – 12:30 p.m.

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

Chair: Charles J. Seyffer, Member, Camfil Farr, Troy, NY

Do prefilters add an energy penalty to systems where a single final filter may suffice to ensure proper indoor air quality? What effect does the removal of the prefilter have on the life of the final filter? Are the overall economic implications positive or negative? What happens to the air quality in the building? This seminar examines in-situ and laboratory data that may provide answers or more questions.

1. When, Why and How to Use Prefilters

Michael Corbat, Associate Member, Filtration Group, Inc., Aurora, IL

2. Prefilters: Energy Penalty or System Necessity

Charles J. Seyffer, Member, Camfil Farr, Troy, NY

3. Impact of Effective Prefiltration in Reducing Energy Costs

Don Thornburg, P.E., Member, Camfil Farr, Riversale, NJ

Seminar 12 (Intermediate)

Track: Systems and Equipment

Room: 101 B

Ground Source Heat Pumps for Sustainability

Sunday, June 24, 2007 11 a.m. – 12:30 p.m.

Sponsor: TC 06.08 Geothermal Energy Utilization

Chair: John Shonder, Member, Oak Ridge National Laboratory, Oak Ridge, TN

The high efficiency of ground source heat pumps (GSHPs) means that for a given space conditioning load, less energy is used, resulting in fewer pollutant emissions than most methods of heating and cooling. When combined with other technologies, GSHPs can be instrumental in achieving net zero energy use in homes and buildings. This seminar presents results of innovative projects using GSHPs—and the renewable

resource the earth provides—to increase the sustainability of the buildings in which we live and work.

1. Ground Storage of Solar Energy in a Seasonal Energy Storage System for a Residential Community


Timothy McDowell, Member, Thermal Energy System Specialists, Madison, WI

2. Geothermal Heat Pumps for Zero Energy Houses

Jeffrey Christian, Member, Oak Ridge National Laboratory, Oak Ridge, TN

3. Optimization of Hybrid Geothermal Heat Pump Systems

Scott Hackel, Member, University of Wisconsin Madison, Madison, WI

 **Seminar 13 (Intermediate)**

Track: Fundamentals

Room: 202 AB

Moisture Performance of Details, Part 2: Claddings, Flashings, Wall Penetrations, etc.

Sunday, June 24, 2007 11 a.m. – 12:30 p.m.

Sponsor: TC 04.04 Building Materials and Building Envelope Performance

Chair: Wahid Maref, Ph.D., Member, National Research Council Canada, Ottawa, ON, Canada

Proper detailing of a building envelope is critical for providing adequate moisture control and performance. Water infiltration is often encountered during the service life of a building. Any opening in an envelope is a potential risk for water ingress that can lead to mould growth and wood decay. In this seminar, speakers give examples of good and poor detailing based on case studies from the field, laboratory experiments and hygrothermal modeling. They focus on envelope failures, symptoms, causes and remedial measures.

1. Oblique Masonry: A Recipe for Moisture Problems


Hugo Hens, Ph.D., Member, K.U.Leuven, Leuven, Belgium

2. Water Retention in Drainage Cavities

Achilles Karagiozis, Ph.D., P.E., Member, Oak Ridge National Laboratory, Oak Ridge, TN

3. What Happens When the Purpose of the Details Is Unknown?

William C. Brown, P.E., Member, Morrison Hershfield Limited, Ottawa, ON, Canada

 **Seminar 14 (Intermediate)**

Track: Applications

Room: 201 B

New Developments in Residential Ventilation

Sunday, June 24, 2007 11 a.m. – 12:30 p.m.

Sponsor: SSPC 62.2; TC 04.03 Ventilation Requirements and Infiltration

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

ASHRAE's residential ventilation and IAQ standard, 62.2, is discussed. Presentations include a simulation study of the ventilation and energy performance of several ventilation system options designed to meet the standard's requirements; potential changes to the standard to account for ventilation system configuration and air distribution effects; and an update on the status and content of the draft companion guideline to the standard.

1. Ventilation and Energy Performance of Standard 62.2 Ventilation System Options

Iain S. Walker, Ph.D., Member, Lawrence Berkeley Laboratory, Berkeley, CA

2. Consideration of System Configuration and Air Distribution in Standard 62.2

Joseph W. Lstiburek, Ph.D., ASHRAE Fellow, Building Science Corp., Westford, MA

3. An Update on the Draft Standard 62.2 Companion Guideline

Paul Francisco, Member, University of Illinois, Champaign, IL

SUNDAY, 6/24

1 p.m. – 2 p.m.

Forum 1 (Advanced)

Track: Systems and Equipment

Room: 102 B

Hydronic System Energy Performance Requirements for ASHRAE Standard 90.1

Sunday, June 24, 2007 1 p.m. – 2 p.m.

Sponsor: TC 06.01 Hydronic and Steam Equipment and Systems; SSPC 90.1 Mechanical Subcommittee

Moderator: Mark C. Hegberg, Member, ITT Residential & Commercial Water Division, Morton Grove, IL

SSPC 90.1 has asked TC 6.1 to spearhead discussions on requirements that could be incorporated into future editions of Standard 90.1. This forum facilitates the opening round of dialog on existing requirements, and suggested requirements for further research by ASHRAE TC 6.1.

Forum 2 (Intermediate)

Track: Systems and Equipment

Room: 103 B

Refrigerant Emissions: An Opportunity to Update the Responsibility Use Guidelines

Sunday, June 24, 2007

1 p.m. – 2 p.m.

Sponsor: TC 03.08 Refrigerant Containment; TC 02.05 Global Climate Change and SPC-147

Moderator: James G. Crawford, ASHRAE Fellow, Trane/American Standard, Tyler, TX

Refrigerant emissions are perceived in the regulatory and environmental communities as an environmental issue of considerable importance. There is a range of opinions on the causes and extent of emissions due to leaks. This forum provides an opportunity to share views and experience to begin to build a database for use in further development of refrigerant responsible use guidelines and in updating ASHRAE Standard 147, Minimizing the Release of Refrigerants.

SUNDAY, 6/24

1:30 p.m. – 3 p.m.

Seminar 15 (Intermediate)

Track: Applications

Room: 202 AB

Acoustics vs. Seismic: Point of View of the Acoustician, OEM, Seismic Hardware Manufacturer and Code Official

Sunday, June 24, 2007

1:30 p.m. – 3 p.m.

Sponsor: TC 02.07 Seismic and Wind Restraint Design

Chair: Patrick Lama, P.E., Life, Mason Industries, Inc., Hauppauge, NY

Acoustical requirements can be compromised by the latest seismic provisions of the International Building Code. HVAC equipment, ducts and pipe demand flexible supports that can be amplified by a seismic input. Seismic codes require the same equipment remain in place and even operational in some instances. Solutions require professional input from the acoustician and expertise from the OEM and seismic snubber manufacturer. Code officials can be asked to render opinions on many aspects of the resulting seismic design. Gray areas exist within current codes regarding seismic requirements for ducts, trapeze, pipe, and systems and equipment operational issues.

1. OEMs Handling of Seismic and Vibration Control on Large Systems

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

2. Acoustical Requirements of HVAC Systems in High Rise Buildings

Warren Blazier, Life Member, San Francisco, CA

3. Seismic Code Review

E. Douglas Fitts, P.E., Member, Fitts HVAC Consulting, St. Louis, MO

4. Problems Associated With Developing Seismic Snubbers That Don't Interfere With Vibration Control Devices

James Tauby, P.E., Member, Mason Industries, Inc., Hauppauge, NY

Seminar 16 (Intermediate)

Track: Applications

Room: 201 A

Benchmarking the Energy Performance of Commercial Buildings

Sunday, June 24, 2007

1:30 p.m. – 3 p.m.

Sponsor: TC 07.06 Systems Energy Utilization

Chair: Martha Brook, P.E., Member, California Energy Commission, Sacramento, CA

Recent national and California-specific surveys have resulted in new information on the energy characteristics of the commercial building sector. The national Commercial Buildings Energy Consumption Survey (CBECS) and California's Commercial End Use Survey (CEUS) are being used to update popular benchmarking tools and to create new, innovative processes to understand commercial building energy use. This seminar provides an overview of the detailed energy characteristics available from the CEUS data, compares the CBECS and CEUS representations of building energy performance, and presents a new benchmarking approach that enables users to identify and prioritize spe-

cific energy

1. Peeking Under the Hood: The Energy Characteristics of California's Commercial Building Sector

Martha Brook, P.E., Member, California Energy Commission, Sacramento, CA

2. Building Energy Performance: A Tale of Two Surveys

Michael MacDonald, Member, Oak Ridge National Laboratory, Oak Ridge, TN

3. Action-Oriented Benchmarking: Using CEUS Data to Identify and Prioritize Efficiency Opportunities in California Commercial Buildings

Paul Matthew, Lawrence Berkeley National Laboratory, Berkeley, CA

Seminar 17 (Basic)

Track: Business Management

Room: 101 A

First Time at an ASHRAE Meeting? This Seminar's for You!

No badge required.

Sunday, June 24, 2007 1:30 p.m. – 3 p.m.

Sponsor: Society Program Committee

Chair: Mohammad Hosni, Ph.D., ASHRAE Fellow, Kansas State University, Manhattan, KS

OPEN SESSION—No badge required. 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

Ginger Scoggins, P.E., Member, Engineered Design Inc., Raleigh, NC

2. Technical Committees, Standing Committees and Programs

Al Veeck, P.E., Member, MVA Inc., Virginia Beach, VA

3. The Fun Side of ASHRAE Meetings

Joseph S. Ferdelman, P.E., Member, Heapy Engineering, Dayton, OH

Seminar 18 (Intermediate)

Track: Systems and Equipment

Room: 204

Heat Pump Sound and Acoustic Experiences

Sunday, June 24, 2007 1:30 p.m. – 3 p.m.

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

Chair: Jitendra B. Singh, P.E., Member, J and P Engineers, P.A., Linwood, NJ

As the indoor environment becomes more sensitive to noise levels, more emphasis is being placed on acoustic considerations. This seminar provides an overview of sound issues associated with heat pumps. Equipment, applications, installations and standards are discussed, as well as sound test facilities and methods. The acoustic issues associated with modular classrooms are addressed as well as the applicability of ARI Standard 260 (Sound Rating of Ducted Air Moving Equipment) to ground and water source heat pumps.

1. Sound Rating Standards and Acoustic Considerations for Ground Water Source Heat Pump Installations

Robert R. Brown, Member, WaterFurnace International Inc., Fort Wayne, IN

2. An Overview of a Ground/Water Source Heat Pump Sound Testing Facility

Wes Wostal, ClimateMaster, Oklahoma City, OK

3. The New Quiet Classroom: A Case Study: Modular Classroom HVAC Acoustics

Irv Derks, Member, Bard Climate Control Solutions, Bryan, OH

Seminar 19 (Intermediate)

Track: Systems and Equipment

Room: 201 B

Modeling Stratified Room Air Distribution Systems with Energy Simulation Tools

Sunday, June 24, 2007 1:30 p.m. – 3 p.m.

Sponsor: TC 05.03 Room Air Distribution

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

Stratified air distribution systems are becoming more popular as they offer the potential to increase the use of natural ventilation, reducing energy use, and provide increased ventilation effectiveness and improved indoor air quality as compared to mixed ventilation systems. Until recently, traditional energy simulation tools developed for mixed air distribution systems have not been able to handle stratified air distribution patterns typified by underfloor air distribution systems and displacement ventilation systems. This seminar deals with improvements to energy simulation tools such as DOE 2, eQuest and EnergyPlus to facilitate the modeling of stratified air distribution systems.

1. Development of a New Building Energy Simulation Program for Underfloor Air Distribution Systems

Fred Bauman, Ph.D., P.E., Member, University of California, Berkeley, CA

2. Displacement Ventilation System Modeling

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

3. Integrated Building Energy and CFD Simulation for Rooms with Mixed and Displacement Ventilation Systems

John Zhai, Ph.D., Member, University of Colorado, Boulder, CO

4. Stratification Models for Displacement Ventilation and Underfloor Air Distribution Systems Suitable for Implementation in Energy Simulation Tools

Paul F. Linden, Ph.D., P.E., Member, University of California, San Diego, La Jolla, CA

Seminar 20 (Basic)

Track: Fundamentals

Room: 101 B

Pressure Losses in Modern-Construction Air Duct Systems

Sunday, June 24, 2007 1:30 p.m. – 3 p.m.

Sponsor: *TC 05.02 Duct Design*

Chair: *Stephen A. Idem, Ph.D., Member, Tennessee Technological University, Cookeville, TN*

This seminar presents recent results from two experimental projects intended to characterize pressure losses in modern-construction air duct systems. Pressure loss measurements in flat oval elbows and corrugated straight ducts are reported. Measurements of pressure losses in 12-in and 8-in flexible ducts, including the effects of sag and compression, are discussed. The data is compared to CFD predictions.

1. Pressure Loss Measurements of Flat Oval Elbows and Straight Corrugated Ducts

Stephen A. Idem, Ph.D., Member, Tennessee Technological University, Cookeville, TN

2. As-Built DP Data for 12" Flex Ducts

David Cantrill, Student, Texas A&M University, College Station, TX

3. CFD Calculations and Measured DP Data for 8 inch Flexible Duct

Ahmet Ugursal, Student, Texas A&M University, College Station, TX

SUNDAY, 6/24

3:15 p.m. – 4:45 p.m.

Seminar 21 (Basic)

Track: Business Management

Room: Speakers Lounge

How to Give More Effective Presentations

No badge required.

Sunday, June 24, 2007 3:15 p.m. – 4:45 p.m.

Sponsor: *Society Program Committee*

Chair: *Al Veeck, P.E., Member, MVA Inc., Virginia Beach, VA*

OPEN SESSION - No badge required. Speaking to an audience can be intimidating; however, it is a skill that can be learned, practiced and mastered. This working session will provide the attendee with methods and techniques to more effectively present information, especially of a technical nature, to groups. Better use of PowerPoint and other visuals along with creative openings, more credible information in the presentation, and a dynamic Q & A and summary. Your audience will thank you for attending this session.

Seminar 22 (Advanced)

Track: Business Management

Room: 101 A

Lessons Learned: Case Studies From the Real World of Lawsuits

Sunday, June 24, 2007 3:15 p.m. – 4:45 p.m.

Sponsor: *TC 01.07 Business, Management & General Legal Education*

Chair: *Leon E. Shapiro, Member, J. D., VRTX Technologies, Las Vegas, NV*

At some point in their careers, many ASHRAE members have found themselves embroiled in legal disagreements. This program explores case histories of actual disputes and lawsuits, providing practical insights about how and why ASHRAE members become involved in such situations and how to protect themselves.

1. Lessons Learned From HVAC Designers Who Have Sued and Been Sued

Lawrence G. Spielvogel, P.E., ASHRAE Fellow, L.G. Spielvogel, Inc., King of Prussia, PA

2. Case Study in Design/Build Law

Michael C. Connor, P.E., Member, Earl Walls Associates, Alpharetta, GA
3. "Thank You For Your Support. Ouch!" - Engineering and the Standard of Care
E. Mitchell Swann, P.E., Member, MDC Systems Corp., LLC, Berwyn, PA

Seminar 23 (Intermediate)

Track: Applications

Room: 202 AB

New Development of Cleanroom HVAC Design, Testing, Decontamination and Construction Technologies

Sunday, June 24, 2007 3:15 p.m. – 4:45 p.m.

