
ASHRAE ANNUAL MEETING TECHNICAL PROGRAM

NASHVILLE, TENNESSEE JUNE 27 – 30, 2004

NOTE: THIS PROGRAM IS SUBJECT TO CHANGE.

Updated May 17, 2004

SUNDAY, 6/27 8 A.M. TO 10 A.M.

Symposium NA-04-01

Refrigerant Flammability and Other Properties

Room: Tennessee Ballroom B (T2)

Sunday, June 27 8 a.m. to 10 a.m.

Sponsor: TC 03.01 Refrigerants and Secondary Coolants

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

A number of zeotropic refrigerant blends (R-400 series) are in use today. Property data available from various sources shows significant deviation from the output of some widely used thermodynamic models. In addition, the transition to non-ozone depleting refrigerants has led to the use of flammable refrigerants, either on their own or as components of blends. This has caused the industry to take a close look at the criteria used to assess the flammability hazard. The first two papers address measurement and modeling of refrigerant properties. The second two papers address refrigerant flammability.

1. Viscosity Measurements and Model Comparisons for the Refrigerant Blends R-410A and R-507A

Arno Laesecke, Ph.D., National Institute of Standards and Technology, Boulder, CO

2. Measurement and Model Development for R-400 Series Refrigerants (RP-1215) (4694)

Vladimir Geller, Ph.D., Thermophysics Research Center, San Francisco, CA

3. Burning Velocity and Refrigerant Flammability Classification

Tony Jabbour, Ph.D., Student Member and Denis Clodic, Ph.D., Member, Ecole Des Mines De Paris, Paris, France

4. RF2 for Assessing Combustion Hazard of Flammable Gases: Revision of RF-Number

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

Seminar 1

A Vision of eASHRAE: Or How to Give a Seminar in Your Pajamas

Room: Presidential Ballroom C (P2)

Sunday, June 27 8 a.m. to 10 a.m.

Sponsor: TC 01.05 Computer Applications

Chair: Pornsak Songkakul, Dr.Eng., Member, Siemens Building Technologies, Inc., Buffalo Grove, IL

It is 2014 and you attend an ASHRAE meeting via your living room. The seminar speaker is in Kuala Lumpur, and the ASHRAE audience is scattered about the globe. Possible? Yes. This seminar will preview the ASHRAE of the future with a focus on "state of the shelf" technology. Speakers will use technology available today and the near future to lead you through the life of an active ASHRAE member in the year 2104.

1. A Day In the Life of an ASHRAE Member at the ASHRAE Winter Meeting, Chicago, Ill, Jan. 2014

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

2. E-Communications Make Life Easier for ASHRAE Volunteers

James S. Elleson, P.E., Member, University of Wisconsin, Madison, WI

3. Grassroots Electronic Communication - Awesome

Arthur D. Hallstrom, P.E., Fellow, Trane/ASD, Lexington, KY

4. Using the "e" in eNginer: Or Why I Kicked the Paper Habit

Mark M Hydeman, P.E., Member, Taylor Engineering, LLC, Alameda, CA

Seminar 2

Adaptive Reuse of Existing Buildings

Room: Jackson C/D (PM)

Sunday, June 27 8 a.m. to 10 a.m.

Sponsor: TC 09.01 Large Building Air-Conditioning Systems

Chair: Warren G. Hahn, P.E., Life, Hahn Engineering, Inc., Tampa, FL

As populations shift and local economies fluctuate, many cities and suburbs are striving to find new types of uses for abandoned buildings. Engineers are being called upon for systems expertise in adaptive reuse of older buildings. This Seminar examines, through case studies, the mechanical engineering challenges, opportunities, benefits, and lessons learned associated with adaptive reuse. In one such project, an Engineer/Architect firm learned to efficiently, effectively, and inexpensively adapt an abandoned supermarket for their own headquarters office. Another shows examples of utilizing the raised floor platform with underfloor air to overcome obstacles in re-use of existing structures.

1. Adaptive Reuse of Abandoned Supermarket as a New Engineer/Architect Professional Office
Stephen W. Duda, P.E., Member, Ross & Baruzzini, Inc., St. Louis, MO
 2. Adaptive Reuse of the Historic Subway Terminal Building in Los Angeles into 277 Luxury Apartments and Retail/Office Space
Phillip M. Trafton, Member, Donald F. Dickerson Associates, Inc., Van Nuys, CA
 3. Underfloor Air HVAC Solutions for Re-use of Old Buildings
John L. Kuempel, Jr., P.E., Member, Debra-Kuempel, Cincinnati, OH
 4. Two Methods of Humidity Control in Fast Food Restaurants
Rodney H. Lewis, Member, Rodney H. Lewis Assoc., Inc., Houston, TX
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Seminar 3

Business, Technical and Legal Issues Related to Design-Build Services

Room: Tennessee Ballroom C (T2)

Sunday, June 27 8 a.m. to 10 a.m.

Sponsor: TC 01.07 Business, Management & General Legal Education

Chair: Mark Diamond, J. D., Diamond and Diamond, LLC, New York, NY

"Design-build" is a method of project delivery that joins the architect-engineer and builder under one umbrella. Hopefully, this leads to more effective and less costly business for all, including the client. Design-build is increasingly specified as the required form of development for both private and government projects. This program delves into the legal, business operations, marketing and technical issues of design-build including how to organize, get business, do business, and use contracts as a design-build firm.

1. Design-Build: Executing the Project (Now that We've Talked Ourselves Into This Mess) Start from Where

You Want to Be

E. Mitchell Swann, P.E., Member, MDC Systems, Incorporated, Berwyn, PA

2. Design-Build from a Marketing Perspective

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

3. An Overview of Legal Aspects of Design-Build

Mark Diamond, Associate, Law Firm of Mark Diamond, New York, NY

4. Protecting Yourself from Liability: Design-Build Contracts

George Zier, State of Georgia, Atlanta, GA

Seminar 4

Current Technology and Applications of Fan Powered Terminal Units

Room: Presidential Ballroom B (P2)

Sunday, June 27 8 a.m. to 10 a.m.

Sponsor: TC 05.03 Room Air Distribution

Chair: Fred Lorch, P.E., Member, P. Eng, Phoenix Controls Corp., Acton, MA

Descriptions of new technologies associated with fan powered VAV terminal units and their application possibilities are presented. ECM motors, controller advances, improved operating sequences, IAQ issues for areas with high occupancies, and methods for utilizing low temperature air are described and discussed.

1. Comparison of Energy Use Between Parallel and Series Terminal Units
Eugene Faris, Associate Member, Nailor Industries, Kingwood, TX
 2. Application of Fan Powered Terminals in Underfloor Air Distribution Systems
Kenneth Loudermilk, Member, Trox USA, Alpharetta, GA
 3. History and Applications of ECM Motors
Leon Kloostra, Member, Titus, Division of Tomkins, Richardson, TX
 4. ECM Motor Energy Concerns
John Hogan, Member, City of Seattle, Seattle, WA
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Seminar 5

Moving Towards a Rational Approach to Addressing Mold Problems in Buildings

Room: Tennessee Ballroom A (T2)

Sunday, June 27 8 a.m. to 10 a.m.

Sponsor: TC 05.12 Ventilation Requirements and Infiltration

Chair: James T Reardon, Ph.D., Member, National Research Council of Canada, Ottawa, ON, Canada

The Healthy Indoor Partnership S&T Workshop on Mold took place November 2003, in Montreal, bringing together more than 85 North-American stakeholders and experts, including occupational hygiene, health, property management, manufacturers, consultants and builders. A consensus on state-of-art and R&D priorities on two aspects of mold in buildings was determined: potential health impacts and remedial technologies. Workshop leaders report on the new collaborative plan for a consistent multi-disciplinary approach to mold by Canadian government and industry.

1. Overview of the Healthy Indoor Partnership Mold Workshop
Morad R. Atif, Ph.D., National Research Council of Canada, Ottawa, ON, Canada
2. Identified R&D Themes and Priorities for Mold in Buildings
Marie-Alix D'Halewyn, Ph.D., Institut National de Sante Publique du Quebec, Ste.-Anne-de-Belleveue (Quebec), Quebec, Canada
3. Canadian Approaches to Mold Remediation in Buildings
Donald A. Figley, Ph.D., P.E., Figley Consulting Associates Ltd., Saskatoon, SK, Canada

Seminar 6

Smoke Control Design Review and Inspection

Room: Tennessee Ballroom D/E (T2)

Sunday, June 27 8 a.m. to 10 a.m.

Sponsor: TC 05.06 Control of Fire and Smoke

Chair: Gary D. Lougheed, Ph.D., Member, National Research Council, Ottawa, ON, Canada

Review and inspection of smoke control designs for buildings are discussed. This includes review of smoke control designs, the role of the special inspector in the review process, pitfalls in the design of smoke control systems, the review of designs based on CFD modeling and the testing of atrium smoke management systems.

1. Smoke Control Design Review

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

2. The Role of the Special Inspector for Smoke Control Systems

John A. Clark, P.E., Fellow, Hammel Green & Abrahamson Inc., Eagan, MN

3. Pitfalls and Recovering from a Smoke Control System Failure

Rajendera K. Kapoor, P.E., Member, Texas Youth Commission, San Antonio, TX

4. Design Review of Atrium Smoke Control Systems Based on CFD

Jeffrey S. Tubbs, P.E., Member, ArupFire, Westborough, MA

5. Modern Smoke Control System Testing for Atria

Steven D. Wolin, P.E., Code Consultants Inc., St. Louis, MO

Forum 1

8 a.m. to 8:50 a.m.

Implications of the International Building Code (IBC 2000) to the Application and Design of Chillers

Room: Presidential Ballroom A (P2)

Sunday, June 27 8 a.m. to 8:50 a.m.

Sponsor: TC 08.02 Centrifugal Machines; TC 02.07 Seismic and Wind Restraint Design

Moderator: William F. McQuade, P.E., Member, York International Corp., York, PA

Recent FEMA regulation has tied federal funding of building projects to the adoption of the International Building Code (2000). More than 40 states have complied. The implication for the industry is that HVAC equipment, considered essential for life safety or continual operation of essential building systems must now be able to survive and operate after a seismic event. A constructive discussion about the specific implications of the IBC 2000 seismic requirements to the application and design of chillers is sought.

Forum 2

8 a.m. to 8:50 a.m.

Should You Recirculate Exhaust from Industrial Air Cleaners?

Room: Jackson A/B (PM)

Sunday, June 27 8 a.m. to 8:50 a.m.

Sponsor: TC 05.04 Industrial Process Air Cleaning (Air Pollution Control); TC 05.08 Industrial Ventilation Systems

Moderator: Ronald C. Troxell, Member, United Air Filter, Forest Park, IL

Co-Moderator: Al Woody, P.E., Fellow, Albert Kahn Associates Inc, Detroit, MI

Energy conservation and emissions monitoring avoidance are two reasons for recirculating cleaned exhaust air. Some types of air cleaners do not lend themselves to recirculation, and some processes should never be recirculated because of the inherent risks associated with them. With all the caveats that must be met, should any cleaned process air be returned to an inhabited space? What about returning hot exhaust back to the process?

Forum 3

9 a.m. to 9:50 a.m.

What Is Needed for an Industrial Space Indoor Air Quality Standard?

Room: Jackson A/B (PM)

Sunday, June 27 9 a.m. to 9:50 a.m.

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

Moderator: Wayne M. Lawton, Associate, ARCADIS, West Bloomfield, MI

TC 5.8 and TC 9.2 both recommend that a new standard be generated to address indoor air quality for industrial spaces and to remove industrial spaces from Standard 62.1. The purpose of this forum is to seek direction and advice from ASHRAE members who design, own and work in industrial spaces. ASHRAE Standard 62.1 currently covers industrial spaces; however design specialists are concerned that they cannot totally comply with the standard. With the special applications for industrial spaces, is it time to generate a new ASHRAE Standard for IAQ in Industrial Spaces?