Sponsor: TC 09.11 Clean Spaces

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

The latest developments on cleanroom HVAC studies are addressed. Traditionally cleanroom airflow rate is arbitrarily selected from a wide range of a recommended Federal Standard 209, disregarding the actual room particle generation level. As a new approach, airflow rate can be calculated based on room-particle-load and required cleanliness class, which avoids unnecessary airflow over-supply. Fan-filter application is getting more popular - testing data and performance evaluation is provided. Filtration selection and utilization in cleanroom HVAC systems is critical to overall cleanroom performance, so in-depth considerations are presented.

1. Fan-filter Testing - The Results Are In

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

2. Cleanroom Microbial Decontamination with Gassing Methods

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

3. Pharmacy Cleanroom Construction to Meet JCAHO MM 8.10

Roger W. Lutz, P.E., Member, HGA Inc. Milwaukee, WI

MONDAY, 6/25

8 a.m. – 9:30 a.m.

Seminar 24 (Basic)

Track: Systems and Equipment

Room: 102 B

Economic and Environmental Benefits of Turbine Inlet Cooling

Monday, June 25, 2007 8 a.m. – 9:30 a.m.

Sponsor: TC 01.10 Cogeneration System

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

Combustion turbines (CTs) are known to lose generation capacity as the ambient air temperature increase above 59F (the temperature use for rating CTs). Cooling inlet air to CTs is known to enhance the generation capacity of combustion turbines when the ambient temperatures are above 59F. The economic and environmental benefits of various combustion turbine inlet cooling technologies are showcased.

1. Evaporative Cooling: Good for Economics and the Environment

Patricia Thomas Graef, Member, Munters Corp., Fort Myers, FL

2. Economic and Environmental Benefits of Wet Compression

John Kraft, Member, Cladwell Energy Co., Louisville, KY

3. Packaged Chiller Systems for Improves Power Generation Economics and the Reduction of Emissions

Gary Hilberg, TAS, Ltd., Houston, TX

4. Environmental and Economic Benefits of Bulk Air Cooling: A New Technology that Allows the Flexibility of Evaporative Cooling and Mechanical Chilling

Kurt Liebendofer, Member, The Stellar Group, Jacksonville, FL

Seminar 25 (Intermediate)

Track: Applications

Room: 103 B

Energy Efficiency and Innovations in Commercial Kitchens

Monday, June 25, 2007 8 a.m. – 9:30 a.m.

Sponsor: TC 05.10 Kitchen Ventilation

Chair: Richard T. Swierczynna, Member, Architectural Energy Corp., Wood Dale, IL

The design of an energy efficient commercial kitchen requires conscientious approaches and innovative solutions. This seminar presents innovative energy efficient solutions to commercial kitchen ventilation in addition to utility rebate strategies.

1. Field Studies in Demand Ventilation

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

2. Introduction to Ventilated Ceilings

Joe Profenna, Associate Member, Halton-Canada, Mississauga, ON, Canada

3. Energy Efficient Solutions for Commercial Kitchen Ventilation

Andrey Livchak, Ph.D., Member, Halton Group Americas, Scottsville, KY

4. How Energy Efficiency Can Make You Money: Utility Rebates in Foodservice

Carlos Haiad, P.E., Associate Member, Southern California Edison, Irwindale, CA

Seminar 26 (Basic)

Room: 201 B

Food Freezing Technology

Monday, June 25, 2007 8 a.m. – 9:30 a.m.

Sponsor: TC 10.09 Refrigeration Application for Foods and Beverages

Chair: Brian A. Fricke, Ph.D., Member, University of Missouri - Kansas City, Kansas City, MO

A significant application of refrigeration is in the preservation of food. This seminar addresses the current trends and technology used in food refrigeration, freezing and storage. Topics covered include airflow optimization, refrigerant piping, humidity control, and food refrigeration simulation software.

1. Airflow Optimization

Donald J. Cleland, Ph.D., Member, Massey University, Palmerston North, New Zealand

2. Gravity Drain vs. Vertical Risers

Ajay R. Chatlani, Member, Tyson Foods, Inc., Springdale, AR

3. Humidity Control Using Desiccants

Peter G. Demakos, P.E., Member, Niagara Blower Company, Buffalo, NY

4. Food Refrigeration Simulation Software

Bryan R. Becker, Ph.D., P.E., ASHRAE Fellow, University of Missouri–Kansas City, Kansas City, MO

Seminar 27 (Advanced)

Track: Fundamentals

Room: 202 AB

HVAC&R Seminar I

Monday, June 25, 2007 8 a.m. – 9:30 a.m.

Sponsor: HVAC&R Research Committee

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

Authors who published in recent HVAC&R Research publications (October 2006 and January 2007) present their papers followed by Q&A.

1. Lighting Heat Gain Parameters: Experimental Method and Lighting Heat Gain Parameters: Experimental Results

Dan Fisher, Ph.D., Member, Oklahoma State University, OK

2. A Methodology for Diagnosing Multiple-Simultaneous Faults in Vapor Compression Air Conditioners

Haorong Li, Ph.D., Member, University of Nebraska-Lincoln, Oklahoma, NE

3. The Importance of Human Productivity to Air-Conditioning Control in Office Environments

W.L. Tse, Ph.D., City University of Hong Kong, Kowloon Tong, Hong Kong

Seminar 28 (Intermediate)

Track: Applications

Room: 204

Moisture Management Issues in Residential and Commercial Buildings

Monday, June 25, 2007 8 a.m. – 9:30 a.m.

Sponsor: TC 01.12 Moisture Management in Buildings

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

Modern construction practices have improved energy efficiency but also resulted in conditions that may be more susceptible to moisture intrusion and rapid microbial growth. This seminar provides results of laboratory evaluations and field applications of design and construction strategies that address moisture management issues in residential and commercial buildings. Recommendations encompass both mechanical and natural ventilation strategies in new and existing buildings.

1. Commissioning of Schools K-12 for Mold and Mildew

Carl N. Lawson, Member, Hanson Professional Services, Zephyrhills, FL

2. Controlling Moisture in Commercial Buildings at Part Load

Raymond E. Patenaude, P.E., Member, The Holmes Agency, St. Petersburg, FL

3. Field Review in Rehabilitation of Moisture-Damaged Buildings

Alex McGowan, P.E., Member, Levelton Consultants, Ltd., Victoria, BC, Canada

4. Effects of Condensation on Building Materials and Equipment in Confined Spaces

Rodney H. Lewis, P.E., Member, Rodney H. Lewis Associates, Inc., Houston, TX

Seminar 29 (Intermediate)

Track: Fundamentals

Room: 101 A

Natural Ventilation: Modeling and Measurements Part 1, State of the Art in Prediction and Design

Monday, June 25, 2007 8 a.m. – 9:30 a.m.

Sponsor: TC 04.10 Indoor Environmental Modeling

Chair: Duncan Phillips, Ph.D., P.E., Member, P. Eng., Rowan Williams Davies & Irwin, Guelph, ON, Canada

Natural ventilation is an ages old technique of ventilating an occupied space. Natural ventilation within a building can be as simple as opening a window or be actively designed such that the wind, thermal and occupant conditions are optimized. Ultimately, with proper design techniques, both air quality and thermal comfort can be optimized within a properly engineered system. This seminar demonstrates the level of modeling analysis that is possible for the design of a high performance naturally ventilated building.

1. A Quick Guide to the Simulation of Natural Ventilation

Iain Macdonald, Ph.D., Member, National Research Council of Canada, Ottawa, ON, Canada

2. Study of Natural Ventilation Through a Building by Large Eddy Simulation

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

3. Validation of Different Modeling Methods for Natural Ventilation

Atila Novoselac, Ph.D., Member, University of Texas, Austin, TX

4. Combining Windtunnel and CFD Modeling for the Prediction of Natural Ventilation in a Classroom

Duncan Phillips, Ph.D., P.E., Member, Rowan Williams Davies & Irwin, Guelph, ON, Canada

Seminar 30 (Basic)

Track: Applications

Room: 101 B

New ASHRAE Seismic Resistant Standard and California Seismic Code Review

Monday, June 25, 2007 8 a.m. – 9:30 a.m.

Sponsor: TC 02.07 Seismic and Wind Restraint Design

Chair: E. Douglas Fitts, P.E., Member, Fitts HVAC Consulting, St. Louis, MO

Proposed ASHRAE Standard 171P, *Method of Test of Seismic Restraint Devices for HVAC&R Equipment*, is reviewed along with the seismic codes for California.

1. SPC-171P Review

Richard Sherren, P.E., Member, Kinetics Noise Control, Dublin, OH

2. VISCMA Seismic Qualification Standard

John P. Giuliano, P.E., Member, The VMC Group, Bloomington, NJ

3. The Codes for Seismic Bracing of MEP Systems

William E. Staehlin, P.E., State of California, Sacramento, CA

Seminar 31 (Advanced)

Room: 201 A

Two-Phase Flow At Micro/Nano Scale

Monday, June 25, 2007 8 a.m. – 9:30 a.m.

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

Chair: Timothy A. Shedd, Ph.D., Member, University of Wisconsin-Madison, Madison, WI

Two-phase heat transfer and fluid flow at micro/nano-scale is an area of ongoing research with many unknowns to be investigated. This seminar reviews new studies in the two-phase flow area with possible applications in refrigeration industry.

1. Boiling with Refrigerants and Nanolubricants

Mark A. Kedzierski, Ph.D., Member, National Institute of Standards and Technology, Gaithersburg, MD

2. Critical Heat Flux in Microchannel Two-phase Flows

John R. Thome, Ph.D., P.E., Member, Swiss Federal Institute of Technology Lausanne EPF, Lausanne, Switzerland

3. Local Heat Transfer Coefficients During Condensation Inside a Single Circular Microchannel

Alberto Cavallini, P.E., Member, University of Padova, Padova, Italy

4. Unexpected Findings from Experimental Study of Nucleate Boiling with Gold Nanoparticles in Water

James E. Bryan, Ph.D., Member, University of Missouri, Columbia, MO

MONDAY, 6/25

9:45 a.m. – 10:45 a.m.

Seminar 32 (Basic)

Track: Systems and Equipment

Room: 103 B

Back to Basics: Compressors

Monday, June 25, 2007 9:45 a.m. – 10:45 a.m.

Sponsor: TC 08.01 Positive Displacement Compressors

Chair: Dan Manole, Ph.D., Member, Tecumseh Products Co., Tecumseh, MI

Refrigeration compressors, basic compressor technology, and the application of compressors to air-conditioning and refrigeration products are addressed in this seminar, making it of interest to new engineers or engineering students. Discussion includes operational characteristics of several compressor types, compressor selection and application criteria and a review of refrigeration compressor development trends.

1. Fundamentals of Positive Displacement Compressor Operating Characteristics and Protection

Robert Utter, Member, Innovative Thermal Solutions, Adrian, MI

2. Fundamentals of Compressor-refrigerant Selection

Dan Manole, Ph.D., Member, Tecumseh Products Co., Tecumseh, MI

Seminar 33 (Intermediate)

Track: Systems and Equipment

Room: 201 A

Case Studies: Retrofits of Large Building HVAC Systems

Monday, June 25, 2007 9:45 a.m. – 10:45 a.m.

Sponsor: TC 09.01 Large Building Air-Conditioning Systems; TC 06.01 Hydronic and Steam Equipment and Systems

Chair: Charles G. Arnold, P.E., Life, HDR, Omaha, NE

Case studies for retrofit of large HVAC systems, which significantly increased the efficiency of the systems and improved performance, are highlighted. Air side and chilled water systems are addressed.

1. Conversion of Central Chilled Water System to Variable Flow Primary

Kelley Cramm, P.E., Member, Integrated Design Engineering Associates, Kansas City, MO

2. High Rise Office Building Ventilation Air Retrofit

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

3. Terminal Reheat to VAV: A Simple Solution

Rodney H. Lewis, P.E., ASHRAE Fellow, Member, Rodney H. Lewis Associates, Inc., Houston, TX

Seminar 34 (Basic)

Track: Fundamentals

Room: 201 B

Exergy 101 for Beginners

Monday, June 25, 2007 9:45 a.m. – 10:45 a.m.

Sponsor: TC 01.01 Thermodynamics and Measurements; TG1.Exergy Analysis for Sustainable Buildings

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

Speakers review of energy conservation and an introduction to exergy balance laws. Exergy analysis is a powerful tool in analyzing the energy efficiency of systems; therefore, exergy analysis can be an important tool in designing sustainable systems. Unfortunately, exergy analysis is often misunderstood and overlooked. This seminar provides attendees with a clear understanding of the differences between energy and exergy analysis and provides simple examples of the use of exergy analysis.

1. Energy and Exergy: Basic Concepts and Powerful Analysis Tools

Liping Liu, Student, University of Illinois, Urbana, IL

2. The ABC's About Three E's: Energy, Exergy, and Efficiency

Sandy A. Klein, Ph.D., University of Wisconsin - Madison, Madison, WI

3. Towards More Sustainable Buildings and Communities Through Exergy Analyses

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

Seminar 35 (Advanced)

Track: Fundamentals

Room: 202 AB

HVAC&R Seminar II

Monday, June 25, 2007 9:45 a.m. – 10:45 a.m.

Sponsor: HVAC&R Research Committee

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

Authors who published in recent HVAC&R Research publications (October 2006 and January 2007) present their papers followed by Q&A.

1. General Methodology Combining Engineering Optimization of Primary HVAC&R Plants with Decision Analysis Methods, Part 1 and Deterministic Analysis, Part 2 Uncertainty and Decision Analysis

Wei Jiang, Ph.D., Associate Member, Pacific Northwest National Laboratory, Richland, WA

2. Evaluation of Small Capacity, Hot Water Driven, Air-Cooled H₂O-LiBr Absorption Machine

Jesus Castro, Member, Universitat Politecnica de Catalunya, Terrassa, Spain

Seminar 36 (Intermediate)

Track: Systems and Equipment

Room: 101 B

Inlet installation Effects on Air and Sound Performance of Propeller Fan

Monday, June 25, 2007 9:45 a.m. – 10:45 a.m.

Sponsor: TC 05.01 Fans; TC 05.09 Enclosed Vehicular Facilities

Chair: Aresh Raychaudhuri, P.E., Member, FMC-NA, Inc., Sharon, MA

Experimental results for air and sound performance of propeller fans with systematic variation of inlet flow components are discussed. It is known that fan performance data measured as installed may show lower performance than manufacturer published ratings. Reasons for these variations are discussed and explained with the experimental data. Also, typical "in the field" installation of the fans is identified.