Forum 4

9 a.m. to 9:50 a.m.

What New Terminologies We Need to Include in ASHRAE Handbooks for Alternative and Sustainable Technologies

Room: Presidential Ballroom A (P2)

Sunday, June 27 9 a.m. to 9:50 a.m.

Sponsor: TC 01.06 Terminology

Moderator: Birol Kilkis, Ph.D., Fellow, Watts Radiant, Vienna, VA

With the advent and infusion of alternative, green, and sustainable technologies, ASHRAE publications need a consistent terminology base. This forum discusses how to prepare such a reference base to be used in ASHRAE publications and in other HVAC&R industries.

SUNDAY, 6/27 10:15 A.M. TO

12:15 P.M.

Symposium NA-04-02

HVAC Is for People

Room: Tennessee Ballroom B (T2)

Sunday, June 27 10:15 a.m. to 12:15 p.m.

Sponsor: TC 02.01 Physiology and Human Environment

Chair: Alison G. Kwok, Ph.D., Member, University of Oregon, Eugene, OR

The HVAC is for People session traditionally has covered a variety of topics related to thermal comfort in buildings. This year's symposia focuses on field evaluation of occupant thermal comfort with a particular interest in commercial buildings; the influence of personal control (either windows, task-ambient conditioning systems, or other means of control) on occupant response; statistical analyses of thermal comfort; and the cultural and climatic influences on thermal comfort.

1. Thermal Comfort and Adaptation in Semi-Outdoor Environments

Junta Nakano, Ph.D., Associate Member, and Shin-ichi Tanabe, Ph.D., Member, Waseda University, Tokyo, Japan

2. Operable Windows, Personal Control, and Occupant Comfort (RP-1161) (4695)

Gail S. Brager, Ph.D., Fellow, and Gwelen Paliaga, University of California Berkeley, Berkeley, CA; Richard de Dear, Macquarie University, Sydney, Australia

3. A Stochastic Approach to Thermal Comfort, Occupant Behavior and Energy Use in Buildings

Fergus Nicol and Michael A. Humphreys, Rev., Oxford Brookes University, Oxford, United Kingdom

4. Do People Like to Feel "Neutral"? The Behavior of the ASHRAE Scale of Subjective Warmth in Relation to Thermal Preference, Indoor and Outdoor Temperature

Michael A. Humphreys, Rev., and J. Fergus Nicol, Oxford Brookes University, Headington, Oxford, United Kingdom

5. Thermal Comfort in the Climatic Conditions of Southern Italy

Ida Fato, Francesco Martellotta, Ph.D. and Cecilia Chiancarella, Politecnico di Bari, Bari, Italy

6. Re-calibration of the Complaint Prediction Model (RP-1129) (HVAC&R Research Journal - April 2004)

Clifford Federspiel, Ph.D., P.E., Member, Rodney Martin and Hannah Yan, University of California, Berkeley, Berkeley, CA

Seminar 7

Back to Basics: Specifying the Right Windows for Your Job

Room: Jackson C/D (PM)

Sunday, June 27 10:15 a.m. to 12:15 p.m.

Sponsor: TC 04.05 Fenestration

Chair: Francois Dubrous, P.E., Member, Natural Resources Canada, Ottawa, ON, Canada

Ever wished you could get basic, down-to-earth information about windows? Chapter 30 of the ASHRAE Handbook, Fundamentals, is filled with technical information, and many ASHRAE presentations about windows have become highly specialized. Presentations in this seminar focus on window performance assessment, specification and installation. Presentations are based on real life cases and speakers' experience in the field. This seminar is part of an ongoing series.

1. A Handy Way of Checking Window Options and the Impact on Whole Building Performance

Michel Tardif, ing., Natural Resources Canada, Ottawa, ON, Canada

2. Selecting the Right Glass for Solar Shading

William McCluney, Ph.D., Member, Florida Solar Energy Center, Cocoa, FL

3. Get the Installation Right the First Time

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

Seminar 8

Engineering Ethics: Who Says What They Are?

Room: Tennessee Ballroom A (T2)

Sunday, June 27 10:15 a.m. to 12:15 p.m.

Sponsor: ASHRAE Accreditation Activities; TC 01.07 Business, Management & General Legal Education

Chair: Duane A. Wolf, P.E., Associate, Leuwerke and Associates, Inc., Des Moines, IA

Ethics have been around since the beginning of time, but the debate over them will continue until the end of time. What does it mean for engineers to be bound to a code of ethics? This seminar provides information on the sources and usage of the various codes of ethics as they pertain to the practice of engineering. It also discusses ethical dilemmas faced by practicing engineers. Technical expert or high priced advocate? Speakers examine the challenges faced by engineering expert witnesses who must balance ethics with clients' desires.

1. Codes of Ethics for Engineers

William J. Coad, P.E., Fellow, Presidential Member, Coad Engineering Enterprises, St. Louis, MO

2. Legal Aspects of Engineering Ethics

Christopher M. McDonald, Associate Member, Shook, Hardy & Bacon, LLP, Kansas City, MO

3. Ethical Duties of Being an Expert Witness

Lawrence G. Spielvogel, P.E., Fellow, Consulting Engineer, King of Prussia, PA

4. Ethical Dilemmas: Case Studies

Seminar 9

Green Buildings: Practical Experiences with Commissioning

Room: Tennessee Ballroom C (T2)

Sunday, June 27 10:15 a.m. to 12:15 p.m.

Sponsor: TC 02.08 Building Environmental Impacts and Sustainability

Chair: Stephen C. Turner, P.E., Member, P. Eng, CIAQP, Brown University, Providence, RI

Speakers' experiences with commissioning LEED buildings ranging from certified to platinum are discussed, including a review of systems used in buildings and issues raised in their commissioning. Lessons learned are summarized, and conclusions drawn on the impact of the LEED rating process on the successful commissioning of each project. Practical benefits of integrating the management of LEED certification with the commissioning process are presented. All speakers were contributors to the recently published ASHRAE GreenGuide.

1. Six LEED Buildings: Certification and Commissioning Experiences

Malcolm Lewis, P.E., Member, CTG Energetics, Inc., Irvine, CA

2. Making High-Performance Buildings Work

Paul A. Torcellini, Ph.D., P.E., Member, National Renewable Energy Laboratory, Golden, CO

3. Integrating LEED Certification with Commissioning

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

Seminar 10

HVAC Pumps: A Learning Series

Room: Tennessee Ballroom D/E (T2)

Sunday, June 27 10:15 a.m. to 12:15 p.m.

Sponsor: TC 06.01 Hydronic and Steam Equipment and Systems District Energy

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

Pumps are used as the motivating force in all water distribution systems but often their importance to successful system operation is not fully understood, resulting in failure to achieve design parameters. It is a design professional's responsibility to be fully knowledgeable in how pumps are selected and applied. However, the designer may lack experience and/or knowledge necessary to follow the following logical steps so that all aspects of pump selection and application are utilized: selecting a water distribution system and the appropriate pump(s) and preparing construction drawings and specifications.

1. Selecting a Hydronic Water Distribution System that Meets the Project Design Requirements

Richard Hegberg, Member, Hegberg & Associates, Chicago, IL

2. Selection of Pumps to Be Used

Mark Hegberg, Member, ITT Bell & Gossett, Wilmhurst, IL

3. Preparation of Construction Drawings Showing Configuration of Pumps and their Associated Piping Specialties

John Clark, P.E., Fellow, Hammel, Green & Abrahamson, Inc., Minneapolis, MN

4. Preparation of Specifications that Fully Describe the Pumps Selected for the Project

Michael J. King, Member, ARCOM Master Systems, Alexandria, VA

Seminar 11

Indoor Environmental Modeling of Museums, Art Galleries and Performing Arts Theaters

Room: Presidential Ballroom C (P2)

Sunday, June 27 10:15 a.m. to 12:15 p.m.

Sponsor: TC 04.10 Indoor Environmental Modeling; TC 05.03 Room Air Distribution

Chair: Duncan A. Phillips, Ph.D., P.E., Associate, P. Eng, Rowan Williams Davies & Irwin (Inc), Guelph, ON, Canada

Museums, art galleries and performing arts theaters present unique requirements and challenges for HVAC systems and air distribution. They have narrow tolerances on temperature, air speed and humidity ranges (for contents and performers) while having large local loads (e.g. lighting on the stage) and high occupant densities: the audience. Finally, the HVAC systems serving these environments must be low noise. Speakers discuss recent case studies of environmental modeling of thermal comfort, noise and humidity in these spaces with tight environmental constraints.

1. Application of CFD to the Design of Ventilation Systems for an Art Gallery

Roger Chang, ARUP, New York, NY

2. Computer Modeling and Simulation of the Heat, Air and Moisture Transport for Moisture Control in an Art Museum

Jensen Zhang, Ph.D., Member, Syracuse University, Syracuse, NY

3. Physical and Computer Modeling Methods for the Acoustics of Performing Arts Spaces

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

4. Concert Hall Retrofit to Displacement Ventilation Using CFD Analysis as a Design Tool

Tim McGinn, Member, Keen Engineering Co. Ltd., Calgary, AB, Canada

Seminar 12

Proper Installation Methods for Seismic Restraints

Room: Presidential Ballroom B (P2)

Sunday, June 27 10:15 a.m. to 12:15 p.m.

Sponsor: TC 02.07 Seismic and Wind Restraint Design

Chair: Greg Meeuwssen, Member, Trane Company, La Crosse, WI

The new building codes, IBC 2000 and NFPA 5000, significantly changed the requirements for seismic restraint of HVAC equipment, piping and ducts, adding requirements in much of the country where none existed before. This seminar focuses on sources of practical information on the design, selection and installation of seismic restraint devices.

1. Installing Seismic Restraints on Mechanical, Electrical, Pipe and Duct Equipment

James A. Carlson, Associate, NED, Springfield, NE

2. Proper Installation Methods Using ASHRAE's "Practical Guide to Seismic Restraints" Manual

James R. Tauby, P.E., Member, Mason Ind. Inc., Hauppauge, NY

3. SMACNA Seismic Restraint Manual - An Overview

Robert J. Wasilewski, Member, SMACNA, Chantilly, VA

4. Proper Installation Method for Anchors for Seismic Restraint

Chris LaVine, ITW Ramset/Red Head, Wood Dale, IL

Forum 5 10:15 a.m. to 11:05 a.m.

ASHRAE and Homeland Security: Where Have We Been and Where Should We Be Going?

Room: Jackson A/B (PM)

Sunday, June 27 10:15 a.m. to 11:05 a.m.

Sponsor: Presidential Ad Hoc on Homeland Security Committee

Moderator: James E. Woods, Ph.D., P.E., Fellow, Building Diagnostics Research Institute, Inc., Chevy Chase, MD

With ASHRAE members involved in many aspects of the nation's infrastructure and with the nation and the world facing increased concerns about infrastructure vulnerability, ASHRAE leadership has determined that the Society will take a proactive approach to minimize risks for building occupants during extraordinary events. The Presidential Ad Hoc Committee on Homeland Security will update members on relevant homeland security matters both within and outside of ASHRAE. Forum participants will learn about available resources, ongoing research, planned projects, and opportunities for participation. Participants will also be asked for their input into the future direction of this important endeavor.

Forum 6 10:15 a.m. to 11:05 a.m.

What Do You Need to Know About Standard 62.1?

Room: Presidential Ballroom A (P2)

Sunday, June 27 10:15 a.m. to 11:05 a.m.