1. Experimental Apparatus and Procedure

Mathew N. Young, Tennessee Tech University, Cookeville, TN

2. Influence of System Effects on Fan Aerodynamic Performance

Stephen Idem, Ph.D., Member, Tennessee Tech University, Cookeville, TN

3. Influence of System Effects on Fan Acoustic Performance

Corinne Darvennes, Ph.D., Tennessee Tech University, Cookeville, TN

Seminar 37 (Intermediate)

Track: Applications

Room: 204

Natural Ventilation: Modeling and Measurements, Part 2: Case Studies

Monday, June 25, 2007 9:45 a.m. – 10:45 a.m.

Sponsor: TC 04.03 Ventilation Requirements and Infiltration; TC 04.10 Indoor Environmental Modeling

Chair: John J. Carter, Member, Cermak Peterka Petersen, Inc., Fort Collins, CO

Natural ventilation is an ages old technique of ventilating an occupied space. Natural ventilation within a building can be as simple as opening a window or be actively designed such that the wind, thermal and occupant conditions are optimized. Ultimately, with proper design techniques, both air quality and thermal comfort can be optimized within a properly engineered system. This seminar demonstrates the level of modeling analysis that is possible for the design of a high performance naturally ventilated building.

1. Evidence of Natural Ventilation in Preventing Spread of Infectious Disease (SARS): Case Studies in Two Hospitals in China

Xudong Yang, Ph.D., Member, University of Miami, Coral Gables, FL

2. Natural Ventilation and Passive Cooling in a Bank Building: Results and Experiences from the KFW-OSTARKE in Frankfurt, Germany

Andreas Wagner, Ph.D., University of Karlsruhe, Karlsruhe, Germany

3. Natural Ventilation in a Large Rental Car Facility: CFD and Wind Tunnel Simulations

David Banks, Ph.D., Member, Cermak Peterka Petersen, Inc., Fort Collins, CO

Seminar 38 (Intermediate)

Track: Applications

Room: 101A

Fire and Other Issues

Of CKV Duct Systems—Part 1

Monday, June 25, 2007 9:45 a.m. – 10:45 a.m.

Sponsor: TC 05.10 Kitchen Ventilation

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

The latest findings in the kitchen ventilation area with respect to current ductwork design and fire safety are presented. New technologies and construction techniques that may impact ductwork construction in the future are discussed.

1. Duct Issues and Restaurant Fires

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

2. Grease Ducts: New Generation

Jayendra S. Parikh, P.E., Compliance Solutions International Inc., Buffalo Grove, IL

Seminar 39 (Intermediate)

Track: Fundamentals

Room: 102 B

Ventilation and IAQ in Apartment Buildings

Monday, June 25, 2007 9:45 a.m. – 10:45 a.m.

Sponsor: TC 04.03 Ventilation Requirements and Infiltration

Chair: Todd Friedman, P.E., Member, GHT Ltd., Arlington, VA

Despite the existence of over 7 million living units in U.S. mid- and high-rise multifamily buildings, there have been no major studies of the ventilation and IAQ performance of such buildings. While apartment buildings are covered by ASHRAE standards, the ASHRAE Handbook contains only a few paragraphs specific to these buildings. Since apartment buildings differ significantly from both low-rise residential buildings and high-rise commercial buildings, the available data from study of those building types is only indirectly applicable to apartment buildings. This seminar presents design issues and research results related to ventilation and IAQ in apartment buildings.

1. Ventilation System Leakage: Observations and Impacts

Mark Modera, Ph.D., Member, Carrier Aeroseal LLC, Piedmont, CA

2. Mechanical System Design for Compartmentalization of Multifamily Buildings

Joseph W. Lstiburek, Ph.D., ASHRAE Fellow, Building Science Corp., Westford, MA

MONDAY, 6/25

11 a.m. – 12 p.m.

Seminar 40 (Intermediate)

Track: Systems and Equipment

Room: 201 A

Design of Unitary Air Conditioners for California Efficiency Standards

Monday, June 25, 2007 11 a.m. – 12 p.m.

Sponsor: TC 08.04 Air-to-Refrigerant Heat Transfer Equipment; TC 08.11 Unitary and Room Air Conditioners and Heat Pumps

Chair: Mahesh Valiya-Naduvath, Ph.D., Member, York International, York, PA

Energy consumption of air conditioners with specific reference to California climates is highlighted. An analysis of performance and possible solutions to problems are presented, from manufacturers and the utilities' perspective of performance. A discussion of the impact of building codes on air conditioner performance and selection is included.

1. Performance Evaluation of Standard and High Efficiency 5 Ton RTUs Under Various Ambient Conditions (75°F to 130°F) with R-22 and R-134a

Ramin Faramarzi, Southern California Edison, Irwindale, CA

2. Design of Air Conditioning Units for the California Building Environment

Steve Hancock, Member, The Trane Co., Tyler, TX

3. Optimizing Air Conditioner Performance for California Peaking Power Constraints Using Ice Storage

Ram Narayanamurthy, Member, Ice Energy, Inc., Windsor, CO

Seminar 41 (Basic)

Room: 202 AB

Residential DHW: Distributing Hot Water

Monday, June 25, 2007 11 a.m. – 12 p.m.

Sponsor: TC 06.06 Service Water Heating

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

Residential building practice ignores losses of energy and water caused by the poor design of hot water systems. These losses in-

clude the waste of water while waiting for hot water to get to the point of use; the wasted heat as water cools down in the distribution system after a draw; and the energy to reheat water that was already heated once before. Field and laboratory analysis and test results are provided.

1. What Works in Multifamily Central DHW Systems

Owen Howlett, Heschong Mahone Group, Inc., Fair Oaks, CA

2. Potable Hot Water Distribution System Delivery Delay Time, Water, And Energy Waste In Air and Buried Environments

Carl Hiller, Ph.D., P.E., ASHRAE Fellow, Applied Energy Technology Co., Davis, CA

3. Hot Water Draw Patterns from Field Studies

Jim Lutz, P.E., Member, Lawrence Berkeley National Laboratory, Berkeley, CA

Seminar 42 (Intermediate)

Track: Applications

Room: 101A

Fire and Other Issues of CKV Duct Systems - Part 2

Monday, June 25, 2007 11 a.m. – 12 p.m.

Sponsor: TC 05.10 Kitchen Ventilation

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

The latest findings in the kitchen ventilation area with respect to current ductwork design and fire safety are presented. New technologies and construction techniques that may impact ductwork construction in the future are discussed.

1. NFPA 96: Its Role in CKV

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

2. Effect of UV on Ductwork

Chester Raczewski, Halton Indoor Climate Systems, Mississauga, ON, Canada



Seminar 43 (Basic)

Track: Fundamentals

Room: 102 B

The ASHRAE GreenGuide, 2nd Edition

Monday, June 25, 2007 11 a.m. – 12 p.m.

Sponsor: TC 02.08 Building Environmental Impacts and Sustainability

Chair: John Swift, P.E., Member, Cannon Design, Boston, MA

The ASHRAE GreenGuide is the primary reference for mechanical engineers working on high performance building projects in the United States. The updated Guide includes a new chapter on LEED® guidance for mechanical engineers and on systems impact on the local environment. There are additional Green Tips, including a new version of the Green Tip that focuses on specific building types. Chapters from the first edition have been reorganized to more accurately mirror the path that an actual project would take. The presentation focuses on how to use the Green Guide.

1. Case Studies of How the Green Guide Can Be Used on Specific Building Design Projects

John Swift, Jr., P.E., Member, Cannon Design, Boston, MA

2. What's New With the 2nd Edition of the ASHRAE Green Guide?

Thomas Lawrence, Ph.D., Member, University of Georgia, Athens, GA

Seminar 44 (Basic)

Room: 201 B

The History of System Chemistry

Monday, June 25, 2007 11 a.m. – 12 p.m.

Sponsor: TC 03.02 Refrigerant System Chemistry

Chair: Kenneth C. Lijje, Ph.D., Member, CPI Engineering Services, Inc., Midland, MI

An overview is provided of the use of system chemical observations and solutions and the role system chemistry plays in the successful use of vapor compression cooling/refrigeration.

1. System Chemistry—Past, Present and Future

Joseph A. Karnaz, Member, Tecumseh Compressor Co., Tecumseh, MI

2. System Chemistry Aspects of Lubricants for HFC Refrigerants

Ganesan (Sonny) Sundaresan, ASHRAE Fellow, Emerson Climate Technologies, Inc., Sidney, OH

Seminar 45 (Intermediate)

Track: Systems and Equipment

Room: 101 B

Variable Speed Pumping Systems

Monday, June 25, 2007 11 a.m. – 12 p.m.

Sponsor: TC 06.01 Hydronic and Steam Equipment and Systems

Chair: Niels Bidstrup, Ph.D., Member, Grundfos Management A/S, Bjerringbro, Denmark

Pumps are responsible for a significant part of the world's electrical energy consumption. This consumption can be reduced significantly by using variable speed pump control - especially in hydronic systems. However, this requires that pumps and their associated system components are selected and controlled correctly. This seminar addresses these issues and demonstrates how electrical energy savings can be achieved.

1. Selecting Valves and Piping Coils in Variable Speed Pumping Systems

Gil Avery, ASHRAE Fellow, Life Member, Kele Controls, Memphis, TN

2. How to Select and Control Variable Speed Pumps

Torben Kynde Nielsen, Member, Grundfos Management A/S, Bjerringbro, Denmark

11 a.m. – 12 p.m.

Forum 3 (Intermediate)

Room: 204

11 a.m. – 12 p.m.

Can Resource Conservation Be Achieved Through the Use of Evaporative Heat Rejection Systems

Monday, June 25, 2007 11 a.m. – 12 p.m.

Sponsor: TC 08.06 Cooling Towers and Evaporative Condensers

Moderator: Leon E. Shapiro, Member, VRTX Technologies, Las Vegas, NV

Resource conservation is a goal of ASHRAE's focus on sustainability. This forum explores the question of whether evaporative heat rejection systems, which utilize natural refrigerants (i.e. water and air), can provide greater net resource conservation when compared to other heat rejection technologies.

Forum 4 (Advanced)

Room: 103 B

Field Testing Chillers: What Are Your Expectations?

Monday, June 25, 2007 11 a.m. – 12 p.m.

Sponsor: TC 08.02 Centrifugal Machines; TC 01.02 Instruments and Measurement, TC 01.09 Electrical Systems, SPC 184 and SSPC 41

Moderator: John Vucci, Member, University of Maryland, College Park, MA

Co-Moderator: Richard L. Hall, Member, Battelle, Columbus, OH

To commission and retro-commission building mechanical systems, operational testing of chillers is required to adequately insure peak efficiency and adherence to design criteria to provide for a sustainable building environment. ASHRAE has asked for a method of test standard for field testing chillers. What should be included? What tolerances are practical for field testing? What conditions are practical for engineers, contractors and owners to bear? Should a user's guide follow the standard? Should the standard provide a sample guide specification?

TUESDAY, 6/26

8 a.m. – 9:30 a.m.

Seminar 46 (Intermediate)

Track: Systems and Equipment

Room: 101 A

Advances in Refrigerant to Air Heat Transfer

Tuesday, June 26, 2007 8 a.m. – 9:30 a.m.

Sponsor: TC 08.04 Air-to-Refrigerant Heat Transfer Equipment

Chair: Edward A. Vineyard, P.E., Member, Oak Ridge National Laboratory, Oak Ridge, TN

Recent advances in heat exchangers for heating, cooling, and refrigeration equipment are explored. Advances include outdoor heat exchanger design improvements, microchannel heat exchanger potential, and refrigeration distribution in evaporator manifolds.

1. Heat Transfer and Fluid Flow of Finned Tube Heat Exchangers in an Outdoor A/C Unit

Man-Hoe Kim, Ph.D., Member, Korea Advanced Institute of Science and Technology, Daejeon, Korea

2. Microchannel Design Potential

Mark W. Johnson, Associate Member, Modine Manufacturing Co., Racine, WI

3. Refrigerant Distribution in Minichannel Evaporator Manifolds

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

Seminar 47 (Intermediate)

Track: Systems and Equipment

Room: 204

California Gold Rush: Cashing in on Sustainability with CHP in California

Tuesday, June 26, 2007 8 a.m. – 9:30 a.m.

Sponsor: TC 01.10 Cogeneration System

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

Combined heat and power (CHP) systems are becoming an essential tool for peak electric demand reduction and sustainability in the State of California and within its municipalities, intuitions and businesses. Three diverse California CHP installations are discussed covering micro-turbine, combustion turbine and reciprocating engine applications, installation issues, performance and ultimately economic viability. Lastly, a forward-looking engineering presentation is given covering essential metrics and approaches for CHP use in California and beyond.

1. Packaged CHP at the Ronald Regan Library

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

2. CHP at LAX

Ian Spanswick, Member, York/JCI, York, PA

3. Motion Picture and Television Fund Hospital

William Martini, Member, TECOGEN/TECOCHILL, Portland, OR

4. The Future of Sustainable CHP Design in California, and Elsewhere, Depends on Thermal to Electric Load Matching

Gearoid Foley, Member, Integrated CHP Systems Corp., Fair Lawn, NJ

Seminar 48 (Intermediate)

Track: Fundamentals

Room: 101 B

Climate Change: Modeling the Weather and Its Potential Impacts on Building Performance

Tuesday, June 26, 2007 8 a.m. – 9:30 a.m.

Sponsor: TC 04.02 Weather Information

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

Recently, much scientific work has focused on potential human-forced climate change. The UN International Program on Climate Change (IPCC) publishes data from global climate models showing impacts. Urban heat islands can also be characterized from measured diurnal and seasonal patterns of urban vs. rural conditions. In this seminar, these data are used to represent future climatic conditions—climate change and heat island—and simulation used to demonstrate potential building performance impacts on loads, energy end-use, demand and other building conditions.

1. Simulated Impacts of Global Warming on Building Thermal Loads throughout the 21st Century

Larry O. Degelman, P.E., Life, Texas A&M University, College Station, TX

2. The Potential Impact of Climate Change on US Building Energy Use Through 2080

Y. Joe Huang, Member, Lawrence Berkeley National Laboratory, Berkeley, CA

3. Creating Climate Change and Urbanization Weather for Impacts Analysis

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

4. A Review of the IPCC Climate Change 2007 Report: Mitigation Options for Buildings and Plants

Geoff J. Levermore, Member, University of Manchester, Manchester, UK

Seminar 49 (Advanced)

Track: Fundamentals

Room: 201 B

Integrated Design Load Calculations

Tuesday, June 26, 2007 8 a.m. – 9:30 a.m.

Sponsor: TC 04.01 Load Calculation Data and Procedures

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

Naturally, ventilation projects are successful in buildings with small cooling loads. An integrated design team approach is effective in achieving low cooling load building envelopes, internal and other building gains. During design development of an integrated design project many of the loads are unknowns. This seminar offers integrated design teams guidance on reasonable assumptions to steer natural ventilation projects toward success.

1. Early Load Assumptions

Gary Wingfield, P.E., ASHRAE Fellow, Life Member, Haskell, Jacksonville, FL

2. Internal Loads Benchmarking and Diversity

Larry Sun, P.E., Member, Tsuchiyama & Kaino, Irvine, CA

3. Selecting Design Temperature Conditions

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

Seminar 50 (Intermediate)

Track: Systems and Equipment

Room: 201 A

Pressure Independent Valves

Tuesday, June 26, 2007 8 a.m. – 9:30 a.m.

Sponsor: TC 01.04 Control Theory and Application

Chair: Larry G. Felker, Member, Belimo Americas, Sparks, NV

Pressure independent control valves are designed to allow linear heat emission with respect to control signal regardless of pressure changes in a system. Most common methods used for balancing hydronic systems, the internal construction for pressure regulation, and details of an installation are covered.

1. Balancing Variable Flow Hydronic Systems

Steve Taylor, P.E., Member, Taylor Engineering, LLC, Alameda, CA

2. Pressure Independent Control Valve Technology

Trisha M. Bruenn, Member, Belimo Americas, Danbury, CT

3. Pressure Independent Valve Project: Analysis and Results

Barry Bridges, P.E., Member, Sebesta Blomberg & Associates, Roseville, MN

Seminar 51 (Intermediate)

Room: 102 B

Refrigeration System Operation Techniques for Energy Cost Reduction

Tuesday, June 26, 2007 8 a.m. – 9:30 a.m.

Sponsor: TC 10.01 Custom Engineered Refrigeration Systems

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

Operators of refrigeration system are under constant pressure to reduce operating costs without the allocation of capital. For some, this means deferred maintenance. For others, this can be achieved by altering the operation of their refrigeration system. Various changes to the operation of refrigeration systems can be implemented to reduce energy use or at least reduce the cost of the energy used. This program provides three examples.

1. Passive Operation of Cold Storage Facilities

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

2. Two Gas Engine-Driven Refrigeration Systems

Wayne Borrowman, Member, CIMCO Refrigeration, Delta, BC, Canada

3. Control Optimization: Simulation and Implementation

Douglas C. Scott, Member, VaCom Technologies, La Verne, CA

Seminar 52 (Intermediate)

Track: Applications

Room: 103 B

Thermal Comfort and IAQ in Naturally Ventilated Environments

Tuesday, June 26, 2007 8 a.m. – 9:30 a.m.

Sponsor: TC 02.01 Physiology and Human Environment

Chair: Jaap Hogeling, Member, ISSO, the Netherlands, Rotterdam, The Netherlands

Naturally ventilated spaces are common considerations in many modern day building designs. Since the publication of ASHRAE Standard 55-2004, which included an adaptive comfort chart for naturally conditioned spaces, many diverse applications of natural ventilation have been investigated. This seminar addresses the effects of natural ventilation in schools, in hot and humid climates and the effect of natural ventilation on carbon emissions from buildings.

1. Window-Opening Behavior in School Classrooms in Response to Temperature and IAQ Interventions

David Wyon, Member, Danish Technical University, Lyngby, Denmark

2. Thermal Comfort of Semi Outdoor Spaces in Hot and Humid Climate

Chandra Sekhar, Ph.D., Member, National University of Singapore, Singapore

3. Occupant Comfort in a Naturally Ventilated Building in New York City

Peter Simmonds, ASHRAE Fellow, IBE Consulting Engineers, Sherman Oaks, CA

4. Thermal Comfort and IAQ in Naturally Ventilated Environments in the Era of Carbon Emission Limits

Hal Levin, ASHRAE Fellow, Santa Cruz, CA

TUESDAY, 6/26

9:45 a.m. – 10:45 a.m.

Seminar 53 (Advanced)

Track: Systems and Equipment

Room: 201 B

Lubrication of Variable Speed Compressors

Tuesday, June 26, 2007 9:45 a.m. – 10:45 a.m.

Sponsor: TC 03.04 Lubrication; TC8.01 Positive Displacement

Chair: Curt R. Slayton, P.E., Member, Consulting Services International, LLC, Louisville, KY

Variable speed compressors have unique lubrication criteria, particularly when operating at very low or very high speeds. The oil pump mechanism must provide adequate lubrication to the compressor bearings under all operating conditions. At low operating speeds, centrifugal oil pumps may not provide sufficient oil lift to ensure an adequate quantity of oil is always available. At very high speeds, cavitation in the oil may prevent effective bearing lubrication. This seminar addresses the design criteria for effective lubrication of variable speed compressors.

1. Lubrication of Variable Speed Compressors

Alex Lifson, Member, Carrier Corp., Syracuse, NY

2. Fundamentals of Lubricating a Variable Speed Compression Mechanism

Dan M. Manole, Member, Tecumseh Products Co., Tecumseh, MI

Seminar 54 (Intermediate)

Track: Systems and Equipment

Room: 101 A

What's New Under the Sun?

Tuesday, June 26, 2007 9:45 a.m. – 10:45 a.m.

Sponsor: TC 06.07 Solar Energy Utilization

Chair: Mark Hertel, P.E., Member, Solray Corp., Honolulu, HI

New solar technologies are ready for prime time and future products promise even more increased efficiency and lower cost. At the same time, state solar programs—like the California Solar Initiative—and Federal tax incentives have upped the value of going solar. Find out if solar is right for you and your project.

1. Solar Water Heating Systems: State of the Art and a Look to the Future

Tim J. Merrigan, P.E., Member, National Renewable Energy Laboratory, Golden, CO

2. Near Zero Energy Homes

Bruce Baccei, ConSol, Stockton, CA

9:45 a.m. – 10:45 a.m.

Forum 5 (Basic)

Room: 102 B

Dedicated Outdoor-Air Systems (DOAS): What Information is Required to Develop a Uniform Design Guide?

Tuesday, June 26, 2007 9:45 a.m. – 10:45 a.m.

Sponsor: TC 08.10 Mechanical Dehumidification Equipment and Heat Pipes

Moderator: Harry M. Milliken, Member, Desert Aire Corp, Lewiston, ME

In today's design environment, the term DOAS is used generically. Does the engineering community need a uniform design and application guide for DOAS? What definitions should be included? What information is required for both system design and the application of manufacturer's DOAS equipment?

Forum 6 (Intermediate)

Track: Applications

Room: 103 B

Do We Need Drier Air in Buildings?

Tuesday, June 26, 2007 9:45 a.m. – 10:45 a.m.

Sponsor: TC 08.12 Desiccant and Sorption Technology

Moderator: Douglas R. Kosar, Associate, University of Illinois at Chicago, Chicago, IL

A growing number of applications in buildings are operating below conventional 55F dew point levels for comfort down into the 45°F dew point range. These include supermarkets seeking to reduce overall air-conditioning and refrigeration energy costs, hospital operating rooms to avoid high %RH at mid 60°F dry bulb temperatures, and museums/libraries to meet exhibition/artifact preservation specifications. These types of specific market drivers are lacking in more mainstream commercial/institutional building types. Do emerging, but more nebulous arguments, relating such lower humidity levels with reduced microbial activity and improved IAQ/health, along with enhanced comfort and productivity, provide compelling evidence for manufacturers to push the concept or building owners/operators to pull the approach more broadly into the marketplace?

Forum 7 (Intermediate)

Track: Applications

Room: 201 A

9:45 a.m. – 10:45 a.m.

Measurement of Gas-Phase Contaminants: Input for Guideline GPC27P

Tuesday, June 26, 2007 9:45 a.m. – 10:45 a.m.

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

Moderator: William P. Lull, Member, Garrison/Lull Inc., Princeton, NJ

For IAQ investigations and solution validation, HVAC engineers are often faced with the need to have meaningful field measurements of gaseous contaminants. The low levels for IAQ applications can be problematic to measure. This forum discusses the membership experience and issues with gaseous contamination measurement, so a better guideline, Guideline for Procedures for Measurement of Gases in Indoor Environments, can be written.

Forum 8 (Intermediate)

Track: Fundamentals

Room: 101 B

9:45 a.m. – 10:45 a.m.

Naturally Ventilated Buildings: What Needs to Be Included To Design Them Properly?

Tuesday, June 26, 2007 9:45 a.m. – 10:45 a.m.

Sponsor: TC 04.10 Indoor Environmental Modeling

Moderator: Duncan Phillips, Ph.D., P.E., Member, P. Eng, Rowan Williams Davies & Irwin, Guelph, ON, Canada

The drive for high performance (green) ventilation systems is reinvigorating interest in natural ventilation. In many parts of the world, natural ventilation systems, either alone or in concert with thermal management strategies, provide high thermal comfort and air quality. However, not all is well. In some circumstances, the design of a natural ventilation system ignores certain aspects of the external environment. This can include ambient air quality, wind conditions, and/or meteorological realities. This forum addresses components of a proper design.

Forum 9 (Basic)

Track: Fundamentals

Room: 204

What Topics Should Be Included in a Credentialing Program in Sustainability

Tuesday, June 26, 2007 9:45 a.m. – 10:45 a.m.

Sponsor: Ad Hoc Committee on Certification

Moderator: Timothy G. Wentz, P.E., ASHRAE Fellow, University of Nebraska, Lincoln, NE

ASHRAE's Strategic Plan calls for the Society to be "a world-class provider of education and certification programs." One such program to be developed under this strategic plan is a certification in sustainability. This forum discusses potential topics to be included in the body of knowledge in order to ensure that it is complete and meets the needs of the design professionals who are expected to pursue this certification.

TUESDAY, 6/26

11 a.m. – 12:30 p.m.

Transactions Session 3 (Intermediate)

Track: Applications

Room: 103 B

Improvements in Manufactured Housing

Tuesday, June 26, 2007 11 a.m. – 12:30 p.m.

Sponsor: TC 06.03 Central Forced Air Heating and Cooling Systems

Chair: Iain S. Walker, Ph.D., Member, Lawrence Berkeley National Laboratory, Berkeley, CA

More than 200,000 factory homes are built in the United States each year to the federally preemptive Manufactured Housing Construction and Safety Standards (MHCSS). These manufactured homes tend to be built tighter than site built homes, which is why MHCSS require whole house mechanical ventilation systems, sized to provide flow rates comparable to ASHRAE Standard 62.2. This session presents current research related to energy efficient HVAC systems and thermal envelope performance, focusing on possible changes to MHCSS that would employ systems engineering to achieve higher levels of energy efficiency than is currently required.

1. National Energy Savings Potential in HUD-code Homes from HVAC and Thermal Envelope Improvements (LB-07-006)

Robert Lucas, P.E., Member, Pacific Northwest National Laboratory, Punta Gorda, FL; Robert Garcia, P.E., Member, Fleetwood Enterprises Housing Group, Riverside, CA; Phillip Fairey, Member, Florida Solar Energy Center, Cocoa, FL; Michael Lubliner, Washington State University Extension Energy Program, Olympia, WA

2. HVAC Improvements in Manufactured Housing Crawlspace-Assisted Heat Pump for Manufactured Housing (LB-07-007)

Michael Lubliner, Member, Washington State University Energy Program, Olympia, WA; Adam Hadley, P.E., Bonneville Power Administration, Portland, OR; Danny Parker, Florida Solar Energy Center, Cocoa, FL

3. Effect of Mastic and Testing on Duct Tightness in Energy Efficient Manufactured Homes (LB-07-008)

David Hales, Member, Washington State University Energy Program, Spokane, WA

4. Thermal Characterization and Duct Losses of Belly Spaces in Manufactured Homes (LB-07-009)

Paul Francisco, Member, University of Illinois at Urbana-Champaign, Champaign, IL; Larry Palmiter, Ecotope, Inc., Seattle, WA

Seminar 55 (Intermediate)

Track: Systems and Equipment

Room: 102 B

Chiller Tower Control: Marketing Hype vs. Physics Basics

Tuesday, June 26, 2007 11 a.m. – 12:30 p.m.

Sponsor: TC 08.02 Centrifugal Machines

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

As illustrated in various articles on tower control, it is apparent that different strategies exist even for the same application. This seminar provides insight on tower control principles for a given application from the perspective of an engineering consultant, a cooling tower manufacturer, and a systems application engineer.

1. Tower Control: Tower Manufacturer

Gil Avery, P.E., ASHRAE Fellow, Life Member, Kele Co., Memphis, TN

2. Optimizing Cooling Tower and Condenser Water Pump Operation in Chiller Plants

Steven T. Taylor, P.E., Member, Taylor Engineering, Alameda, CA

3. Tower Control: Systems Application Engineer

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

Seminar 56 (Intermediate)

Track: Fundamentals

Room: 201 B

Emerging Issues in Environmental Health

Tuesday, June 26, 2007 11 a.m. – 12:30 p.m.

Sponsor: Environmental Health Committee

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

From SARs to Legionellosis prevention, a variety of emerging issues that impact the health and well-being of building occupants are addressed. Advances in portable air cleaners require new methods of rating their performance. Appropriate control of pressurization within buildings can provide significant health, comfort, energy and safety benefits. The financial liability for inadequately considering Legionellosis pre-

vention practices has never been greater. From SARs to bird flu, the potential impact of airborne infectious disease - and the opportunities for engineering intervention - is enormous. All of these topics are explored during this seminar.

1. Portable Air Purifiers: The Role of ASHRAE

Ronald J. Kessner, Member, RJK Consulting, Ponte Vedra, FL

2. The Need for Dynamic Building Pressurization Control

R. Mark Nunnally, P.E., Member, Nunnally & Associates, Inc., Birmingham, AL

3. Moving Forward with Risk Management of Legionellosis

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

4. Airborne Infectious Disease: Engineering Interventions

Sidney A. Parsons, P.E., Member, South African CSIR, Pretoria, Gauteng, South Africa

Seminar 57 (Intermediate)

Track: Applications

Room: 101 B

High-Rise Residential Building HVAC Systems

Tuesday, June 26, 2007 11 a.m. – 12:30 p.m.

Sponsor: TC 09.12 Tall Buildings

Chair: *Luke Leung, Member, SOM Chicago, Chicago, IL*

Many high rise residential projects are being developed around the United States. This seminar identifies characteristics taken into consideration when designing these buildings.

1. High Rise Condominium Projects in California

Ben Sun, P.E., Member, Flack+Kurtz, San Francisco, CA

2. High Rise Condominium Projects in the Pacific Northwest

Bungane Mehlomakulu, P.E., IBE Consulting Engineers, Sherman Oaks, CA

3. High-Rise Condominium Projects in Florida

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

Seminar 58 (Basic)

Track: Fundamentals

Room: 204

Issues Update: Regulating Climate Change and Greenhouse Gas Emissions

Tuesday, June 26, 2007 11 a.m. – 12:30 p.m.

Sponsor: Advocacy Committee

Chair: *Douglas Read, ASHRAE, Washington, D.C.*

With the passage of AB32 – *the Global Warming Solutions Act of 2006*—in California and shifts in the U.S. Congress, interest in climate change and greenhouse gas emissions policy has grown. As a considerable contributor to total energy use and accompanying greenhouse gas emissions, the building community can be part of the solution. Increased energy efficiency likely will be an element of any control strategy. Many provisions of the Energy Policy Act of 2005 also can affect greenhouse gas emissions. This seminar provides background on climate change policy efforts within state and Federal government, and the provisions of EPAct affecting the built environment.