Sponsor: SSPC 62.1

Moderator: Hoy R. Bohanon, P.E., Member, R.J. Reynolds Tobacco Co., Winston-Salem, NC

The education subcommittee of ASHRAE's Standard 62.1 committee wants to enhance the ability of users to effectively and efficiently apply the standard. What do you as a designer, code official, owner or operator need to know about using Standard 62-2001, Ventilation for Acceptable Indoor Air Quality? There have been many changes since the 2001 standard was published. What topics need to be addressed and in what form should the information be presented to benefit you?

Forum 7 11:15 a.m. to 12:05 p.m.

How Are Electric Motors and Drives Affected by 90.1?

Room: Presidential Ballroom A (P2)

Sunday, June 27 11:15 a.m. to 12:05 p.m.

Sponsor: TC 01.11 Electric Motors and Motor Control

Moderator: Thomas F. Lowery, Associate, ABB Inc., Mentor, OH

Input is sought on a proposed seminar, Inside and Out - 90.1 from an Electric Motor and Drive Perspective, tentatively scheduled for the 2005 Winter Meeting. Topics of discussion include: VAV methods of complying with 90.1, setting limits for applications of electric motors and drives within 90.1, addressing the need within 90.1 for reducing flows in variable pumping systems and what does section 6.3.4 within 90.1 mean for applications.

Forum 8 11:15 a.m. to 12:05 p.m.

What Do You Need to Know About Designing and Operating Stratified Air Distribution Systems?

Room: Jackson A/B (PM)

Sunday, June 27 11:15 a.m. to 12:05 p.m.

Sponsor: TC 05.03 Room Air Distribution

Moderator: Fred S. Bauman, P.E., Member, University of California, Berkeley, CA

Underfloor air distribution (UFAD) and displacement ventilation (DV) systems have received considerable attention during the past decade in North America as promising approaches to space conditioning in commercial buildings. Many of the cooling performance benefits of UFAD and DV systems arise from the fact that air is supplied near floor level and returned near ceiling level, producing an overall stratified environment. The control and optimization of stratification plays a key role in determining thermal comfort, IAQ and energy performance. This forum examines UFAD and DV system design and operation issues that impact room air stratification and for which additional guidance is needed.

SUNDAY, 6/27¹ P.M. TO 3 P.M.

Symposium NA-04-03

Inside the Box: Using Plenums and Plenum Fans Wisely

Room: Presidential Ballroom B (P2)

Sunday, June 27 1 p.m. to 3 p.m.

Sponsor: TC 02.06 Sound and Vibration Control

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

The use of plenums as an acoustical attenuation element is common in both built-up systems and packaged HVAC units. Unhoused plenum fans often are applied in these plenums to take advantage their acoustical properties and low outlet velocities. Until recently, the data available on the acoustical and flow characteristics of plenums was dated and questionable in nature. Newly completed ASHRAE research has produced better methods of prediction of plenum performance. These new prediction methods along with practical lessons learned by applying plenum fans in the lab and in the field are presented.

1. The Acoustic Properties of Common HVAC Plena - RP-1026
Emanuel Mouratidis, Associate Member and John Becker, Vibro-Acoustics, Toronto, ON, Canada
2. Pressure Drop and Acoustical Application Guidelines for HVAC Plenums Based on RP-1026
Karl L. Peterman, P.E., Member and Emanuel Mouratidis, Vibro-Acoustics, Toronto
3. Plenum Fans in HVAC Equipment: The Good, the Bad, and the Ugly
Kim Osborn, Associate, Governair Corp., Oklahoma City, OK

Seminar 13

Contaminant Removal from Air-Conditioning and Refrigeration Systems

Room: Tennessee Ballroom D/E (T2)

Sunday, June 27 1 p.m. to 3 p.m.

Sponsor: TC 03.03 Refrigerant Contaminant Control

Chair: Raymond Thomas, Ph.D., Member, Honeywell, Buffalo, NY

Contaminants are generated during the use of air-conditioning and refrigeration systems. Mechanisms to control their levels during use and techniques for their removal during service and repair are required. Contaminants, the consequences of not removing them, techniques for their removal and control are discussed. A key part of the discussion is the measurement of contaminant levels and experimental determination of the effectiveness of the techniques for their removal and control. Past research is reviewed and new data presented.

1. Flushing of Air-Conditioning and Refrigeration Systems
Raymond Thomas, Ph.D., Honeywell, Buffalo, NY
2. Contaminant Removal: Why Do We Need It?
Joe A. Karnaz, Member, Tecumseh Compressor Co., Tecumseh, MI
3. Moisture Levels in Real Systems and their Implications
Rob Yost, Fellow, National Refrigerants, Inc, Rosenhayn, NJ

Seminar 14

Effective Measures to Improve the Efficiency of Chilled Water Plants

Room: Presidential Ballroom C (P2)

Sunday, June 27 1 p.m. to 3 p.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., Member, P. Eng, HDR, Omaha, NE

Owners, engineers, operators, commissioning agents and others recognize the need to improve chilled water plant efficiency. What is the state of the art in our industry? Speakers investigate applications and industry state of the art to improve the efficiency of chilled water plants.

1. Measuring Water Flows through Central Plant Chillers
Gil Avery, P.E., Fellow, Kele Companies, Memphis, TN
2. Investigation of On-Board Flow Measurement Options
William E. Dietrich, Member, York International Corp., York, PA
3. Design Considerations for Improved CHW Plant Performance
Chris Miller, P.E., Member, P2S Engineering, Inc, Long Beach, CA
4. Commissioning to Improve Efficiency of Chilled Water Plants
Jeff J. Traylor, Member, PWI Consulting Engineering, Durham, NC

Seminar 15

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

Room: Lincoln A (PM)

Sunday, June 27 1 p.m. to 3 p.m.

Sponsor: ASHRAE Program Committee

Chair: Kelley Cramm, P.E., Member, IDEA, Kansas City, MO

This seminar introduces new meeting attendees to the events of a Society meeting - how to get involved in a technical committee, the difference between a symposium and a seminar, and how to become part of the meeting program. The role of ASHRAE staff in a meeting and the events that surround the AHR Exposition are explained. And if you're not having fun yet, the technical tours, guest and "special" events (how to have fun at ASHRAE) are discussed.

1. Membership: How to Get the Most Out of an ASHRAE Meeting and Exposition
John Nix, Member, Florida Power and Light Company, Miami, FL
2. Technical Committees, Technical Programs

Joy Eileen Altwies, Member, Farnsworth Group, Inc., Madison, WI
3. The Fun Side of ASHRAE Meetings
Spencer Morasch, Member, Jersey Central Power and Light, Allenhurst, NJ

Seminar 16

Innovative Applications of Evaporative Cooling

Room: Tennessee Ballroom B (T2)
Sunday, June 27 1 p.m. to 3 p.m.

Sponsor: TC 05.07 Evaporative Cooling

Chair: Leon E. Shapiro, Member, J. D., ADA Systems, Carol Stream, IL

Innovations in evaporative cooling equipment and systems designs have made the use of evaporative cooling/humidification more cost effective and available than before, even in high wet bulb areas like the South and Southeast. Evaporative cooling systems can provide significant opportunities for green building designs and enhance sustainability. This seminar focuses on innovations in evaporative cooling equipment/systems as well as innovative uses of these systems.

1. Evaporative Cooling and Underfloor Delivery Systems

C. Mike Scofield, P.E., Fellow, Conservation Mechanical Systems, Sebastopol, CA

2. Comparative Water Usage of Evaporative Cooling and Vapor Compression Cooling

Michael S. Sherber, P.E., Member, Lentz Engineering Associates, Inc., Avon, CT

3. Innovative HVAC System Designs for Evaporatively Cooled Schools

Daniel Harmeyer, P.E., Member, Harmeyer Nellos Engineers, Inc., Albuquerque, NM

4. Innovative Uses for Evaporative Cooling

Mark S. Lentz, P.E., Member, Lentz Engineering Associates, Inc., Sheboygan Falls, WI

Seminar 17

Mold or Gold: New Means of Controlling Humidity

Room: Tennessee Ballroom A (T2)
Sunday, June 27 1 p.m. to 3 p.m.

Sponsor: TC 05.05 Air-to-Air Energy Recovery

Chair: James L. Newman, Life Member, Newman Consulting Group, LLC, Bloomfield Hills, MI

The potential for fungal growth is exacerbated by improper sizing of a/c equipment. The role of the HVAC equipment and the use of novel energy recovery systems to control the building interior humidity are discussed and analyzed.

1. Mold and Sources of Moisture in Buildings

Davor Novosel, Member, National Center for Energy Management and Building Technologies, Alexandria, VA

2. Energy Recovery Design to Minimize Potential for Fungal Growth

Kirk T. Mescher, P.E., Member, CM Engineering, Columbia, MO

3. Avoid Mold and Get Gold: Why Not to Oversize an HVAC System

Klas C. Haglid, P.E., P.E., Member, Haglid Engineering & Associates, Inc., Wyckoff, NJ

4. Using Indirect Evaporative Cooling to Control Humidity in Natatoriums

Michael S. Sherber, P.E., Member, Lentz Engineering Associates, Inc., Avon, CT

Seminar 18

Novel Geothermal Systems

Room: Presidential Ballroom A (P2)
Sunday, June 27 1 p.m. to 3 p.m.

Sponsor: TC 06.08 Geothermal Energy Utilization

Chair: Stevan J. White, Member, Standard Pipe Co., Woodland, CA

The advancement of geexchange technology can have a profound impact on energy management and operating expense. This seminar features four presentations requiring the designer to consider alternative systems and compare costs, concluding with novel designs that incorporate radiant heating, chilled water, snow melt, water to air exchange and domestic hot water. Recent projects include a Napa Valley winery, commercial office buildings in South Lake Tahoe and Utah and custom homes.

1. Optimizing On-site Geexchange Resources

Bill O'Donnell, P.E., Member, Quantum Group Engineering, PLLC, Idaho Falls, ID

2. Radiant Heating and Cooling Using a Geexchange System

Cary Smith, Member, Sound Geothermal Corp., Roosevelt, UT

3. Geexchange Applications for Chilled Water Systems Design

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

4. Direct Use Geothermal: Alligators in Idaho and Other Adventures

Kevin Rafferty, P.E., Associate Member, Modoc Point Engineering, Klamath Falls, OR

5. Performance of Buried Plate Type Heat Exchangers for Geothermal Applications

William E. Murphy, Ph.D., P.E., Member, University of Kentucky, Paducah, KY

Seminar 19

Particulate Dispersion and Transport in Buildings

Room: Tennessee Ballroom C (T2)
Sunday, June 27 1 p.m. to 3 p.m.

Sponsor: TC 04.10 Indoor Environmental Modeling; TC 02.04 Particulate Air Contaminants and Particulate Contaminant Removal Equipment

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

Particulate matter is present in buildings as fine solids and liquid droplets. High concentrations of the matter present a serious danger to human health. To understand how particulates are dispersed and transported in buildings is crucial for HVAC engineers developing and designing measures to remove the matter and to create a clean and healthy indoor environment. Particulate dispersion and transport in buildings are complex processes. This seminar presents an effort to understand the processes.

1. Computational Modeling of Pollutant Transport in Outdoors, Indoors and Personal Exposure

Goodarz Ahmadi, Ph.D., Clarkson University, Potsdam, NY

2. Virus Dispersion by Coughing

Shinsuke Kato, Member, The University of Tokyo, Tokyo, Japan

3. Numerical Analysis of Particle Dispersion in Indoor Air Using Lagrangian Method

Zhao Zhang, Student Member, Purdue University, West Lafayette, IN

4. Ozone, Tepenes, and Particles in Residences

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

5. Particle Transport in Buildings

Tracy L. Thatcher, Ph.D., P.E., Lawrence Berkeley National Laboratory, Berkeley, CA

Forum 9

1 p.m. to 1:50 p.m.