1. State Climate Change Programs: Precedent for the Nation?

Glen Andersen, National Conference of State Legislatures, Denver, CO

2. Federal Climate Change Policy: Prospects for a Comprehensive National Strategy

Tim Greeff, Natural Resources Defense Council Climate Center, Washington, DC

3. EPACT2005: Impacts on the Built Environment

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

Seminar 59 (Intermediate)

Track: Applications

Room: 201 A

Novel Applications of Radiant Cooling with GSHPs

Tuesday, June 26, 2007 11 a.m. – 12:30 p.m.

Sponsor: TC 06.08 Geothermal Energy Utilization

Chair: Michel Bernier, Ph.D., P.E., Member, Ecole Polytechnique de Montréal, Montreal, PQ, Canada

Ground-source heat pumps (GSHP) are recognized as one of the most energy-efficient methods of heating/cooling buildings. This seminar looks at real life applications that use radiant cooling combined with GSHPs. Configuration of night sky radiators to reduce borehole length and radiant cooling floors are covered.

1. GHP'S & Radiant for a Novel Application in IL

John (Jack) P. DiEnna, Geothermal National & International Initiative, Washington, D.C.

2. Integration of Night Sky Cooling with GSHPs

Marcus J Romani, Meline Engineering Corp., Sacramento, CA

3. Radiant Cooling of a Energy Efficient Home in California's Gold Country

Lisa M. Meline, P.E., Member, Meline Engineering Corp., Sacramento, CA

Seminar 60 (Intermediate)

Room: 101 A

The Energy Performance Buildings Directive in the EU: Implementation In Existing Building Stock

Tuesday, June 26, 2007 11 a.m. – 12:30 p.m.

Sponsor: TC 02.08 Building Environmental Impacts and Sustainability

Chair: Jaap J. Hogeling, Member, MSc, ISSO, Rotterdam, Netherlands

Energy performance of existing building stock has a major impact on CO₂ emission. About 40% of CO₂ production is caused by energy use in buildings. Reducing this could be cost effectively reduce the GWP of the built environment. To support this policy, parties should be aware of performance of existing buildings. Standardizing energy labeling and connected energy performance improvement advice and inspection procedures of HVAC systems would better educate owners, potential buyers and building officials on property performance. This seminar shares standard procedures developed in Europe to reduce the energy use in buildings.

1. Calculation of the Energy Use for Heating and Cooling of Buildings

Dick van Dijk, TNO-Build Environment and Geo Sciences, Delft, Netherlands

2. General Framework for the Assessment of Overall Energy Use of a Building

Johann Zirngibl, Member CSTB, Paris, France

3. Standard Economic Evaluation Procedure for Energy Systems in Buildings According EN15459

Bruno Ziegler, EDF, Paris, France

4. Indoor Environmental Input Parameters for Design and Assessment of Energy Performance of Buildings

Bjarne Olesen, Ph.D., ASHRAE Fellow, Technical University of Denmark, Lyngby, Denmark

Poster Session

11 a.m. – 1 p.m.

Room: 202 AB

Acoustical Ventilation Rate Sensor Concept for Naturally Ventilated Buildings (LB-07-022)

Tuesday, June 26, 2007 11 a.m. – 1 p.m.

S. Van Buggenhout, S. Eren Ozcan, E. Vranken, Catholic University of Leuven, Hervelee, Belgium; W. Van Malcot, Katholieke Hogeschool Kempen, Geel, Belgium; Daniel Berckmans, Member, Catholic University of Leuven, Heverlee, Belgium

Since natural ventilation is a sustainable approach to provide an appropriate environment in many applications with biological organisms, this technique is gaining more interest. A major drawback of natural ventilation is the inability of measuring and controlling the actual ventilation rate through a building, which is crucial to control indoor air conditions, energy use and for monitoring of gaseous emissions. This paper presents a new sensor concept has the potential to measure ventilation rates through naturally ventilated buildings.

An Economic Evaluation of the Benefits Associated With Application of Automated Fault Detection and Diagnosis

In Rooftop Air Conditioners

(LB-07-023)

Tuesday, June 26, 2007 11 a.m. – 1 p.m.

Haorong Li, Member, University of Nebraska-Lincoln, Omaha, NE; James E. Braun, Ph.D., P.E., ASHRAE Fellow, Purdue University, Lafayette, IN

This paper addresses economics of FDD application to rooftop air conditioning units (RTU). Two major aspects of savings associated with FDD application to RTU are investigated qualitatively and quantitatively: service and operating cost savings. A methodology is presented for evaluating the cost savings for application of automated FDD to RTU.

An Experimental Study of Falling Film Evaporation on Inclined Plates Using R-141b and R-134a (LB-07-024)

Tuesday, June 26, 2007 11 a.m. – 1 p.m.

Liang-Han Chien, Ph.D. and Hung-Ta Lin, National Taipei University of Technology, Taipei, Taiwan

This manuscript discusses the effects of surface geometries and inclination angle on the falling film evaporation performance. Falling film evaporation experiments were conducted on a plain plate and a finned plate using refrigerants R141b and R134a.

Binary Enthalpy Wheel Humidification Control in Dedicated Outdoor Air Systems (LB-07-025)

Tuesday, June 26, 2007

11 a.m. – 1 p.m.

Jaе-Weon Jeong, Ph.D., Associate Member, Texas A&M University - Kingsville, Kingsville, TX; Stanley A. Mumma, Ph.D., P.E., ASHRAE Fellow, Pennsylvania State University, University Park, PA

The central focus of this paper is the operation and control of a total energy recovery device, or enthalpy wheel (EW), during the heating and intermediate seasons when the outside dew point temperature (DPT) is below the desired supply air DPT. It was found that use of an EW can reduce the energy consumption for humidification, but does not eliminate the potential need for an auxiliary humidifier. Finally, binary control of the EW for supply air temperature control is also addressed.

Calibrated Simulation for Retrofit Evaluation of Demand-Controlled Ventilation in Small Commercial Buildings (LB-07-026)

Tuesday, June 26, 2007

11 a.m. – 1 p.m.

Thomas M. Lawrence, Ph.D., P.E., Member, University of Georgia, Athens, GA; James E. Braun, Purdue University, West Lafayette, IN

The method utilizes an existing simulation tool with many parameters collected from site information along with several parameters calibrated using field data. Specifically, the calibration parameters are the occupancy schedules for weekday and weekend periods, parameters that characterize the heating, ventilation and air conditioning (HVAC) equipment performance, and several key parameters characterizing the building thermal performance. Economic benefits of DCV were evaluated against the case where outdoor air flow rates equaled those specified in ASHRAE Standard 62.1.

Computer Simulation of Heat Loss Characteristics of Commercial Door Assemblies (RP-1236) (LB-07-027)

Tuesday, June 26, 2007

11 a.m. – 1 p.m.

Sponsor: TC 04.05 Fenestration

Alexander McGowan, Member, P.Eng., Levelton Consultants Ltd., Victoria, BC, Canada

This paper describes computer simulation associated with a recent research project to develop improved design data for the ASHRAE Handbook of Fundamentals. The project presents U-factor data for seven different types of non-residential door product, for comparison to test. These data are for seven different specimens, representing these product categories: non-insulated sectional (multi-panel) garage door, insulated sectional garage door, three-wing revolving door, four-wing revolving door, metal coiling roll-up door, emergency exit door (or "fire door"), and aircraft hangar door.

Controlling Cooling Tower Water Quality by Hydrodynamic Cavitation (LB-07-028)

Tuesday, June 26, 2007

11 a.m. – 1 p.m.

William Gaines, B. R. Kim, A. R. Drews, C. Bailey and T. Loch, Ford Motor Co., Dearborn, MI; S. Frenette, Sali Group, Ann Arbor, MI

A field study was conducted to evaluate the performance of a hydrodynamic cavitation device (HCD) for disinfection, scaling, corrosion, and heat-transfer efficiency on a cooling-tower system at an automotive testing facility. Long-term effectiveness of this technology was not evaluated as part of this study.

Development of High-Performance Water-to-Water Heat Pump for Ground Source Application (LB-07-029)

Tuesday, June 26, 2007

11 a.m. – 1 p.m.

Y. Shiba, Zeneral Heatpump Industry Co., Ltd., Nagoya, Aichi, Japan; R. Ooka, University of Tokyo, Meguro, Tokyo, Japan; K. Sekine, Taisei Corp., Yokohama, Kanagawa, Japan

A high-performance water-to-water heat pump for ground source application was developed using a plate heat exchanger; a new type of compressor and refrigerant cycle with a liquid-gas heat exchanger.

Development of Simplified Estimation method of Chiller Energy Use for Office Buildings in Taiwan Estimated from Maximum Chiller Capacity (LB-07-030)

Tuesday, June 26, 2007

11 a.m. – 1 p.m.

K.T. Huang, Ph.D., National Chiayi University, Chiayi City, Taiwan; and H.T. Lin, Ph.D., National Cheng-Kung University, Taiwan

This paper describes the development of the estimation method of rational chiller maximum capacity. This technique, in conjunction with Taiwan's TMY2 weather file, are used to develop the standard annual chiller energy consumption via DOE-2.

Efficient Coupling of Multizone and CFD Indoor Flow Models through Proper Orthogonal Decomposition (LB-07-031)

Tuesday, June 26, 2007

11 a.m. – 1 p.m.

H. Ezzat Khalifa, Ph.D., Member, Syracuse University, Syracuse, NY; Basman Elhadidi, Ph.D., Cairo University, Giza, Egypt; John F. Dannerhoffer, III, Syracuse University, Syracuse, NY

This paper describes a novel approach for efficiently coupling computational fluid dynamics and lumped parameter flow network zonal models in order to predict the flow and contaminant distribution in a non-uniform open space connected to one or more suites of well-mixed offices through corridor openings.

Energy Monitoring and Building Simulation of a University Laboratory Research Facility (LB-07-032)

Tuesday, June 26, 2007

11 a.m. – 1 p.m.

Katherine R. Edwards, Member, Sanford A. Klein, Ph.D., ASHRAE Fellow, and Douglas T. Reindl, Ph.D., P.E., Member, University of Wisconsin-Madison, Madison, WI

This paper presents a case study of energy monitoring and potential savings for a large laboratory research facility. The use of a simple

energy monitoring technique allowed operational faults to be identified. More detailed building simulations quantified operating cost implications of the faults and of other energy savings alternatives identified during the project. While the focus here was on a single laboratory-type research building, the findings may be generalized to other facilities.

Examination of Thermal Adaptive Effect of Postural and Positional Adjustment of a Seated Human Body Exposed to Spot Airflow (LB-07-033)

Tuesday, June 26, 2007 11 a.m. – 1 p.m.

Shengwei Zhu, Ph.D., Technical University of Denmark, Lyngby, Denmark; Shinsuke Kato and Ling Yang, The University of Tokyo

In this paper, the thermal adaptive effect of the postural and positional adjustment of a seated human body was examined by simulating heat exchange on the surface of a manikin dressed as an office worker in summer and exposed to cooled spot airflow. The experimental method with a thermal manikin was adopted to measure the local skin temperature and sensible heat transfer rate by positioning the manikin in forward-leaning or back-leaning postures.

Experimental Evaluation of a Downsized Residential Air Distribution System: Comfort and Ventilation Effectiveness (LB-07-034)

Tuesday, June 26, 2007 11 a.m. – 1 p.m.

Ali A. Jalalzadeh-Azar, Ph.D., P.E., Member, National Renewable Energy Laboratory, Golden, CO

This paper experimentally examined the thermal stratification and air mixing effectiveness of a prevalent residential air-distribution configuration incorporating high sidewall supply-air (S.A.) diffusers and near floor, wall-mounted return-air (R.A.) grilles. This arrangement is inherently less effective in the heating mode, which is the focus of the current study. In the experiments, two levels of S.A. flow rate were considered, low and high, of which the latter is proportionately comparable to the design range commonly applied in standard-practice residential buildings.

Field Testing of a Supervisory Optimal Controller for an Air-Conditioning System (LB-07-035)

Tuesday, June 26, 2007 11 a.m. – 1 p.m.

Yuji Miyajima, Masayoshi Sakuma and Takumi Sugiura, P.E., Hitachi Plant Technologies, Ltd., Matsudo, Chiba, Japan; Minoru Takahashi, Ph.D., Noboru Oshima, P.E. and Hiroo Sakai, Hitachi Plant Technologies, Ltd., Toshima, Tokyo, Japan; Hiroshige Kikuchi and Tadakatsu Nakajima, Hitachi, Ltd., Hitachinaka, Ibaraki, Japan

To address the growing demand for energy saving in building operation, an advanced control system for air conditioning systems was developed and evaluated. This control system incorporates physical models of each component together with optimization engine software that enables it to calculate the optimal settings of five variables (chilled water temperature and flow rate, condenser water temperature and flow rate, and supply air temperature) according to the current cooling (or heating) load.

Formulation of Generic Methodology for Assessing FDD Methods and Its Specific Adoption to Large Chillers (RP-1275) (LB-07-036)

Tuesday, June 26, 2007 11 a.m. – 1 p.m.

Sponsor: TC 07.05 Smart Building Systems

T. Agami Reddy, Ph.D., P.E., Member, Drexel University, Philadelphia, PA

This paper describes research done in this regard by first reviewing past pertinent literature on FDD evaluation, and identifying various elements of a general conceptual evaluation framework which considers issues such as site-specific criteria, performance criteria of the FDD tool, cost of implementing, training and maintaining the tool, testing sequence, and evaluating the cost benefit of implementing the tool.

Impact of Control on Operating Costs for Cool Storage Systems with Dynamic Electric Rates (LB-07-037) (RP-1252)

Tuesday, June 26, 2007 11 a.m. – 1 p.m.

James E. Braun, Ph.D., P.E., ASHRAE Fellow, Purdue University, West Lafayette, IN

This paper evaluates the operating cost savings associated with employing this strategy as compared with using chiller-priority control. In addition, operating cost savings associated with employing ice storage in combination with RTP rates were evaluated for both the near-optimal and chiller-priority strategies.

Measurement and Assessment of VOC and Formaldehyde Contamination During Construction Period of a New Museum in China (LB-07-038)

Tuesday, June 26, 2007 11 a.m. – 1 p.m.

Junjie Liu, Tianjin University, Tianjin, China; Zhiqiang Zhai, University of Colorado at Boulder, Boulder, CO; Jingjing Pei and Yanju Li, Tianjin University, Tianjin, China

This study measured the concentrations of volatile organic compound (VOC) and formaldehyde, as well as benzene, toluene, and xylene, in the main entrance lobby and an exhibit hall of an under-construction museum in Tianjin, China. The results reveal that significant VOC contamination existed in the museum, especially during the period of building construction and finishing.

Optimized Pump Speed Control Using Pump Water Flow (LB-07-039)

Tuesday, June 26, 2007 11 a.m. – 1 p.m.

Guopeng Liu, Student Member and Mingsheng Liu, Ph.D., P.E., Member, University of Nebraska, Omaha, NE

A new pump speed control method for the primary-secondary system is developed and presented in this paper. The distribution (secondary) pump speed is controlled to maintain the optimized system resistance to make the coil valves open. A case study is presented in this paper for application of this new method in a Continuous Commissioning (CC) practice.