Indoor Environmental Quality Impact of Homeland Security Measures

Room: Jackson A/B (PM)

Sunday, June 27

1 p.m. to 1:50 p.m.

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

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

Homeland security measures have changed the design and operation of many buildings. These measures can affect indoor environmental quality. For example, higher performance filtration often has a higher pressure drop, which can lead to excessive fan energy expenditure and diminished air flows. Restrictions against opening windows can lead to changes in perceived comfort. The goal of this forum is discussion of measures promoted by building operators and designers and the unintended, both positive and negative, consequences they have on indoor environmental quality.

Forum 10

2 p.m. to 2:50 p.m.

Filtration/IAQ for Hospitals

Room: Jackson A/B (PM)

Sunday, June 27

2 p.m. to 2:50 p.m.

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

Moderator: Robert B. Burkhead, Member, Blue Heaven Enterprises, Hopkinsville, KY

This forum is one of an ongoing series of general IAQ forums co-sponsored by TC 2.3 and 2.4. The objective of these programs is to gather current interest and document anticipated needs. This information will be used in prioritizing and directing Society activities. The influence of ASHRAE in providing IAQ in health care facilities is an important aspect of these efforts. Come and join our discussion on hospital environments.

MONDAY, 6/28⁸ A.M. TO 10 A.M.

Symposium NA-04-04

High Density Cooling Issues Update June 2004

Room: Tennessee D/E (P2)

Monday, June 28

8 a.m. to 10 a.m.

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

Chair: David Copeland, Dr.Eng., Fujitsu Laboratories of America, Sunnyvale, CA

This symposium addresses cooling of high density electronic equipment installations such as data centers, telecommunication facilities, and combinations thereof. 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. Distribution of Cooling Airflow in a Raised-Floor Data Center

Suhas V. Patankar, Ph.D. and Kailash C. Karki, Ph.D., Innovative Research, Plymouth, MN

2. Thermal Profile of a High Density Data Center

Roger Schmidt, Ph.D., Member, IBM Corporation, Poughkeepsie, NY

3. Liquid Cooling of Electronic Equipment: Friend or Foe

Don Beaty, P.E., Member, DLB Associates Consulting Engineers, Ocean, NJ

Symposium NA-04-05

Recent Findings in Water Heating Technology

Room: Presidential Ballroom C (P2)

Monday, June 28

8 a.m. to 10 a.m.

Sponsor: TC 06.06 Service Water Heating

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

Service water heating is a major consumer of energy and non-renewable resources. Obtaining and understanding consumption patterns and distribution is problematic. Field data has been obtained and is presented. Innovative heat pump technologies that have the potential to reduce the consumption of non-renewable resources are discussed. Performance reports from two installations that preheat service water are provided.

1. Hot Water Use in a High School Cafeteria

Carl C. Hiller, Ph.D., P.E., Member, Applied Energy Technology, Davis, CA; Jeffrey Miller, AIL Research Inc., Princeton, NJ; David R. Dinse, P.E., Tennessee Valley Authority, Chattanooga, TN

2. Measured Performance and Impacts of Drop in Residential Water Heaters

John Tomlinson, Member and Richard W. Murphy, Oak Ridge National Laboratory, Oak Ridge, TN

3. Numerical Evaluation of Alternative Residential Hot Water Distribution Systems

Evelyn Baskin, Ph.D., Member, Robert Wendt and Roberto Lenarduzzi, Ph.D., Oak Ridge National Laboratory, Oak Ridge, TN; Keith A. Woodbury, The University of Alabama, Tuscaloosa, AL

4. Online Domestic Hot Water End Use Database (1172-RP)

Dale Tiller, Ph.D., Gregor P. Henze, Ph.D., P.E., Member, and Xin Guo, University of Nebraska, Lincoln, NE

5. Field Performance of HPWH Preheating for Water Heating in Schools

David Dinse, P.E., Member, Tennessee Valley Authority, Chattanooga, TN; Hugh I. Henderson, P.E., Member, CDH Energy Corp., Cazenovia, NY; John O. Richardson, P.E., Tennessee Valley Authority, Chattanooga, TN

Seminar 20

Cogeneration in an Unregulated Environment

Room: Jackson C/D (PM)

Monday, June 28 8 a.m. to 10 a.m.

Sponsor: TC 01.10 Cogeneration System

Chair: Steve Fischer, Member, Oak Ridge National Laboratory, Oak Ridge, TN

The complex process of design, construction and operation of cogeneration plants is made more challenging by the uncertainties of energy costs, particularly in times of electric deregulation and highly volatile gas prices. Two speakers in this seminar provide insight into gas and electric rates and how price volatility impacts cogeneration projects. Three other speakers address applications in the northeast, the Midwest, and the far west covering health care, meeting resorts, and educational and commercial institutions.

1. Cogen in Hospitals

Verle Williams, Member, United Services Unlimited, Inc., San Diego, CA

2. Natural Gas Prices: Riding the Roller Coaster

Bruce Henning, Energy and Environmental Analysis, Inc., Arlington, VA

3. Show Me the Rates

Rich Sweetser, Member, Exergy Partners Corp, Herndon, VA

4. Impact of Standby Tariffs on Project Economics for a 5.5 MW CHP System

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

5. Cogeneration in the Midwest

John Cuttica, Member, University of Illinois at Chicago, Chicago, IL

Seminar 21

Current and Future Economic Analyses for ASHRAE Standard 90.1

Room: Presidential Ballroom B (P2)

Monday, June 28 8 a.m. to 10 a.m.

Sponsor: TC 07.06 Systems Energy Utilization

Chair: Harry P. Misuriello, Member, Alliance to Save Energy, Washington, D.C.

Current economic analysis methods used to guide selection of Standard 90.1 criteria and describe future directions for improving these analyses are reviewed. Current cost-effectiveness analyses treat each section of the standard separately. Future efforts may include integration of cost-effectiveness analyses to account for interactions among the sections of the standard on a whole building basis. This seminar also provides the perspective of real estate investors and managers on how cost-effectiveness is determined for development projects and if private sector investment criteria can or should be used in standards setting.

1. Current Standard 90.1 Economic Analysis Methods

Merle F. McBride, Ph.D., P.E., Member, Owens Corning Science and Technology Center, Granville, OH

2. Future Directions for Standard 90.1 Economic Analyses

Joseph J. Deringer, Member, The Deringer Group, Inc., Berkeley, CA

3. Cost Effectiveness Criteria for Commercial Property Development

John Montgomery, Member, GreenSky Design, Memphis, TN

Seminar 22

Impact of Commissioning on Today's Systems

Room: Presidential Ballroom A (P2)

Monday, June 28 8 a.m. to 10 a.m.

Sponsor: GPC 1; TC 07.09 Building Commissioning

Chair: Carl N. Lawson, Member, PWI Commissioning Services, Durham, NC

Now that commissioning has taken on a new look as "business as usual," and with some people still saying that it adds cost to the building, speakers show how commissioning has impacted systems and facilities with better systems, from an operational and

maintenance perspectives and given owners what they had envisioned.

1. Impact of Commissioning from a Provider's Viewpoint
Paul Tseng, P.E., Member, Advanced Buildings Performance, Potomac, MD
2. Impact of Commissioning from an Engineering Viewpoint
Robert Cox, P.E., Member, Farnsworth Group, St. Louis, MO
3. Impact on Commissioning from Construction Manager Viewpoint
Thomas Killian, Bovis Lend Lease, Durham, NC
4. Impact of Commissioning from an Owner's Viewpoint
Kimball Ferguson, P.E., Duke University Health Systems, Durham, NC

Seminar 23

Refrigeration Applications over the Past 100 Years

Room: Tennessee Ballroom B (T2)

Monday, June 28 8 a.m. to 10 a.m.

Sponsor: Refrigeration Committee; TC 10.01 Custom Engineered Refrigeration Systems

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

In celebration of ASRE's 100th anniversary, this seminar looks back at the early days of selected refrigeration applications and how they have evolved. This seminar is a must-see for practicing refrigeration engineers who are interested in the early days and history buffs.

1. Ice Rinks
Ted Martin, Member, Cimco Refrigeration, Toronto, ON, Canada
2. Custom Engineered Refrigeration Systems
George Briley, Member, Technicold Services, Inc., San Antonio, TX
3. Refrigerated Warehouse
Daniel Dettmers, Member, University of Wisconsin, Madison, WI
4. Frozen Foods: From Bricks to IQF to Consumer Convenience
Gordon Follette, P.E., Member, Follette Engineering Inc., Modesto, CA

Seminar 24

Series Versus Parallel in Chillers: What Do We Mean?

Room: Tennessee Ballroom C (T2)

Monday, June 28 8 a.m. to 10 a.m.

Sponsor: TC 08.02 Centrifugal Machines

Chair: Earl M. Clark, P.E., Fellow, DuPont Engineering Technology, Spring, TX

Various aspects of coupling multiple chillers in series as opposed to the more conventional parallel water piping configuration are clarified. Topics include a design study analyzing the energy usage benefits relative to the chiller for the two arrangements; pumping systems involved; and experience with actual operating data from systems that include series chillers and parallel chillers. The challenges of operating systems to meet the theoretical design advantages are presented. Advantages and disadvantages are discussed.

1. Design Study of Series vs. Parallel Chillers
Fred W Betz, P.E., Member, PEDCo E&A Services Inc, Cincinnati, OH
2. Why Variable Flow Systems Succeed
Donald Eppleheimer, P.E., Member, Trane Co., La Crosse, WI
3. Should Your System be Variable or Constant? A Case Study
Vinod P. Gupta, P.E., Member, 3M, St. Paul, MN

Seminar 25

XML Guidelines for the HVAC Industry

Room: Tennessee Ballroom A (T2)

Monday, June 28 8 a.m. to 10 a.m.

Sponsor: GPC 20; TC 01.05 Computer Applications

Chair: Krishnan Gowri, Ph.D., Member, Pacific Northwest National Laboratory, Richland, WA

The HVAC industry does not have a formal standard or guideline for the electronic information exchange between equipment and processes. Several ad hoc XML data models have been developed by various entities, such as IAQ and FIATECH, and private industry. This seminar provides a comprehensive review of the available XML initiatives, their scope, limitations, applications and relation to ASHRAE Guideline 20P, XML Definitions for HVAC&R. This seminar and a subsequent forum are designed to capture feedback for input to development of Guideline 20P development.

1. Building Systems Data Exchange from Design through Operations Using XML
Robert J. Hitchcock, Ph.D., Member, Lawrence Berkeley National Laboratory, Washington, D.C.
2. Automating Equipment Design and Delivery with AEX
Mark E. Palmer, Member, National Institute of Standards and Technology, Gaithersburg, MD
3. gbXML for Energy Simulation and CAD Data Interoperability
John F. Kennedy, P.E., Geopraxis Inc., Petaluma, CA
4. What Can Guideline 20 Do for Me?
Charles S. Barnaby, Member, Wrightsoft Corp., Lexington, MA

Forum 11**8 a.m. to 8:50 a.m.****What Do Contractors, Engineers, and End Users Feel Is Missing from the Handbook Concerning Water Treatment?**

Room: Jackson A/B (PM)

Monday, June 28

8 a.m. to 8:50 a.m.

Sponsor: TC 03.06 Water Treatment**Moderator:** William E. Pearson II, Associate Member, Southeastern Laboratories, Inc., Raleigh, NC

Chapter 48 in the ASHRAE Handbook, HVAC Applications, describes water treatment in heating and air-conditioning systems. The chapter is written and maintained by water treatment professionals. This forum seeks input on what users would like to see included.

Forum 12**9 a.m. to 9:50 a.m.****State-of-the-Shelf Technologies for 30% Above Code Designs**

Room: Jackson A/B (PM)

Monday, June 28

9 a.m. to 9:50 a.m.