Reentrainment of Building Exhaust Air by Packaged HVAC Units (LB-07-040)

Tuesday, June 26, 2007

11 a.m. – 1 p.m.

Sherwood G. Talbert, P.E., Life Member, Stephen Ricci, Ph.D., Matthew E. Goshe, Laura L. Aume and Rodney L. Osborne, Battelle, Columbus, OH

Packaged HVAC equipment, like Roof-Top Units (RTUs), often use economizers to supply fresh outdoor ventilation air and to exhaust stale building air. The fresh-air intake and the exhaust hoods are typically located very close to one another, often with the exhaust hood directly below the intake hood. In this arrangement, a portion of the exhaust air may be re-entrained into the intake air under various operating conditions. This project determined the extent of re-entrainment of building exhaust for a variety of wind speeds and directions, RTU designs, and surrounding structures.

Simulation of the Impact of Commercial Building Envelope Airtightness on Building Energy Utilization (LB-07-041)

Tuesday, June 26, 2007

11 a.m. – 1 p.m.

Steven Emmerich, National Institute of Standard and Technology, Gaithersburg, MD; Timothy McDowell, Thermal Energy System Specialists, Madison, WI; Wagdy Anis, Shepley Bulfinch Richardson and Abbott, Boston, MA

This paper presents a simulation study of the energy impact and cost effectiveness of improving envelope airtightness in low-rise U.S. commercial buildings. To evaluate the potential energy savings and cost effectiveness of an air barrier, annual energy simulations and cost estimates were prepared for two nonresidential buildings (a two-story office building and, a one-story retail building) in 5 U.S. cities.

Static Pressure Losses in 6 in., 8 in., and 10 in. Non Metallic Flexible Duct (RP-1333) (LB-07-042)

Tuesday, June 26, 2007

11 a.m. – 1 p.m.

Sponsor: TC 05.02 Duct Design

Kevin Weaver, Student Member, BesTech, Dallas, TX; Charles H. Culp, Ph.D., P.E., ASHRAE Fellow, Texas A&M University, College Station, TX

This study measured airflow static pressure losses through non-metallic flexible ducts in compliance with ASHRAE Standard 120-1999, Methods of Testing to Determine Flow Resistance of HVAC Air Ducts and Fittings (ASHRAE 1999). This study measured pressure loss at fully stretched, 4% compression, 15% compression, 30% compression and 45% compression. 22

Study on the Energy Conservation Performance of the Plate Enthalpy Exchanger (LB-07-043)

Tuesday, June 26, 2007

11 a.m. – 1 p.m.

Junjie Liu, Bin Wang and Shusen Liu, Tianjin University, Tianjin, China

This paper studies the energy conservation performance of a plate enthalpy exchanger with a kind of paper medium for different outdoor climates in China. According to the calculation of the air treatment process on a psychrometric chart, it is found that the energy saving performance of the enthalpy exchanger depends on its enthalpy recovery efficiency and its resistance to the airflow.

Testing of Air Leakage and Heat Loss Characteristics of Commercial Door Assemblies (RP-1236) (LB-07-044)

Tuesday, June 26, 2007

11 a.m. – 1 p.m.

Sponsor: TC 04.05 Fenestration

Alexander McGowan, Member, P.Eng., Levelton Consultants Ltd., Victoria, BC, Canada; Robert Jutras, Air-Ins, Inc., Varennes, PQ, Canada

This paper describes testing associated with a recent research project to develop improved design data for the ASHRAE Handbook of Fundamentals. The project presents U-factor and air-leakage test data for seven different types of non-residential door products, for comparison to simulation. These data are based in part on test results of seven test specimens, representing these product categories: non-insulated sectional (multi-panel) garage door, insulated sectional garage door, three-wing revolving door, four-wing revolving door, metal coiling roll-up door, emergency exit door (or "fire door"), and aircraft hangar door.

The Development of Standardized Whole Building Simulation Assumptions for Energy Analysis for a Set of Commercial Buildings (LB-07-045)

Tuesday, June 26, 2007

11 a.m. – 1 p.m.

Michael Stocki, Member, University of Massachusetts, Amherst, MA; D. Charlie Curcija, Ph.D., Member and Mahabir S. Bhandari, Ph.D., Member, Carli, Inc., Amherst, MA

Whole building energy simulations of commercial buildings are done for various reasons such as to quantify the various energy components of the end-use building consumption profile, to quantify the energy savings benefit or penalty from modifying various building or system parameters, to assist in the commissioning process, to aid in building design process, and to aid the code development process.. It is the intent of this paper to present a set of standardized assumptions for typical commercial buildings. These assumptions were developed from the criteria in ASHRAE Standard 90.1-2004 and prior published work outlining the typical use patterns and energy densities.

The Effect of Energy Recovery on Perceived Air Quality, Energy Consumption and Economics of an Office Building (LB-07-046)

Tuesday, June 26, 2007

11 a.m. – 1 p.m.

Melanie T. Fauchoux, Carey J. Simonson, Ph.D., Member, and David A. Torvi, Ph.D., P.Eng., University of Saskatchewan, Saskatoon, SK, Canada

The objectives of this paper are to determine if an energy wheel can improve indoor air relative humidity (RH), and perceived air quality (PAQ), as well as reduce energy consumption. The results with and without an energy wheel are compared to see if the energy wheel has a significant impact on the RH and PAQ in the building. By using an energy wheel, the total energy consumed by the HVAC system in Saskatoon, Phoenix and Tampa is reduced. There is a significant reduction in the size of the heating equipment in Saskatoon and in the size of the cooling equipment in Phoenix and Tampa. A cost analysis shows that the HVAC system including an energy wheel has the least life-cycle costs in these three cities.

Thermodynamic Properties for Saturated Air: An Engineering Correlation (LB-07-047)

Tuesday, June 26, 2007

11 a.m. – 1 p.m.

Jose A. Perez Galindo, Ph.D., Member and Luis A. Payan Rodriguez, Instituto Tecnológico de Durango, Durango, Mexico; Ignacio R. Martin Dominguez, Ph.D., Materiales Avanzados, Chihuahua, Mexico

Some HVAC engineering calculations, such as real time simulations and control systems models, need simple and precise equations for properties estimation. Since the simplest model available has large errors as the variables of interest, v , h and s , approach zero and the most precise model calculations are iterative and lengthy, a model simple but precise was developed. This model, based on polynomial curve fits of the enhancement and compressibility factors as functions of temperature and pressure, is described and its parameters calculated.

Whole Building Dispersion of Tracer Gas After Internal Release in an Administrative/Classroom Building (LB-07-048)

Tuesday, June 26, 2007

11 a.m. – 1 p.m.

David Underwood, P.E., Member, Dale L. Herron, Member and William J. Croisant, U.S. Army Engineer Research and Development Center, Champaign, IL

This paper presents detailed experimental results for the transient dispersion of a tracer gas following internal releases in a building. Ambient air analyzers were used to simultaneously measure the real time concentrations of tracer gas at eight locations in the building following a single point release. The building and its systems were operated in selected known states before, during, and after the tracer gas releases. Results are presented to illustrate the dispersion of sulfur hexafluoride (SF₆) for three different release/building operation scenarios. The results of the experiments from this case study provide valuable insight relevant to the proper planning, design, construction and operation of buildings.

Definition of Standard Office Environments for Evaluating the Impact of Office Furniture Emissions on Indoor VOC Concentrations (LB-07-049)

Tuesday, June 26, 2007

11:00:00 AM - 1:00:00 PM

Randal D. Carter, Associate Member, Steelcase, Inc., Grand Rapids, MI, and Jianshun S. Zhang, Member, Syracuse University, Syracuse, NY

A representative "worst-case" office environment which defines the size and volume of the office space, the amount and type of office furniture surface area, and the outdoor, clean air flow rate is necessary to estimate the impact of office furniture emissions on indoor VOC concentrations based on the emission rates measured from chamber tests. In this study, 31 randomly selected floor plans from North American office buildings were analyzed in detail to determine a representative "worst-case" office environment model (i.e. occupant exposure scenario).

Study on the Impact of Buildings on the Outdoor Thermal Environment Based on a Coupled Simulation of Convection, Radiation and Conduction (LB-07-050)

Tuesday, June 26, 2007

11:00:00 AM - 1:00:00 PM

Hong Chen, Ph.D., Ryozo Ooka, Ph.D., Member, and Hong Huang, Ph.D., The University of Tokyo, Tokyo, Japan; and Madoka Nakashima, The Tokyo Electric Power Co., Inc., Tokyo, Japan

Outdoor thermal environment represented by the urban heat island phenomenon has deteriorated in recent years due to changes in land cover and increases in the release of artificial heat that accompanies urbanization. This paper clarifies the influence of sensible heat flux from walls and the artificial heat release from buildings for outdoor thermal environment in the summer.

TUESDAY, 6/26

12:30 p.m. – 1:30 p.m.

Forum 10 (Intermediate)

Track: Systems and Equipment

Room: 101 A

Experience with Coil Fouling, UV and Energy Savings in HVAC Systems

Tuesday, June 26, 2007

12:30 p.m. – 1:30 p.m.

Sponsor: TG2.UVAS Ultraviolet Air Surface Treatment

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

This forum explores the causes and effects of coil fouling and the consequent need for coil cleaning. Controversy exists over the prevalence of coil fouling and the circumstances that substantially increase coil pressure drop and energy use and reduce heat transfer and coil

capacity. The relative advantages and disadvantages of pressure cleaning, biocides and ultraviolet lighting for various systems and equipment applications are discussed.

Forum 11 (Intermediate)

Track: Fundamentals

Room: 101 B

Is Green Clean? IAQ and Energy Efficiency for LEED and Green Buildings

Tuesday, June 26, 2007 12:30 p.m. – 1:30 p.m.

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

Moderator: Marilyn Listvan, Ph.D., Member, Listvan & Assoc., Consulting, Edina, MN

LEED® (Leadership in Energy and Environmental Design) buildings have energy savings as a prime objective. Good indoor air quality (IAQ) for occupants is another design goal (both from a particulate and gaseous contaminant perspective). In any building there are ventilation options for HVAC systems of outdoor vs. recirculated air, filtration of indoor and/or outdoor air and maintaining the building cost effectively. This forum discusses the state of knowledge for meeting IAQ needs in sustainable buildings and develop criteria and/or tradeoffs that can be explored and perhaps explained in the Handbook for this growing design approach.

WEDNESDAY, 6/27

8 a.m. – 1:45 p.m.

Wednesday's program is focused on eight topics for in-depth presentations and discussions.

COMMISSIONING TRACK

Forum 14 (Intermediate) 8 a.m. – 9 a.m.

Room: 101 B

What is Needed to Commission Air Distribution Systems for Small Commercial Buildings?

Sponsor: TC 06.03 Central Forced Air Heating and Cooling Systems; TC 05.02 Duct Design

Moderator: Craig P. Wray, Member, P. Eng, Lawrence Berkeley National Laboratory, Oakland, CA

Substantial amounts of energy can be saved by commissioning small HVAC systems, but the applicability and reliability of diagnostic tools to support commissioning has not yet been established. In particular, approaches for measuring duct leakage and air distribution system airflows need to be evaluated, and building industry guidelines that describe the best current tools and procedures for commissioning small commercial duct systems need to be prepared. This forum discusses system deficiencies, diagnostic tools, and the need for commissioning guidelines.



Seminar 63 (Intermediate)

9:15 a.m. – 10:45 p.m.

Room: 101 B

Commissioning Sustainable Buildings

Wednesday, June 27, 2007 9:15 a.m. – 10:45 a.m.

Sponsor: TC 07.09 Building Commissioning

Chair: Gerald J. Kettler, P.E., Member, AIR Engineering and Testing, Inc., Dallas, Texas

Commissioning is a quality process that ensures that buildings perform to owners' project requirements. Much attention has recently been focused on sustainable buildings, which often include new technologies and integrated design features. This seminar discusses several aspects of sustainable buildings and how important that commissioning is in ensuring maximum performance. Topics include planning and design phase goals, getting full value, and achieving optimum indoor environmental quality.

1. Planning and Design Phase Commissioning to Achieve Sustainability Goals

Jeff J. Traylor, Member, Emcor, Durham, NC

2. Getting Full Value from Your Green Building Investment

Henry J. Enck, Member, Commissioning and Green Building Services, LLC, Buford, GA

3. Commissioning for Indoor Environmental Quality

Elia M. Sterling, Member, Theodore D. Sterling & Assoc. Ltd, Vancouver, BC, Canada

Forum 18 (Intermediate) 11 a.m. – 12 p.m.

Room: 101 B

What Topics Should be Included in the Credentialing Program on Commissioning?

Wednesday, June 27, 2007 11 a.m. – 12 p.m.
Sponsor: Certification Committee; TC 07.09 Building Commissioning
Moderator: Gerald J. Kettler, P.E., Member, AIR Engineering and Testing, Inc., Dallas, TX

This forum discusses the focus of an ASHRAE initiative to develop a certification program for building commissioning professionals. The certification program is being developed as part of the ASHRAE Strategic Plan. Attendees discuss the specific body of knowledge needed by commissioning professionals to ensure that the building systems will operate as intended by owners.

Seminar 78 (Intermediate)

12:15 p.m. – 1:45 p.m.

Room: 101 B

Measurement and Verification for Retrocommissioning

Wednesday, June 27, 2007 12:15 p.m. – 1:45 p.m.
Sponsor: TC 07.09 Building Commissioning
Chair: Kristin H. Heinemeier, Ph.D., P.E., Member, Portland Energy Conservation, Inc., Davis, CA

Measurement and verification, which has been a cornerstone of energy efficiency for some years, is a more difficult proposition for retro-commissioning projects and programs. The broad number of possible interventions and vague definition of the impact of those interventions provides significant challenges. On the other hand, retro-commissioning is a data-rich endeavor, and it is possible to assess the impacts of retro-commissioning interventions in ways that are not possible for some other measures. This seminar explores experience with measurement and verification for retro-commissioning in several types of programs, and identifies activities underway to develop better methods.

1. Measurement and Verification Methods Applied to Retrocommissioning Projects

Mark Stetz, P.E., Member, Nexant, Boulder, CO

2. The Retrocommissioning Process with an Emphasis on Measurement and Verification

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

3. Benefits of Integrating M&V in RCx Projects

David A. Jump, Ph.D., P.E., Member, Quantum Energy Services and Technologies, Inc., Berkeley, CA

4. M&V for Determining ESCO Payments: A Case Study

Tarek Bou-Saada, Member, Texas - Human Health Services Commission, Richmond, TX

DATA CENTER COOLING TRACK

Transactions Session 6 (Intermediate)

8 a.m. – 9 a.m.