Sponsor: TC 09.05 Residential and Small Building Applications**Moderator:** Charles H. Culp, Ph.D., P.E., Member, Texas A&M University, College Station, TX

What technologies really apply to the 30 percent above Standard 90.1 effort that ASHRAE is developing? This forum brings together experts and interested engineers to discuss what is available as "state-of-the-shelf" today, which can be used to achieve the 30 percent and above. Issues related to comfort and indoor environmental quality also determine the technologies that can be successfully applied in a high efficiency design. This session seeks ideas for a proposed public session at the 2005 Winter Meeting on achieving 30 percent-plus efficiency.

MONDAY, 6/28 10:15 A.M. TO**12:15 P.M.**

Symposium NA-04-06**Forced Air Distribution System Performance**

Room: Presidential Ballroom A (P2)

Monday, June 28

10:15 a.m. to 12:15 p.m.

Sponsor: TC 06.03 Central Forced Air Heating and Cooling Systems**Chair:** John W. Andrews, Ph.D., P.E., Member, Brookhaven National Laboratory, Upton, NY

Advances in the state of the art of residential duct systems are described, covering three specific areas: room air distribution and thermal comfort impacts, improved techniques for insulating ductwork, and advanced methods of testing for duct leakage.

1. Field Observations of Room Air Distribution in a High Performance House

Keith Temple, P.E., Ph.D., Member, Consultant, Pittsburgh, PA

2. Characterization of Airflows at the Exit of Registers Using Laser Doppler Velocimetry

Narinder K. Tutu, Ph.D., C. R. Krishna, Ph.D., and Thomas A. Butcher, Ph.D., Member, Brookhaven National Laboratory, Upton, NY

3. An Analysis of the Effective R-Value for Insulation Buried Attic Ducts

Dianne Griffiths, Associate Member, and Marc Zuluaga, Steven Winter Associates, Inc., Norwalk, CT

4. Evaluation of Two New Duct Leakage Measurement Methods in 51 Homes

Paul Francisco, Member, Building Research Council, Champaign, IL; Larry Palmiter, Erin Kruse and Bob Davis, Ecotope, Inc., Seattle, WA

5. Validating and Improving the Delta Q Test

Darryl Dickerhoff, Ian Walker, Ph.D., Member, and Max Sherman, Ph.D., Fellow, Lawrence Berkeley National Laboratory, Berkeley, CA

Seminar 26**Decontamination of HVAC Systems Under Attack**

Room: Presidential Ballroom C (P2)

Monday, June 28

10:15 a.m. to 12:15 p.m.

Sponsor: TC 02. TRG BCBR Blast, Chemical and Biological Remediation**Chair:** Dean T. Tompkins, Ph.D., P.E., Member, University of Wisconsin - Madison, Madison, WI

Extraordinary incidents (e.g., events in America on 9/11/01, etc.) that impact buildings has resulted in the need for approaches and technologies to remediate and decontaminate HVAC systems. Via presentations by professionals, this seminar identifies approaches that can be used to perform remediation and decontamination of HVAC systems.

1. Airborne and Surface Decontamination with Atmospheric Plasma

Ronald E. Domitrovic, Member, Atmospheric Glow Technologies, Knoxville, TN

2. Decontamination with Gas-Phase Chlorine Dioxide Fumigation

John Mason, Sabre Technical Svc, LLC, Albany, NY

3. UV Decontamination of Building Air

Mike W. Ingram, Novatron, Inc., San Diego, CA

4. Decontamination Formulation for Neutralization of CBW Agents and Biological Pathogens

Mark D. Tucker, Ph.D., P.E., Sandia National Laboratories, Albuquerque, NM

Seminar 27

Environmental Health Issues: Mold and Other Indoor Environmental Concerns

Room: Tennessee Ballroom C (T2)

Monday, June 28 10:15 a.m. to 12:15 p.m.

Sponsor: Environmental Health Committee

Chair: Sidney A. Parsons, P.E., Member, SA Council for Scientific and Industrial Research, Gillitts, Kwa Zulu Natal, South

These seminar features presentations on health effects associated with exposure to indoor air. Indoor air chemistry and the topical issues related to mold and ventilation systems including mold prevention in new construction are presented.

1. Mold in Building Systems

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

2. Allergies and Ventilation

Jan Sundell, Ph.D., P.E., Member, Technical University of Denmark, Lyngby, Denmark

3. Indoor Air Chemistry

Annette C. Rohr, Ph.D., Member, EPRI, Palo Alto, CA

4. Preventing Mold in New Construction

Wane A. Baker, P.E., Member, Michaels Engineering, WC, La Crosse, WI

Seminar 28

Heat Pump Noise and Vibration Issues

Room: Tennessee Ballroom B (T2)

Monday, June 28 10:15 a.m. to 12:15 p.m.

Sponsor: TC 02.06 Sound and Vibration Control; TC 09.04 Applied Heat Pump/Heat Recovery Systems

Chair: Sally Anne McInerny, Ph.D., P.E., Member, The University of Alabama, Tuscaloosa, AL

Noise and vibration design and installation consideration for heat pumps are discussed. Issues associated with water source heat pumps in luxury condominiums and office plenums are addressed. Noise and vibration control design features also are covered.

1. Acoustical Considerations for Water Source Heat Pumps

Gustav Foster, P.E., Member, Gustav Foster Consulting, L.L.C., Vineland, NJ

2. Heat Pump Systems in Luxury Condominium Buildings

Robert M. Lilkendey, Associate, Siebein Associates, Inc., Gainesville, FL

3. Noise Control in WSHP Design

William B. Rockwood, Member, Trane Company, La Crosse, WI

4. Water Source Heat Pumps in Office Ceiling Plenums

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

Seminar 29

Leading Edge Solar Energy Technologies

Room: Jackson C/D (PM)

Monday, June 28 10:15 a.m. to 12:15 p.m.

Sponsor: TC 06.07 Solar Energy Utilization

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

A variety of leading edge solar energy technologies are presented, including those already available, expected to be available soon, or those considered a less traditional way of utilizing solar energy.

1. Simple, Affordable Zero Energy Houses

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

2. Solar Alkali Metal Thermolectric Conversion and Eautomation for Sustainable Distributed Cogeneration and HVAC Systems

Marija S. Todorovic, Ph.D., Member, University of Belgrade, Belgrade, Serbia, Serbia and Montenegro

3. A Solar Cooling System for Humid Climates

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

4. Two Case Studies of Solar Air Collector Systems Coupled with an Air-to-Water Heat Pump for Water Heating

Christian Vachon, Enerconcept, Inc., Sherbrooke, QC, Canada

Seminar 30

Operation and Maintenance in Specialized Facilities

Room: Tennessee Ballroom D/E (T2)

Monday, June 28 10:15 a.m. to 12:15 p.m.

Sponsor: TC 07.03 Operation and Maintenance Management

Chair: Joseph (J. R.) Anderson, P.E., Member, Anderson Engineering, LLC, Germantown, TN

The operations and maintenance of specialized facilities, such as a research hospital, industrial, a sportplex or high profile hotel and convention center, demand attention to details. Practical experience from managers in these areas are presented, including how they see operations and maintenance being done efficiently. When viewed from the design phase, construction phase and end of the first year of maintenance, a research hospital manager can bring a wealth of knowledge to those experiencing this same path.

1. The Importance of Documentation of Service in Meeting a Customer's Requirements

John Saucier, Associate, Temperature, Inc., Memphis, TN

2. How an Owner Prepares to Occupy and Operate a New Facility

Bill Dudley, P.E., Member, St. Jude Hospital, Memphis, TN
3. A Project Can Be CMMS-Ready in the Design Phase
Howard J. McKew, Member, Richard D. Kimball Co. Inc., Andover, MA

Seminar 31

TEGA Issues Update: Greenhouse Gas Emissions Reporting for Buildings

Room: Presidential Ballroom B (P2)

10:15 a.m. to 12:15 p.m.

Sponsor: TC 02.05 Global Climate Change; Technical, Energy and Government Activities Committee

Chair: Thomas Werkema, Member, ATOFINA Chemicals, Inc., Philadelphia, PA

Building owners are focusing on reducing their environmental footprint. Federal, regional and state activity encourages reporting greenhouse gas emissions and reductions at the entity, facility and individual installation level. This seminar focuses on the “how-to” of reporting building emissions from HVAC equipment to energy consumption and sourcing. Measurements and reporting methods are explored.

1. The ASHRAE GreenGuide: Help in Designing Green Buildings

David L. Grumman, P.E., Fellow, Grumman/Butkus Associates, Evanston, IL

2. How Can a Building Be Energy Star?

Thomas Hicks, Environmental Protection Agency, Washington, D.C.

3. Will International Energy Standards Impact Your Building Design?

Stephen Turner, Member, Brown University, Providence, RI

4. Engineering, Modeling and Measuring a Building’s Greenhouse Gas Footprint

Jon Christopher Larry, Member, Siemens Building Technology, Pittsburgh, PA

5. How Do I Get Credit for Greenhouse Gas Reductions? ISO 14064, DOE 1605(b)

Thomas E. Werkema, Member, ATOFINA Chemicals, Inc., Philadelphia, PA

Forum 13 10:15 a.m. to 11:05 a.m.

Do ASHRAE Members Need an Energy Simulation Model of Refrigerated Warehouses?

Room: Jackson A/B (PM)

Monday, June 28

10:15 a.m. to 11:05 a.m.

Sponsor: TC 10.05 Refrigerated Distribution and Storage Facilities; TC 10.08 Refrigeration Load Calculations

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

When an HVAC engineer needs to determine load and energy calculations for a building, numerous simulation tools are available. Such options do not currently exist for the refrigeration industry. Some in the industry argue the tools do not exist to perform load calculations to obtain proper peak refrigeration requirements. Others claim the load calculation information is available, but an energy simulation program cannot be created because each industrial refrigeration system is a custom creation. Do ASHRAE members need refrigeration simulation tools? Are these goals even achievable? Join us with your opinion.

Forum 14 10:15 a.m. to 11:05 a.m.

Future Directions for Improving ASHRAE Standard 90.1

Room: Tennessee Ballroom A (T2)

Monday, June 28

10:15 a.m. to 11:05 a.m.

Sponsor: TC 07.06 Systems Energy Utilization

Moderator: Harry P. Misuriello, Member, Alliance to Save Energy, Washington, DC

The purpose of this forum is to provide the membership with an opportunity to voice their opinions on future efforts to improve Standard 90.1 and to see it more widely adopted and used. Topics to be addressed in the forum include: revising and updating economic analysis and cost-effectiveness procedures; incorporating findings from ASHRAE’s advanced building energy guides; determining how current practice should be tracked and used to update the standard; support needed from ASHRAE research; and ASHRAE’s role, if any, in promoting its adoption by jurisdictions.

Forum 15 11:15 a.m. to 12:05 p.m.

How Can Proposed Guideline 20 Help the ASHRAE Membership?

Room: Tennessee Ballroom A (T2)

Monday, June 28

11:15 a.m. to 12:05 p.m.

Sponsor: TC GPC 20; TC 01.05 Computer Applications

Moderator: Charles S. Barnaby, Member, Wrightsoft Corp., Lexington, MA

Proposed Guideline 20, XML Definitions for HVAC&R, is under development by GPC-20. The guideline will specify formats for automated data exchange among HVAC&R industry participants as well as procedures for managing the ongoing evolution of those formats. This forum provides an opportunity for members to comment on and learn more about the issues addressed by Proposed Guideline 20.

Forum 16 11:15 a.m. to 12:05 p.m.

How Do We Compile a Statistical Sampling for the Commissioning Process?

Room: Jackson A/B (PM)

11:15 a.m. to 12:05 p.m.

Sponsor: Guideline Project Committee 0 – The Commissioning Process

Moderator: *Walter T. Grondzik, Member, Florida A&M University, Tallahassee, FL*

Co-Moderator: *Charles E. Dorgan, Ph.D., P.E., Fellow, Life Member, University of Wisconsin - Madison, Madison, WI*

This forum addresses the requirement for effective verification during all phases of the commissioning process from pre-design through occupancy using random and statistically based sampling of the total population. The goal is a discussion of how commissioning authorities and owners are achieving statistical based sampling and whether there are any requirements for research.

TUESDAY, 6/29 8 A.M. TO 10 A.M.

Symposium NA-04-07

Integration in Cleanroom Design and Construction

Room: Tennessee Ballroom A (T2)

Tuesday, June 29 8 a.m. to 10 a.m.

Sponsor: *TC 07.01 Integrated Building Design; TC 09.11 Clean Space*

Chair: *Charlie C. Shieh, Ph.D., P.E., Member, CYS Consulting, LLC, Bellaire, TX*

This symposium addresses the design and construction integration for cleanroom facilities to achieve better quality, faster delivery, lower cost, optimization of operation and maintenance, lower energy consumption, cleaner environment, safer, more reliable and more productive conditions, and longer service life.

1. Using Certification Data of Cleanrooms to Determine Degradation and Retrofit

Susan Morrison, Member, Paratek Microwave, Inc., Columbia, MD

2. Quantitative Multistage Pressurizations in Controlled and Critical Environments

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

3. Using Benchmarking to Identify Energy Efficiency Opportunity in Cleanrooms

William Tschudi, Member, Lawrence Berkeley Laboratory, Berkeley, CA; Peter Rumsey, Rumsey Engineers, Oakland, CA

4. Controlled Clean Operating Room Area

Jinming Shen, Ph.D., Member, Tongji University, Shanghai, China

Seminar 32

Back to the Basics:

Refrigeration 101

Room: Presidential Ballroom C (P2)

Tuesday, June 29 8 a.m. to 10 a.m.

Sponsor: *TC 10.01 Custom Engineered Refrigeration Systems; Refrigeration Committee*

Chair: *Bruce L. Griffith, Associate, York Refrigeration / Frick, Waynesboro, PA*

The proper design and application of heat exchangers, system piping and the refrigeration cycle impact energy consumption and reliability of the final refrigeration system. This seminar addresses the basics in sizing pipe, selecting components and reviewing system cycles for industrial refrigeration.

1. Vapor Compression Refrigeration Systems Basics

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

2. Ammonia Refrigeration Piping

Don Siller, P.E., Member, Electro Motion Refrigeration, Inc., Chesterfield, MO

3. Heat Exchangers for Industrial Refrigeration

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

4. Thermodynamics of Absorption Cooling

Sanford A. Klein, Ph.D., Fellow, University of Wisconsin, Madison, WI

Seminar 33

Demand Response and Building Control

Room: Tennessee Ballroom B (T2)

Tuesday, June 29 8 a.m. to 10 a.m.

Sponsor: *TC 07.04 Building Operation Dynamics; TC 07.05 Smart Building Systems*

Chair: *Peng Xu, Ph.D., P.E., Member, Lawrence Berkeley National Laboratory, Berkeley, CA*

This seminar evaluates technical factors that concerning demand responsive (DR) building controls to shed peak electrical load. The seminar covers DR control technologies in three types of buildings. For large office buildings, authors will present real field tests and experimental analysis of different demand responsive strategies in several large office buildings. For small commercial buildings, authors will discuss the potential for demand reduction through precooling and manipulation of zone temperature set points. For residential buildings, authors will present recent research on enabling technology for residential appliances to respond to dynamic prices.

1. Enabling Technology for Residential Demand Response

Clifford Federspiel, Ph.D., Member, University of California, Berkeley, Berkeley, CA

2. Machine to Machine (M2M) Technology in Demand Responsive Commercial Buildings

David Watson, Lawrence Berkeley National Laboratory, Berkeley, CA

3. Evaluation of Precooling and Demand-Limiting in a Prototypical Small Commercial Building

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

4. A Case Study of Precooling With Demand Limiting in Commercial Office Buildings

Peng Xu, Ph.D., P.E., Member, Lawrence Berkeley National Laboratory, Berkeley, CA
5. Experimental Analysis of Model-Based Predictive Optimal Control for Active and Passive Building Thermal Storage Inventory
Gregor P. Henze, Ph.D., P.E., Member, University of Nebraska, Omaha, NE

Seminar 34

Diesel Locomotives in Enclosed Vehicular Spaces

Room: Jackson C/D (PM)

Tuesday, June 29 8 a.m. to 10 a.m.

Sponsor: TC 05.09 Enclosed Vehicular Facilities; TC 04.10 Indoor Environmental Modeling

Chair: Robert J. Henry, P.E., Member, National Railroad Passenger Corp. (a.m. TRAK), Philadelphia, PA

Recent issues related to controlling diesel exhaust emissions in buildings and tunnels are discussed. Topics include ventilation guidance, published contaminant limits, design approaches and applications, field measurements and CFD modeling. Speakers present application case studies and ASHRAE sponsored research.

1. ASHRAE Research, Current Issues and New Handbook Updates
Amy Musser, Ph.D., P.E., Associate Member, University of Nebraska, Omaha, NE
 2. Parametric Study of General Exhaust Systems Using CFD Modeling
Liangcai Tan, Ph.D., Member, University of Nebraska, Omaha, NE
 3. Case Study of Diesel Locomotive Fume Capture in a Train Station
Ray Sinclair, Ph.D., Member, Rowan, Williams, Davies & Irwin, Inc., Guelph, ON, Canada
 4. Analysis and Design of a Ventilation System for Diesel Emissions in a Railroad Overbuild
James W. Guinan, P.E., Member, Parsons, Brinckerhoff Quade & Douglas, Inc., New York, NY
 5. Ventilation Study for the Removal of Diesel Emissions
Charles Rowland, P.E., Member, Kling, Philadelphia, PA
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Seminar 35

Industrial Ventilation

Case Studies

Room: Tennessee Ballroom D/E (T2)

Tuesday, June 29 8 a.m. to 10 a.m.

Sponsor: TC 05.08 Industrial Ventilation Systems

Chair: Hank Bagheri, Ph.D., P.E., Member, P. Eng, University of California-Irvine, Irvine, CA

Case studies in industrial ventilation are presented. The concepts and applications include: new approaches in exhaust system design for oil mist control; creating a clean air island by supplying ventilation to an operator-occupied zone to reduce operator exposure; and welding fume exhaust system concept.

1. Enclosure Exhaust System Design for Oil Mist Control
Alfred W. Woody, P.E., Fellow, Albert Kahn Assoc. Inc., Detroit, MI
 2. Welding Fume Exhaust
Wayne M. Lawton, Member, Arcadis, Southfield, MI
 3. New Approach to Oil Mist Control
Gerry A. Lanham, P.E., Member, KBD/Technic, Inc., Cincinnati, OH
 4. Using Supply Air to Reduce Operator Exposures
Gerhard W. Knutson, Ph.D., Member, Knutson Ventilation, Inc., Edina, MN
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Seminar 36

Mold: Where Do We Stand Now?

Room: Presidential Ballroom A (P2)

Tuesday, June 29 8 a.m. to 10 a.m.

Sponsor: TC 01.12 Moisture Management in Buildings; TC 01.07 Business, Management & General Legal Education

Chair: George A. Jackins, P.E., Fellow, Life Member, Presidential Member, Engineering Resource Group, Inc., Birmingham, AL

By some estimates, mold litigation and insurance claims may exceed asbestos and Superfund claims combined. This microbial contamination has been around for more than 4,000 years yet it has taken on a new life that will change the way we do business. It is time to reexamine this issue to understand the responsibility our industry faces in the current business climate. Environmental consultants are suggesting that HVAC systems in buildings may cause mold growth. This seminar examines current engineering and legal issues that must be considered in designing, constructing and operating buildings.

1. Designing for Moisture Management
Lewis G. Harriman, Member, Mason Grant, Portsmouth, NH
 2. You Can't Design It Like You Used To
Rodney H. Lewis, P.E., Member, Rodney H. Lewis Associates, Inc., Houston, TX
 3. Top Ten Tips for Avoiding Liability
Mark Diamond, Associate Member, Diamond and Diamond LLC, New York, NY
 4. A Case Study: Mold, Liability and HVAC Engineering
David M. Governo, Esq., Member, Governo Law Firm, LLC, Boston, MA
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Seminar 37

New Technologies for Maintaining Building Pressurization: Different Approaches

Room: Presidential Ballroom B (P2)

Tuesday, June 29 8 a.m. to 10 a.m.

Sponsor: TC 01.04 Control Theory and Application

Chair: Frank Shadpour, P.E., Member, GEM Engineering, Inc., San Diego, CA

Controlling building pressure is important for several reasons. In general facility use, it is important to maintain pressurization so the building is maintained in a mildly-positive state. This will ensure that clean, conditioned air is pushed out of the building. By maintaining building pressure within tolerances, doors are prevented from 'hanging open'. It also prevents difficulty in opening doors; a violation of the Americans with Disabilities Act. This seminar reviews various methods of building pressurization control. It also examines the effects of the return air fan vs. the exhaust air fan in the building system design.

1. Building Pressurization by Flow Tracking

Richard Yardley, P.E., Member, Newmatic Engineering, Irvine, CA

2. Using a Return Air Fan for Building Pressure Control

James Domholt, Member, McQuay International, Minneapolis, MN

3. Avoid Costly Mistakes in Building Pressurization-Control

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

4. Return Fan vs. Exhaust Fan

Roger Howard, Member, York Int. Corp., York, PA

5. Building Pressurization - Control: Does It Work?

J. Patrick Fex, FEX Environmental System, Gulf Breeze, FL

Forum 17

8 a.m. to 8:50 a.m.

What Work Needs to Be Done to Properly Apply UVC Lights?

Room: Jackson A/B (PM)

Tuesday, June 29 8 a.m. to 8:50 a.m.

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

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

Installations of UVC lights are increasing in commercial buildings. Major issues have arisen concerning UVC specification, application and maintenance that can be clarified using the experience of ASHRAE members and other program participants. The discussion at the meeting will address the following items: Why should I buy UVC lights? Issues regarding use of UVC in disinfection of airborne micro-organisms when placed in HVAC coil/drainpan locations. Standards required to properly specify and maintain UVC lights. Changes needed to existing standards to accommodate effective use of UVC lights.

Forum 18

9 a.m. to 9:50 a.m.

Research Strategic Planning for 2004 and Beyond

Room: Jackson A/B (PM)

Tuesday, June 29 9 a.m. to 9:50 a.m.

Sponsor: Research Advisory Panel

Moderator: John W. Mitchell, Ph.D., P.E., Fellow, University of Wisconsin, Madison, WI

ASHRAE's Research Advisory Panel has been charged with developing a research strategic plan. The proposed process for developing and maintaining the plan is seeking input from related organizations to prioritize challenges and opportunities facing the HVAC&R industry through 2015, soliciting input from technical committees during a workshop, and soliciting input from ASHRAE members. The forum presents the results of the scan and the proposed next step. Input is sought from attendees on the process.

TUESDAY, 6/29 9 A.M. TO 11 A.M.

Poster Session

Room: Tennessee Ballroom C

A Comparison of Electrical and Thermal-Load-Following CHP Systems (4701)

Tuesday, June 29 9 a.m. to 11 a.m.

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

Realization of the full benefits of implementing the combined heat and power (CHP) concept in buildings hinges upon optimum CHP system integration, sizing, and operation in parallel with or independent of the electric utility grid. This realization necessitates assessment of the appropriate CHP design/operation possibilities and selection of the best candidate for a given application. Electrical- and thermal-load-following CHP models are certainly among such candidates. The objectives of this study are to evaluate the thermodynamic performance of a thermal-load-following CHP system for the same building and to compare the results with those of a previous study.