Room: 201 B

High Density Cooling Update

Wednesday, June 27, 2007 8 a.m. – 9 a.m.
Sponsor: TC 09.09 Mission Critical Facilities, Technology Spaces and Electronic Equipment
Chair: Jeffrey P. Rutt, P.E., Member, U.S. Department of Defense, Ft. Meade, MD

Cooling of high-density electronic equipment installations such as data centers and telecommunication facilities, are addressed. Power densities of 1000 watts per square meter (93 watts per square foot) 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. Perforated Tile Flow Distribution in Close Proximity to Computer Room Air Conditioning Units (LB-07-014)

Jeffrey Rambo, Ph.D., Graham Nelson and Yogendra Joshi, Ph.D., Georgia Institute of Technology, Atlanta, GA

2. Liquid Cooling Architectures for High Availability Systems (LB-07-015)

Michael J. Ellsworth, Jr., P.E., Roger R. Schmidt, Ph.D., P.E., Member, Prabjit Singh and Richard C. Chu, IBM Corp., Poughkeepsie, NY

Seminar 69 (Intermediate)

9:15 a.m. – 10:45 a.m.

Room: 201 B

Utilizing Economizers in a Data Center

Wednesday, June 27, 2007 9:15 a.m. – 10:45 a.m.
Sponsor: TC 09.09 Mission Critical Facilities, Technology Spaces and Electronic Equipment
Chair: Fred Stack, Associate, Emerson Network Power / Liebert, Columbus, OH

Increasing energy costs are challenging engineers to find the most cost effective ways to control temperature and humidity within a mission critical data center environment. This seminar discusses two types of economizer systems—air-side and fluid-based. The wider recommended operating conditions defined in ASHRAE's Thermal Guidelines for Data Processing Environments has created the opportunity for significant energy savings. The operation of various types of economizers is discussed and guidelines provided on where they are most effective.

1. Full Time Air Economizer

Jeff Sloan, P.E., McKinstry, Seattle, WA

2. Air Versus Fluid Economizer

Ron Spangler, P.E., Associate, Emerson Network Power / Liebert, Columbus, OH

3. Adiabatic Economizers

Seminar 71 (Intermediate) 11 a.m. – 12 p.m.

Room: 201 B

Energy-Efficient Controls For Data Centers

Wednesday, June 27, 2007 11 a.m. – 12 p.m.

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

Chair: Christian Belady, Member, Distinguished Techno, Hewlett-Packard Company, Richardson, TX

Data centers consume vast quantities of energy, greater than typical office buildings on a square foot basis. Traditionally the focus of data center controls has been reliability. As a result, some manufactured computer room air-conditioning units have no thermostatic or humidistatic dead bands, and most data centers are served by constant volume fans. This seminar presents control schemes that can be used to greatly reduce the power consumption of the HVAC systems while maintaining or improving reliability required by data center owners. Application of such strategies has drastically reduced data center energy as much as 80%.

1. Moving to Supply Air Temperature Control from Conventional Return Air Control in CRACs in a Data Center

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

2. Dynamic Fan Management Energy Savings for Row Level Cooling

John Bean, Member, American Power Conversion, O'Fallon, MO

Seminar 74 (Intermediate)

12:15 p.m. – 1:45 p.m.

Room: 201 B

Electronics Cooling: Techniques and Applications

Wednesday, June 27, 2007 12:15 p.m. – 1:45 p.m.

Sponsor: TC 01.03 Heat Transfer and Fluid Flow; TC 09.09 Mission Critical Facilities, Technology Spaces and Electronic Equipment

Chair: Don Beaty, P.E., Member, DLB Associates, Wanamassa, NJ

Current commercial electronic devices generate waste heat at a rate of 2 million watts per square meter or greater, and the forecast is for this level to continue to increase into the foreseeable future. This seminar presents recent work on high flux thermal management solutions from the device scale to the data center.

1. Compact Impingement Cooling Systems for Electronics Thermal Management

Timothy A. Shedd, Ph.D., Member, University of Wisconsin-Madison, Madison, WI

2. An Innovative Liquid Cooling Heat Exchanger for Cooling of Chips with Various Height and Power Density

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

3. Effect of Jet Arrays and Structured Surfaces on Two-phase Impingement Heat Transfer

James E. Bryan, Ph.D., Member, University of Missouri, Columbia, MO

4. Total System Power Reduction Through the use of Refrigeration for Thermal Management

David Copeland, Ph.D., Member, Sun Microsystems, Sunnyvale, CA

ENVIRONMENTAL HEALTH TRACK

Forum 13 (Intermediate) 8 a.m. – 9 a.m.

Room: 102 B

The Hot Potato, and Is It Glowing?

Wednesday, June 27, 2007 8 a.m. – 9 a.m.

Sponsor: TC 05.08 Industrial Ventilation Systems; TC 09.02 Industrial Air Conditioning

Moderator: Mike Baucom, Member, Bebeco Industries, Inc., La Marque, TX

Help the Hazardous Spaces subcommittee of TC 5.8, Industrial Ventilation Systems, define what a hazardous space is, and what design information is needed in the industry.

Transactions Session 7 (Basic)

9:15 a.m. – 10:45 a.m.

Room: 102 B

Applications of Multizone Airflow and Contaminant Transport Modeling

Wednesday, June 27, 2007 9:15 a.m. – 10:45 a.m.

Sponsor: TC 04.10 Indoor Environmental Modeling

Chair: W. Stuart Dols, Member, National Institute of Standards and Technology, Gaithersburg, MD

Multizone modeling programs can be useful in a variety of applications to analyze building airflows, pressure differences and contaminant transport. These capabilities prove useful in assessing building air change rates, inter-zonal airflow rates, comparing ventilation strategies including natural ventilation, smoke management systems, and performing indoor air quality and chemical biological threat analysis. Multizone models can be useful in performing building research as well as in more practical applications of building design and analysis by engineering practitioners.

1. The Enhancement and Use of Combined Simulation Tools in the Assessment of Hybrid Natural / Mechanical Ventilation Systems (LB-07-016)

David Bradley, Associate Member, Thermal Energy System Specialists, LLC, Madison, WI; D. Michael Utzinger, Ph.D., University of Wisconsin - Milwaukee, Milwaukee, WI

2. Application of Neural Networks Trained with Multi-zone Models for Fast Detection of Contaminant Source Position in Buildings (LB-07-017)

Vladimir Vukovic, Student and Jelena Srebric, Ph.D., The Pennsylvania State University, University Park, PA

3. Study of Penetration of Outdoor Fine Particles into a Nonresidential Building with Multi-Zone Simulation (LB-07-018) (RP-1281)

Xiang Liu, Zhiqiang Zhai, Ph.D., Member, Nick A. Facciola and Shelly L. Miller, University of Colorado at Boulder, Boulder, CO

4. Natural Ventilation in Residential Dwellings Under Uncertainty (LB-07-019)

Se-Hoon Hyun and Cheol-Soo Park, Ph.D., Member, Sung Kyunkwan University, Suwon, Gyeonggi, South Korea

Forum 17 (Basic)

11 a.m. – 12 p.m.

Room: 102 B

11 a.m. – 12 p.m.

What Can the Environmental Health Committee Do for You?

Wednesday, June 27, 2007

11 a.m. – 12 p.m.

Sponsor: Environmental Health Committee

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

The role and responsibilities of the Environmental Health Committee and its members are unusual within ASHRAE. In addition to practicing engineers, the committee's ranks include physicians, public health experts and industrial hygienists. The committee is charged with overseeing all activities related to indoor air quality, but what does that mean to members and the industry? This forum seeks to discover what the committee can do to help attendees do their jobs better, faster or more cost-effectively.

Seminar 80 (Intermediate)

12:15 a.m. – 1:45 p.m.

Room: 102 B

UVGI Installations in Government Buildings: Exploring the Knowns, Unknowns, and Gaps Regarding Potential Benefits For Public Health, Employee Safety and Energy Efficiency

Wednesday, June 27, 2007 12:15 p.m. – 1:45 p.m.

Sponsor: TG2.UVAS Ultraviolet Air and Surface Treatment

Chair: Chuck Dunn, Member, Lumalier, Memphis, TN

Confusion and uncertainty surround the application of ultraviolet germicidal irradiation (UVGI) systems. Today, government agencies are interested in UV applications designed to improve indoor air quality and prevent the spread of airborne infectious diseases, while also improving the energy efficiency and cleanliness of HVAC systems. This seminar outlines the current best practice for the use and maintenance of UVGI systems; describe benefits from large-scale applications in various government buildings to reduce the transmission of tuberculosis; and addresses the gaps and unknowns that currently preclude more wide-spread integration of UVGI technologies into HVAC and building systems.

1. Current Best Practices

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

2. Best Practice Put to the Test, Part 1

Shawn Siegrist, Sacramento County, CA, Mather, CA

3. Best Practice Put to the Test, Part 2

Thomas V. Williams, Jr., Sacramento County, CA, Sacramento, CA

4. What Information Is Needed to Best Apply the Technology?

David S. Marciniak, P.E., Member, U.S. General Services Administration, Washington, D.C.

EXERGY TRACK

Transactions Session 5 (Intermediate)

8:00 a.m. – 9:00 a.m.

Room: 101 A

Exergy Efficient Systems and Applications for Sustainable Buildings

Wednesday, June 27, 2007

8 a.m. – 9 a.m.

Sponsor: TC 01.01 Thermodynamics and Measurements; TC 01.01 Thermodynamics and Psychrometrics

Chair: Samuel Sami, Ph.D., P.E., ASHRAE Fellow, P. Eng, University of Moncton, Moncton, Canada

Sustainable buildings are one of the most important assets of carbon mitigation efforts and essential components for a healthier environment. According to IEA Annexes 38 and 49, the next generation of sustainable buildings largely depends upon the improvement of exergy efficiency of buildings, including their HVAC systems and equipment. In conjunction to these findings, exergetically more efficient buildings- like low-exergy buildings, HVAC systems, district energy systems, and combined heat and power concept must be all integrated on a new roadmap for future sustainable and green buildings, based on both energy and exergy efficiency. This symposium addresses essential components of exergy efficiency improvement for the next generation green building design, application, and associated systems and equipment, and discusses their positive impact on sustainability at large.

1. Exergetic Performance Analysis of Various Cogeneration Systems for Buildings (LB-07-012)

Mehmet Kanoglu, University of Gaziantep, Gaziantep, Turkey; Ibrahim Dincer, Ph.D., Member and Marc A. Rosen, University of Ontario Institute of Technology, Oshawa, ON, Canada

2. A Rational Exergy Management Model for Curbing Building CO₂ Emissions (LB-07-013)

Siir Kilkis, Student, Georgetown University, Vienna, VA

Seminar 65 (Intermediate)

9:15 a.m. – 10:45 a.m.

Room: 101 A

Exergy 201: Use It or Lose It Forever

Wednesday, June 27, 2007 9:15 a.m. – 10:45 a.m.

Sponsor: TG1.Exergy Analysis for Sustainable Buildings; TC 01.01 Thermodynamics and Psychrometrics

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

Speakers provide applications of exergy analysis and by example demonstrate how the analysis is an important tool in designing sustainable HVAC&R systems.

1. Low Temperature Heating and High Temperature Cooling With Advanced Low Exergy Systems

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

2. Net Zero Energy or Net Zero Exergy Buildings?

Siir Kilkis, Student, Georgetown University, Vienna, VA

3. Is Exergy Analysis Necessary for Good System Design?

Roy R. Crawford, Ph.D., Member, Trane, Tyler, TX

Forum 15 (Basic)

11 a.m. – 12 p.m.

Room: 101 A

11 a.m. – 12 p.m.

Dollars and Senses of Exergy: How Exergy Analysis Can Help For Greener, Affordable And Sustainable Buildings

Wednesday, June 27, 2007 11 a.m. – 12 p.m.

Sponsor: TG1.Exergy Analysis for Sustainable Buildings

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

Rebuilding after Hurricane Katrina has brought into focus the need for stronger yet affordable new building designs. However, without embedding greener buildings to the community for a sustainable environment, we may be treating the symptoms but not the root causes of increasing hurricane damage due to global warming. This forum establishes a discussion platform based on exergy to view the issue from a multitude of perspectives and to bring them to a consensus to look for long-term solutions.

Transactions Session 8 (Intermediate)

12:15 p.m. – 1:45 p.m.

Room: 101 A

Exergy: a New Frontier in Green Building Simulation

Wednesday, June 27, 2007 12:15 p.m. – 1:45 p.m.

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

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

Rational exergy efficiency of buildings depends upon the dynamic and non-linear behavior of outdoor meteorological conditions, building envelope and their control algorithms. In turn, rational exergy efficiency is a robust indicator of the compounded CO₂ emissions of buildings. With the lowest rational exergy efficiency among all sectors, buildings are responsible for some 40% of CO₂ emissions. This illustrates that building comfort systems require a new frontier of innovative exergy efficient designs and control strategies. This symposium addresses essential exergy efficiency components for next generation green building simulation with the objective of minimizing the exergy losses.

1. Exergy Analysis of Psychrometric Processes for HVAC&R Applications (LB-07-20)

Mehmet Kanoglu, University of Gaziantep, Gaziantep, Turkey; Ibrahim Dincer, P.E., Member and Marc A. Rosen, University of Ontario Institute of Technology, Oshawa, ON, Canada

2. Upgrading Directive 2004/8/EC with Rational Exergy Model (LB-07-21)

Birol I. Kilkis, Ph.D., ASHRAE Fellow, Watts Radiant, Springfield, MO; Siir Kilkis, Student, Georgetown University, Vienna, VA

HEAT PUMPS TRACK

Transactions Session 4 (Intermediate)

8 a.m. – 9 a.m.

Room: 103 B

Absorption/Sorption Chillers, Heat Pumps and Refrigeration Systems

Wednesday, June 27, 2007 8 a.m. – 9 a.m.

Sponsor: TC 08.03 Absorption and Heat Operated Machines

Chair: Abdolreza Zaltash, Ph.D., Member, Oak Ridge National Laboratory, Oak Ridge, TN

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

1. One Hundred Ton Absorption Chiller/Heat Pump Demonstrates the Real Cost of Saving Energy (LB-07-010)

Donald C. Erickson, Member, Energy Concepts Co., Annapolis, MD

2. Performance of a Demand-Limiting Control Algorithm for Hybrid Cooling Plants (LB-07-011) (RP-1200)

James E. Braun, Ph.D., Member, Purdue University, West Lafayette, IN

Seminar 66 (Intermediate)

9:15 a.m. – 10:45 a.m.

Room: 103 B

Heating with Forced Air Heat Pump Systems: Past, Present and Future

Wednesday, June 27, 2007 9:15 a.m. – 10:45 a.m.

Sponsor: TC 06.03 Central Forced Air Heating and Cooling Systems; TC 09.05 Residential and Small Building Applications

Chair: Michael R. Lubliner, Member, Washington State University Energy Program, Olympia, WA

Residential forced-air heating systems that employ air-to-air heat pumps can reduce space heating energy use in existing and new residential construction. Pacific Northwest utility sponsored research evaluation of heat pump systems, equipment, controls, and duct distribution systems, installations, commissioning, maintenance and operation are presented, and ideas to further improve installed system efficiency and utility heat pump programs explored.