A Preliminary Investigation on the Use of Ultra-Wideband Radar for Moisture Detection in Building Envelopes (4702)

Tuesday, June 29 9 a.m. to 11 a.m.

W.M. Healy, Ph.D., National Institute of Standards and Technology, Gaithersburg, MD; Eric van Doorn, Ph.D., Intelligent Automation Inc., Rockville, MD

A preliminary investigation has been carried out to determine the potential for using ultra-wideband (UWB) radar to determine the moisture level within building envelopes. Radio waves are affected by moisture content because their reflection from the surface of a material depends upon the dielectric constant of that material, a property with a strong dependence upon the moisture content. UWB radar holds the potential for gaining greater information from a wall than can be obtained by conventional radar because of the large frequency range covered by

emitted signals.

A Study on the Control Methods for the Radiant Floor Heating and Cooling System in Residential Buildings (4703)

Tuesday, June 29 9 a.m. to 11 a.m.

Seong-Ryong Ryu, Institute of Construction Technology at Kumho Construction and Engineering; Jae-Han Lim, Myoung-Souk Yeo, Ph.D., and Kwang-Woo Kim, Arch.D., Associate Member, Seoul National University, Seoul, Korea, R.O.C.

When applying a radiant floor cooling system using a Korean traditional radiant floor heating system, it is important to select a precise control method to maintain a stable room temperature and floor surface temperature and prevent surface condensation. Therefore, it is necessary to systematize various control methods and to conduct a comparative study of the respective control methods. In this study, computer simulations and model experiments were performed for this comparative analysis on control methods used for the radiant floor heating and cooling system.

Analysis and Validation of a Psychrometry Apparatus (4704)

Tuesday, June 29 9 a.m. to 11 a.m.

Paulo Smith Schneider, Ph.D., Member and Joao Batista Dias, Federal University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil

This paper uses the analysis of variance as a tool to validate a calibration apparatus for temperature and relative humidity sensors. The validation procedure establishes the operational ranges for measurement of the dry-bulb (tdb) and wet-bulb temperatures, and of the relative humidity of air for this particular apparatus. The results show that air speed on wet covering sensors within the tested range of 1.25 to 5.0 m/s does not change the measured twb, thus widening the range suggested in ASHRAE Standard 41.1-1974. However, for relative humidity of air within the studied range, significant differences are found.

Axial-Flow Air-Vapor Compression Refrigerating System for Air Conditioning Cooled by Circulating Water (4705)

Tuesday, June 29 9 a.m. to 11 a.m.

Shaobo Hou, Zhanjiang Ocean University, Zhanjiang, Guangdong, China

This paper presents an axial-flow air-vapor compression refrigerating system for air conditioning cooled by circulating water, and proves its feasibility through performance simulation. Using this new system may simplify air-conditioning systems and reduce the amount of the initial investment of an air-conditioning system. Simulations show that the new system's COP depends mainly on both the turbine inlet temperature of the wet air and the efficiencies of the axial compressor and the turbine, and the COP varies with the wet bulb temperature of the atmosphere. This system is suitable for use in muggy areas and it will still be efficient if cooled by circulating water.

Benefits of Multi-Building Electric Load Aggregation: Actual and Simulation Case Studies (RP-1146) (4706)

Tuesday, June 29 9 a.m. to 11 a.m.

Sponsor: TC 07.04 Building Operation Dynamics

T. Agami Reddy, Ph.D., P.E., Member, Drexel University, Philadelphia, PA; Jason K. Lukes, Associate Member, R. G. Vanderweil Engineers, Princeton, NJ; Leslie K. Norford, Ph.D., Member, Tabors Caramanis and Associates, Cambridge, MA

The structure of the electric utility market and the complex relationship between suppliers and consumers has undergone (and is undergoing) changes in recent years as a result of electric deregulation and real-time pricing schemes. This paper reports some of the results from an ASHRAE research project, Building Operation and Dynamics within an Aggregated Load.

Calculation of Food Freezing Times and Heat Transfer Coefficients (RP-1123) (4707)

Tuesday, June 29 9 a.m. to 11 a.m.

Sponsor: TC 10.09 Refrigeration Application Foods and Beverages

Brian A. Fricke, Ph.D., Member and Bryan R. Becker, Ph.D., P.E., Fellow, University of Missouri, Kansas City, MO

The freezing of food is one of the most significant applications of refrigeration. In order for freezing operations to be cost-effective, it is necessary to optimally design the refrigeration equipment. This requires estimation of the freezing times of foods and the corresponding refrigeration loads. These estimates, in turn, depend upon the surface heat transfer coefficient for the freezing operation. Therefore, ASHRAE research project 1123-RP was initiated to determine surface heat transfer coefficients for a wide variety of food items.

Calibration and Testing of Thermal Simulation Models of Air Heaters (4708)

Tuesday, June 29 9 a.m. to 11 a.m.

Per Blomberg, Ph.D., Elisabeth Mundt, Ph.D., and Tor-Göran Malmström, Ph.D., Member, R. Institute of Technology, Stockholm, Sweden

Detailed measurements of the thermal characteristics of one one-row and one four-row air heater were performed. It is shown that if the base is a careful calibration of the steady state characteristics, simple uncalibrated dynamic models can be used. The measurement files are available on CD for anyone interested in testing heater simulation models.

CFD-Based Parametric Study of Ventilation and Diesel Exhaust in Locomotive Facilities (RP-1191) (4709)

Tuesday, June 29 9 a.m. to 10 a.m.

Sponsor: TC 05.09 Enclosed Vehicular Facilities

Liangcai Tan, Ph.D., Member and Amy Musser, Ph.D., P.E., Associate Member, University of Nebraska-Lincoln, Omaha, NE

A CFD-based parametric study was conducted for a prototype general exhaust system widely used for ventilation and control of diesel exhaust in large enclosed locomotive facilities. The parameters of fan flow rate, ceiling height, fan spacing, and locomotive position relative to the fan were varied between two values representing the low and high ends of their expected ranges. Regression was then used to obtain an equation to predict these maximum concentrations as a function of the independent parameters. Using these equations, a design procedure that could be used by designers to maintain a target concentration limit for a critical contaminant was developed.

Climate Impacts on Heating Season Performance Factor (HSPF) and Seasonal Energy Efficiency Ratio (SEER) for Air Source Heat Pumps (4710)

Tuesday, June 29

9 a.m. to 11 a.m.

Philip Fairey, Member and Danny Parker, Associate Member, Florida Solar Energy Center, Cocoa, FL; Bruce Wilcox, P.E., Member, Berkeley Solar Group, Berkeley, CA; Matt Lombardi, Florida Solar Energy Center, Cocoa, FL

Within rating procedures established by the U.S. Department of Energy, benchmarks have been established for the comparative performance of heat pumps and air conditioners: The heating seasonal performance factor and seasonal energy efficiency ratio index heating and cooling season performance. Although the procedures result in a highly desirable standard metric, the climate related limitations of the published values must be understood - particularly when attempting to extend performance prediction across regions. This paper describes evaluation of climate related variation of heat pump and air conditioner performance. Operating seasonal efficiencies are statistically related to location specific winter and summer design temperatures and manufacturers' equipment ratings.

Coefficient of Performance of Fluorinated Ether and Fluorinated Ether Mixtures (4711)

Tuesday, June 29

9 a.m. to 11 a.m.

Ismail Kul, Ph.D., Widener University, Chester, PA; Darryl D. DesMarteau, Ph.D. and Adolph Beyerlein, Ph.D., Member, Clemson University, Clemson, SC

The coefficient of performance (COP) is estimated from thermodynamic literature data using methods of Morrison and McLinden and reported for the ether, R-E125, and various ether mixtures. The calculations show that R-E125 and mixtures containing R-E218 would require superheat on the suction line to eliminate 'wet compression.'

Design and Performance Analysis of Heat Exchanger Type Low Pressure Household Water Heaters (4712)

Tuesday, June 29

9 a.m. to 11 a.m.

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

This paper analyses the performance of a heat exchanger type low-pressure household water heater that is commonly used in the northern part of Australia. Australian test standard AS1361 (1995) is used to compare the performance of six different designs that use different heat exchangers for improving the energy efficiency of the water heater. The results could help the manufacturer develop a base for a higher efficiency cost effective water heater design.

Development of Energy Efficient Single Coil Twin Fan Air-Conditioning System with Zonal Ventilation Control (4713)

Tuesday, June 29

9 a.m. to 11 a.m.

S.C. Sekhar, Ph.D., Member, Uma Maheswaran, Student Member, K.W. Tham, Ph.D. and K.W. Cheong, Ph.D., Associate Member, National University of Singapore, Singapore

Indoor air quality is strongly affected by the various sources of indoor pollutants and the efficiency of the ventilation system. Higher ventilation demands pose an enormous energy penalty, particularly in the tropics. This paper presents a new method of air conditioning that addresses both IAQ and energy issues. The new energy efficient method of air conditioning involves the independent control of temperature and humidity of two different air streams.

Domestic Hot Water End Use Analysis Methods and Preliminary Results

(RP-1172) (4714)

Tuesday, June 29

9 a.m. to 11 a.m.

Sponsor: TC 06.06 Service Water Heating

Dale K. Tiller, Ph.D., George P. Henze, Ph.D., P.E., Associate Member, Ronny Goepfert, University of Nebraska-Lincoln and Xin Guo, University of Nebraska-Lincoln, Omaha, NE

A new analysis method to allocate domestic hot water draws to specific end uses has been developed under the auspices of ASHRAE project 1172-TRP. The "temperature-based event inference" method allocates hot water use events based on measured water flow at the hot water tank, and changes in end use pipe temperature. The change in pipe temperature is an indirect measure used to allocate water flow to specific end uses. This paper describes the methods, procedures and selected preliminary results obtained by applying this method to a sample of four residences in Omaha, Nebraska. Recommendations for future work are presented.

Double-Walled Heat Exchanger Risk Analysis for Group B1 and Group B2 Refrigerants (RP-1042) (4715)

Tuesday, June 29

9 a.m. to 11 a.m.

Sponsor: TC 08.03 Absorption and Heat Transfer Equipment

Shuting Lei, Ph.D., Aaron E. Berger and Donald L. Fenton, Ph.D., P.E., Member, Kansas State University, Manhattan, KS; Prasad V. Kaitay, M/S Vima Engineers, Mumbai, India

In compliance with ANSI/ASHRAE Standard 15-2001, Safety Standard for Refrigeration Systems, a large quantity of Group B1 or Group B2 refrigerant cannot enter the occupied space of a building. Instead, a secondary fluid must be used to circulate through the refrigeration system's components located within the occupied space. In typical systems, a single-walled liquid-to-liquid heat exchanger is used outdoors with an air coil in the occupied space. In this study, a double-walled heat exchanger is considered to replace these two components where the double-walled configuration prevents leaking refrigerant from entering the occupied space of a building.

Effect of Boundary Conditions on the Prediction of Temperature Distribution for Curtain Walls (4716)

Tuesday, June 29

9 a.m. to 11 a.m.

Hua Ge, Ph.D., P.E., and Paul Fazio, Ph.D., P.E., Concordia University, Montreal, QE, Canada

Previous studies have indicated that the application of variable local film coefficients can improve the accuracy of temperature predictions for fenestration systems using 2-dimensional programs, such as FRA.m.E and THERM. However, the discrepancy between simulation and test results for metal-framed windows is relatively large. One of the possible reasons was believed to be the lack of test data, which were reported with accurate measurement locations and test conditions. In a comprehensive experimental study on the overall performance of metal curtain walls, extensive temperature measurements enabled more accurate comparison between simulations and tests.