1. Laboratory Evaluation of the Impact of Charge and Air-Flow on Heating and Cooling Performance of Heat Pumps

Larry Palmiter, Ecotope, Inc., Seattle, WA

2. High Performance Heat Pump Monitoring in the Pacific Northwest, Performance and Diagnostics

Dave Robison, P.E., Stellar Processes, Portland, OR

3. Development of Installation Standards for Heat Pumps in Heating Climates

Bob Davis, Member, Ecotope Inc., Portland, OR

4. Training Heating Contractors on Utility Heat Pump Programs

David Hales, WSU Energy Program, Spokane, WA

Forum 16 (Intermediate) 11 a.m. – 12 p.m.

Room: 103 B

Energy Recovery Systems Save Natural Resources, So Why Aren't They Used More Often?

Wednesday, June 27, 2007 11 a.m. – 12 p.m.

Sponsor: TC 05.05 Air-to-Air Energy Recovery

Moderator: James L. Newman, Life, CEM, LEED AP, Newman Consulting Group, LLC, Bloomfield Hills, MI

Since air-to-air energy recovery systems save energy and lower operating costs, why aren't they used by more engineers? Is it lack of familiarity? Is it fear? What are your experiences - both good and bad? Our commitment to more sustainable design is to save energy. How can air-to-air energy recovery systems help?

Seminar 75 (Intermediate) 12 p.m. – 1:45 p.m.

Room: 103 B

Emerging Technologies for Absorption/Sorption Systems

Wednesday, June 27, 2007 12:15 p.m. – 1:45 p.m.

Sponsor: TC 08.03 Absorption and Heat Operated Machines

Chair: Abdolreza Zaltash, Ph.D., Member, Oak Ridge National Laboratory, Oak Ridge, TN

Innovative absorption/sorption chillers with improved overall energy efficiency can provide overall peak load reduction and electric grid relief particularly for summer peak demand. This seminar presents recent innovative absorption/sorption systems for improved overall performance, lower environmental impact, and improved economics compared with current technologies.

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. Development of a Simultaneous Heating and Cooling Absorber

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

3. Innovation in Absorption Technologies

Nitin Pathakji, Member, Broad USA Inc., Hackensack, NJ

LABORATORY DESIGN TRACK

Forum 12 (Intermediate) 8 a.m. – 9 a.m.

Room: 202 AB
8 a.m. – 9 a.m.

Laboratory Fume Hood Performance Testing: Getting the Most from Your Investment

Wednesday, June 27, 2007 8 a.m. – 9 a.m.

Sponsor: TC 09.10 Laboratory Systems

Moderator: Dale T. Hitchings, P.E., Member, C.I.H., SAFELAB Corporation, Indianapolis, IN

Use of ASHRAE Standard 110, *Method of Testing Performance of Laboratory Fume Hoods*, is becoming more widespread, and the ranks of those performing this testing is growing rapidly. For each qualified firm performing this testing, there are many others who are not. This forum discusses certification of those performing Standard 110 testing, the risk to life and health represented by unqualified testers, and the broader aspects of proper commissioning of labs and the impact on energy use and sustainability.

Seminar 67 (Intermediate)

9:15 a.m. – 10:45 a.m.

Room: 202 AB

Reducing Air Flow Rates in Labs: Balancing Energy Savings with Risk

Wednesday, June 27, 2007 9:15 a.m. – 10:45 a.m.

Sponsor: TC 09.10 Laboratory Systems

Chair: Duncan Phillips, Ph.D., P.E., Member, P. Eng, Rowan Williams Davies & Irwin, Guelph, ON, Canada

Air change rates (ACH) in labs are receiving increasing attention. In some labs, ventilation systems use one-pass air: the air is conditioned and supplied to the lab and then exhausted from the building. In many parts of North America, the cost associated with conditioning the air exceeds \$4 per cfm. Reducing the ACH in these labs reduces the energy usage required to operate the lab. However lab operators are reluctant to do so because of the perception that a lower ACH is less safe. This seminar addresses the global issue of reducing ACH, including discussions of safety and energy savings.

1. An Analysis of Minimum Air Changes per Hour in Laboratories with Fume Hoods

Emil R. Sandru, Ph.D., P.E., Member, Research Facilities Design, San Diego, CA

2. Dynamic Control of Laboratory Air Change Rates

Gordon Sharp, Ph.D., P.E., Member, Aircuity, Newton, MA

3. A Rational Method for Determining Air Change Rates in Laboratories

Tom Smith, P.E., Member, Exposure Control Technologies, Cary, NC

Seminar 72 (Advanced) 11 a.m. – 12 p.m.

Room: 202 AB

Lab Design with Low Flow Chemical Fume Hoods

Wednesday, June 27, 2007 11 a.m. – 12 p.m.

Sponsor: TC 09.10 Laboratory Systems

Chair: Victor A. Neuman, P.E., Member, Tour Andover Controls, Spring Valley, CA

Advanced models of chemical fume hoods have been produced by various manufacturers in the past five years, aided in part by a Department of Energy funded research and design team in Berkeley, Calif. This session considers how lab architecture and engineering needs to change to use these new low flow hoods to their best advantage. Control options, mechanical design and lab architecture are covered.

1. Control Options for Low Flow Chemical Fume Hoods

Tom Checksfield, Tek-Air Systems, Danbury, CT

2. Lab Ventilation Devices: Impact on Lab Design

Karl Aveard, *Design For Science, Temecula, CA*

3. Lab Design Decisions for Low Flow Chemical Hoods

Victor A. Neuman, *Member, Tour Andover Controls, Spring Valley, CA*

Seminar 77 (Intermediate)

12:15 a.m. – 1:45 p.m.

Room: 202 AB

Laboratory Noise Control: Designing Quieter Systems

Wednesday, June 27, 2007 12:15 p.m. – 1:45 p.m.

Sponsor: *TC 09.10 Laboratory Systems; TC02.06 Sound and Vibration Control*

Chair: *Gregory R. Johnson, P.E., Member, Newcomb & Boyd, Atlanta, GA*

Speakers examine ASHRAE guidelines for HVAC noise in laboratories, describe challenges in meeting these guidelines, identify design pitfalls, and present practical design strategies to overcome these issues and design facilities with acceptable acoustics. Acoustical fundamentals are included to provide a base for the discussion. Real world case studies with pre- and post-design problems and solutions are presented.

1. A Review of ASHRAE Noise Criteria for Teaching Labs Relative to Achieved Speech Intelligibility

Darron C. Quee, P.E., Member, RWDI, Guelph, ON, Canada

2. Acoustical Design of Laboratory Ventilation Systems

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

3. Designing Quieter Labs: What Not to Do

Gregory R. Johnson, Member, Newcomb & Boyd Consultants and Engineers, Atlanta, GA

PEAK DEMAND/THERMAL STORAGE SYSTEMS TRACK

Seminar 61 (Advanced) 8 a.m. – 9 a.m.

Room: 204

Evaporative Cooling Strategies to Reduce Peak Electric Demand, Part 1

Wednesday, June 27, 2007 8 a.m. – 9 a.m.

Sponsor: *TC 05.07 Evaporative Cooling*

Chair: *Leon E. Shapiro, Member, VRTX Technologies, Las Vegas, NV*

Peak electric demand reduction is becoming increasingly important in many parts of the country. Perhaps no where is this more of a concern than in California where demand can sometimes exceed supply. Evaporative cooling often is at its peak efficiency precisely when the greatest requirement is placed on electric utilities' capacities. This seminar provides a utility company's perspective on the need for peak electric demand reduction, and explores case studies of the use of evaporative cooling in various building designs to effectively accomplish such demand reductions.

1. A California Utility Perspective on Mitigating Demand Growth with Evaporative Cooling

Robert A. Davis, Member, Pacific Gas & Electric Co., San Ramon, CA

2. Laboratory Reduction of Peak Cooling Load with Wet Bulb Triple Dip

Keith F. Marchando, Member, Sonoma State University, Santa Rosa, CA

3. Can Evaporative Coolers Reduce Load While Staying Inside the Standard 52 Comfort Zone?

David A. Springer, Member, Davis Energy Group, Davis, CA

Seminar 64 (Advanced)

9:15 a.m. – 10:45 a.m.

Room: 204

Evaporative Cooling Strategies To Reduce Peak Electric Demand, Part 2

Wednesday, June 27, 2007 9:15 a.m. – 10:45 a.m.

Sponsor: *TC 05.07 Evaporative Cooling*

Chair: *Leon E. Shapiro, Member, VRTX Technologies, Las Vegas, NV*

Peak electric demand reduction is becoming increasingly important in many parts of the country. Perhaps no where is this more of a concern than in California where demand can sometimes exceed supply. Evaporative cooling often is at its peak efficiency precisely when the greatest requirement is placed on electric utilities' capacities. This seminar provides a utility company's perspective on the need for peak electric demand reduction, and explores case studies of the use of evaporative cooling in various building designs to effectively accomplish such demand reductions.

1. IDEC System Shuts Off the Chiller on the Hottest Days

Thomas D. Colvin, P.E., Member, Colvin Engineering Associates, Salt Lake City, UT

2. Reducing Peak KW Demand at a California Campus

Antonio Costa, P.E., Member, Costa Engineers, Inc., Napa, CA

3. Evaporative Cooling, Dedicated Outside Air Systems and Demand Limiting

Wayne M. Lawton, P.E., Member, Lentz Engineering Associates, Inc., Sheboygan Falls, WI

Seminar 73 (Intermediate) 11 a.m. – 12 p.m.

Room: 204

Secondary Benefits of Thermal Energy Storage

Wednesday, June 27, 2007 11 a.m. – 12 p.m.

Sponsor: TC 06.09 Thermal Storage

Chair: Alan W Green, P.E., Member, CB&I, Plainfield, IL

Thermal energy storage (TES) was originally developed as a load shifting technology to avoid peak demand costs and economize on capital costs. The higher chiller plant energy efficiencies are an additional benefit that helps conserve our natural resources. This seminar also explores other secondary benefits such as more efficient operation of combined heat and power plants, lower source emissions of global warming gases and dual use as fire protection.

1. Secondary Benefits of TES

John S. Andrepont, Member, The Cool Solutions Co., Lisle, IL

2. TES and Its Effect on CO₂ at the Source

Scot Duncan, P.E., Retrofit Originality Inc., Lake Forest, CA

3. The Essence of Storage: Balancing CHP Loads Saves Natural Resources at University of Arizona

Mark M. MacCracken, P.E., Member, CALMAC Manufacturing Inc., Fair Lawn, NJ

11 a.m. – 12 p.m.

Seminar 76 (Intermediate)

Room: 204

Energy Performance of Thermal Energy Storage Systems

Wednesday, June 27, 2007 12:15 p.m. – 1:45 p.m.

Sponsor: TC 06.09 Thermal Storage

Chair: Moncef Krarti, Ph.D., Member, P. Eng, University of Colorado, Boulder, CO

The performance of actual thermal energy storage (TES) systems is presented, with focus on design specifications and operating and control settings for TES systems. The historical TES energy use and impact on operating costs of facilities are described.

1. Performance of a TES System in Nebraska

Gregor Henze, Ph.D., P.E., Member, University of Nebraska - Lincoln, Omaha, NE

2. "Case Study of the University of Alberta Thermal

Storage System"

William Bahnfleth, Ph.D., P.E., ASHRAE Fellow, The Pennsylvania State University, University Park, PA

3. Title 24, TDV and Cool Storage

Martyn Dodd, Member, CALMAC Manufacturing Corp., Fair Lawn, NJ

4. Controls of an Ice Storage System for a School

Moncef Krarti, Ph.D., P.E., Member and Steve Morgan, University of Colorado, Boulder, CO

REFRIGERATION TRACK

Seminar 62 (Intermediate) 8 a.m. – 9 a.m.

Room: 201 A

Refrigeration Systems Using Natural Refrigerants

Wednesday, June 27, 2007 8 a.m. – 9 a.m.

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

Chair: Robert D. Tanner, Member, Hill Phoenix, Colonial Heights, VA

A new look at natural refrigerants, such as CO₂ and ammonia, for refrigeration systems, is provided.

1. CO₂ Refrigeration System Energy Comparison

Doron Shapiro, P.E., Ingersoll-Rand (Hussman), Bridgeton, MO

2. Low Charge Air Cooled Ammonia Chillers

Pega Hrnjak, Ph.D., ASHRAE Fellow, University of Illinois at Urbana Champaign, Urbana, IL

Seminar 68 (Intermediate)

9:15 a.m. – 10:45 a.m.

Room: 201 A

Retrofit Technologies for Supermarket Refrigeration Systems and Display Cases

Wednesday, June 27, 2007 9:15 a.m. – 10:45 a.m.

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

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

Presentations include a summary of system performance data for supermarket refrigeration systems retrofitted from R-22 to HFC alternative refrigerants and laboratory studies of two display case retrofits—LED and fiber optic lighting vs. T-8 fluorescents and doors with an anti-fog film vs. standard doors.

1. Retrofit Experience of R-22 Alternative Refrigerants in Supermarket Refrigeration Systems

C. Curtis Lawson, Member, DuPont Fluoroproducts, Wilmington, DE

2. T-8/LED/FO Display Case Lighting

Scott Mitchell, Member, Refrigeration and Thermal Test Center, Irwindale, CA

3. Anti-fog Film for Glass Doors

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

Seminar 70 (Basic) 11 a.m. – 12 p.m.

Room: 201 A

Specific Design Considerations for Refrigerated Storage Facilities

Wednesday, June 27, 2007 11 a.m. – 12 p.m.

Sponsor: TC 10.05 Refrigerated Distribution and Storage Facilities

Chair: Ajay R. Chatlani, Member, Tyson Foods, Inc., Springdale, AR

Insight on using specialty systems and design criteria in the construction of refrigerated storage facilities is given. From racking to doorway infiltration and when to use desiccants, this program educates on various techniques in designing a state-of-the-art system.

1. Opportunities for Energy Reduction in Refrigeration Systems

John Topliss, Member, Refrigeration Components RCC Canada Ltd., Surrey, Canada

2. Managing Doorway Infiltration Entering a Refrigerated Storage Facility

Chuck Zimmermann, ASI Technologies, Inc. - Enviro Division, Milwaukee, WI

3. The Effects of Desiccant Usage Inside a Refrigerated Storage Facility

Peter Demakos, P.E., Member, Niagara Blower Co., Buffalo, NY

Seminar 79 (Intermediate)

12:15 p.m. – 1:45 p.m.

Room: 201 A

Multi-Split Systems and Variable Refrigerant Flow

Wednesday, June 27, 2007 12:15 p.m. – 1:45 p.m.

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

Chair: Ramez M. Afify, P.E., Member, Clifford Dias Consulting Engineers, New York, NY

This seminar discusses the theory and application of the multi split systems and variable refrigerant flow.

1. Multisplit System Air-Conditioning Technology

Man-Hoe Kim, Ph.D., Member, Korea Advanced Institute of Science and Technology, Daejeon, Korea

2. VRF: A Viable Technology?

John Miles, Quietside, Santa Fe Springs, CA

3. VRFT Technology, Its Background, Its Benefits

Russell Tavolacci, Member, Daikin AC (Americas), Inc., Carrollton, TX