Effect of Ventilation System on Particle Spatial Distribution in Ventilated Rooms (4717)

Tuesday, June 29 9 a.m. to 11 a.m.

Xinlei Wang, Ph.D., Member, Yuanhui Zhang, Ph.D., P.E., Member and Ted L. Funk, Ph.D., P.E., University of Illinois at Urbana-Champaign, Urbana, IL; Lingying Zhao, Ph.D., Associate Member, The Ohio State University, Columbus, OH

Airborne particulate matter has been implicated as a major contributor to the increased incidence of respiratory disorders among people working in the livestock buildings. A clear understanding of particle spatial distribution can provide important information for improvement of ventilation system design and control strategies. In this study, the dust mass spatial distributions in three different ventilation systems were measured using a multi-point sampler in a full-scale mechanically ventilated laboratory room under controlled conditions. The experimental results showed that the particle mass spatial concentrations varied widely as a result of ventilation. Increasing the ventilation rate within the same ventilation system reduced the overall mean particle concentration.

Full-Scale Burning Tests on Mechanical Smoke Exhaust in Large Atrium (4718)

Tuesday, June 29 9 a.m. to 11 a.m.

L. Yi, University of Science and Technology of China, Hefei, Anhui, China; W.K. Chow, Ph.D., Member, The Hong Kong Polytechnic University, Hunghom, Kowloon, Hong Kong, China; R. Huo, University of Science and Technology of China, Hefei, Anhui, China; N.K. Fong, Ph.D., The Hong Kong Polytechnic University, Hong Kong, China; Y.Z. Li, Ph.D., University of Science and Technology of China, Hefei, Anhui, China; C.W. Leung, C.L. Shi and W.Y. Hung, The Hong Kong Polytechnic University, Hong Kong, China; H.B. Wang, University of Science and Technology of China, Hefei, Anhui, China

Removing smoke at the early stage of a building fire would assist in evacuation. Mechanical smoke extraction system is commonly installed in buildings of larger space. In designing such a system, make-up air must be provided to displace the hot smoke. However, air supplied would also provide additional oxygen for combustion. Therefore, it is important to study how air should be supplied. In this paper, the efficiency of mechanical exhaust in an atrium with different arrangements for air supply are discussed.

Heat and Moisture Production of Poultry and their Housing Systems: Molting Hens (RP-1044) (4719)

Tuesday, June 29 9 a.m. to 11 a.m.

Sponsor: TC 02.02 Plant and Animal Environment

H. Justin Chepete and Hongwei Xin, Ph.D., Member, Iowa State University, Ames, IA

Heat and moisture production rates (HP, MP) of modern 68- to 75-week-old Hy-Line W-36 laying hens during molting were measured using large-scale indirect calorimeters that mimic commercial production settings. Heat production rates during light period were significantly higher ($P < 0.05$) than those during dark period. Daily mean and diurnal LHP as percentages of THP were similar during fasting and postmolt, but it was 10 percent lower during restricted feeding. The results of this study provide a new thermal load database for design of housing ventilation systems for laying hens undergoing molting phase.

Heat and Moisture Production of Poultry and their Housing Systems: Pullets and Layers (RP-1044) (4720)

Tuesday, June 29 9 a.m. to 11 a.m.

Sponsor: TC 02.02 Plant and Animal Environment

H. Justin Chepete, Ph.D., Hongwei Xin, Ph.D., Member and Manuel C. Puma, Ph.D., Iowa State University, Ames, IA; Richard S. Gates, Ph.D., University of Kentucky

Heat and moisture production rates (HP, MP) of modern pullets and laying hens were measured using large-scale indirect calorimeters that mimic commercial production settings. Results of this study provide an updated thermal load database for design and operation of poultry housing ventilation systems as well as the latest bioenergetics of modern pullets and hens.

Indoor Humidity Modeling and Evaluation of Condensation on Interior Surfaces (4721)

Tuesday, June 29 9 a.m. to 11 a.m.

Franck Lucas, Ph.D. and Frederick Miranville, Ph.D., The College of Technology, Saint Pierre, Reunion Island, France

In tropical humid climates, moisture and condensation on walls lead to significant damage on buildings. This paper presents a numerical model to improve the prediction of internal humidity in buildings. Thermal simulation codes usually evaluate moisture due only to airflow transfers. The model presented takes into account the moisture transfers between walls and air inside a zone. It allows a forecast of the quantities of liquid condensed on a surface. An experimental comparison is presented to appreciate the improvement of the model.

Integrated Damper and Pressure Reset for VAV Supply Air Fan Control (4722)

Tuesday, June 29 9 a.m. to 11 a.m.

Guanghua Wei, P.E., Associate Member, Texas A&M University, College Station, TX; Mingsheng Liu, Ph.D., P.E., Member, University of Nebraska, Lincoln, NE; David E. Claridge, Ph.D., P.E., Member, Texas A&M University, College Station, TX

This paper presents an integrated damper and pressure reset (IDPR) method for the variable air volume (VAV) system fan control. The IDPR method controls the static pressure at minimum required level while maintaining at least one terminal box damper at full open position. When the entire system is flawless, the fan speed is controlled in a way similar to the terminal regulated air volume (TRAV) method to maintain at least one terminal box damper full open. When system faults exist, however, this control strategy uses less fan power than the TRAV method.

Laboratory Observations of Biocide Efficiency in Model Cooling Tower Systems (RP-954) (4723)

Tuesday, June 29 9 a.m. to 11 a.m.

Sponsor: TC 03.06 Water Treatment

Ian D. Smith, First Environment Limited, Birmingham, United Kingdom; William M. Thomas, First Environment Limited; Elizabeth J. Fricker, Jason Eccles and Rosalyn Searle, Thames Water Utilities Ltd., Reading, United Kingdom

This paper provides an overview of the research project findings of the efficacy of specific oxidizing and non-oxidizing biocides examined using a model cooling tower system inoculated with a microcosm containing an environmental isolate of *Legionella pneumophila*. The activity of three biocides were tested against both planktonic and sessile *Legionella* against 'dirty' systems, with pre-established bacterial microcosms and also against 'clean' systems subsequently drip-fed with a *Legionella* seed. The findings of the project can be used to better understand the likely

reaction of Legionella bacteria to biocide dosage programs and assist in the development of future biocide products and strategies.

Method of Thermal Metering on the Air-Side for the Fan-Coil Units (4724)

Tuesday, June 29 9 a.m. to 11 a.m.

Zhi Wei Lian and Ye Yao, Shanghai Jiao Tong University, Shanghai, China; Yi Xiong Hu, Central South University, Changsha, Hunan, China; Zhi Jian Hou, Shanghai Jiao Tong University, Shanghai, China

Energy cost allocation system apportions cooling and/or heating costs among the individual apartments in centrally metered buildings based on various methods of energy metering. The most commonly used systems measure one or more parameters related to the thermal output of the terminal element but do not measure enough parameters to provide an accurate energy measurement because of many reasons, such as investment, installation, maintenance cost, etc.

Minimizing TEWI in a Compact Chiller for Unitary Applications(4725)

Tuesday, June 29 9 a.m. to 11 a.m.

Philip R. Barnes, Florida Power & Light Co., Florida City, FL; Clark Bullard, Ph.D., Fellow, University of Illinois at Urbana-Champaign, Urbana, IL

A simulation model was developed to investigate strategies for reducing total equivalent warming impact (TEWI) in compact water chillers. The focus was on minimizing refrigerant charge while increasing efficiency, using R-410A as an example. Compact flat plate heat exchangers with refrigerant channels similar in scale to microchannels appear capable of reducing total system charge about 80% compared to conventional air-air split systems. Results are also compared to those obtained for highly efficient air-to-air unitary systems, in which minimum-TEWI design strategies require larger heat exchangers having greater charge.

Multidimensional Effects of Ground Heat Transfer on the Dynamics of Building Thermal Performance (4726)

Tuesday, June 29 9 a.m. to 11 a.m.

Gerson H. dos Santos and Nathan Mendes, Pontifical Catholic University of Parana, Curitiba, Brazil

This paper describes a model for investigating the pure conduction heat transfer through the ground and its influence on room air temperature. The differential equation of energy conservation for each node of the building envelope was discretized by using the finite-difference method, a uniform grid and a fully implicit scheme. In order to investigate the use of simpler models for reducing computer run time of yearly building simulation programs, three approaches were considered. In conclusion, the use of 3-D ground heat transfer modeling, in building simulation programs, may be important to be taken into account for thermal load calculation and thermal comfort evaluations of low-rise buildings.

Natural Convection Heat Transfer for Fin-Tube Heat Exchangers (4727)

Tuesday, June 29 9 a.m. to 11 a.m.

Yew Khoy Chuah, Ph.D., Fellow and C.T. Chen, National Taipei University of Technology, Taipei, Taiwan, China

In this study, experiments were conducted on 15 fin-tube heat exchangers. Natural convection heat transfer of these heat exchangers was measured. The results show that lower chilled water temperature will give more heat transfer but water velocity in tubes is a weak factor of heat transfer. It was also found that the single tube heat exchangers have the highest heat transfer coefficient, with the three tube heat exchangers the lowest.

Neural Network Optimal Controller for Commercial Ice Thermal Storage Systems (4728)

Tuesday, June 29 9 a.m. to 11 a.m.

Darrell D. Massie, Ph.D., P.E., Member, U.S. Military Academy, West Point, NY; Jan F. Kreider, Ph.D., P.E., Member, University of Colorado, Boulder, CO; Peter Curtiss, Ph.D., P.E., Member, Curtiss Engineering, Boulder, CO

This paper describes the construction and measured performance of a neural network-based optimal controller for an ice thermal storage system. The controller consists of four neural networks, three of which map equipment behavior and one that acts as a global controller. The controller self-learns equipment responses to the environment and then determines the control settings that should be used. Issues to be addressed are the cost function and selection of a planning window over which the optimization is conducted. The NN controller then determines the sequence of control actions that minimize total cost over the planning window.

Numerical Analysis of the Movement of Biological Particles in Two Adjacent Rooms (4729)

Tuesday, June 29 9 a.m. to 11 a.m.

Zhao Bin, Ph.D. and Xianting Li, Ph.D., Tsinghua University, Beijing, China

Severe acute respiratory syndrome (SARS) is a recently described illness of humans with a high case-fatality rate that has spread widely since November 2002. As SARS and many other diseases may transmit by biological airborne particles, it is important to analyze the movement of biological particles indoors to protect the indoor environment from biological pollution. In this paper, the movement of biological particles in two adjacent rooms is numerically studied under the cross ventilation. The cases of different air exchange rates and initial positions of particles are analyzed and compared numerically.

Numerical Study of the Similarity Law for the Cross Flow Fan of the Split-Type Air-Conditioner (4730)

Tuesday, June 29 9 a.m. to 11 a.m.

Yang-Cheng Shih, Ph.D., Member and Hung-Chi Hou, National Taipei University of Technology, Taipei, Taiwan, R.O.C.; Hsueh-Chiang Chiang, Ph.D., Member, Industrial Technology Research Institute, Hsinchu, Taiwan, R.O.C.

Cross flow fans (CFF) have been used in many industrial applications. The split-type air-conditioner is one of them. No up to date complete similarity laws of CFFs were available on designing split-type air-conditioners. This paper adopted the CFD method to simulate the internal flow fields of a split-type air-conditioner. The effect of the rotational speed on the similarity law for CFF inside the air-conditioner was investigated, and the factors influencing the movement and the strength of eccentric vortex were addressed.

Overview of Existing Guidance and Ventilation Approaches for Control of Diesel Exhaust in Locomotive Facilities (RP-1191) (4731)

Tuesday, June 29

9 a.m. to 11 a.m.

Chadwick C. Rasmussen, University of Michigan; Amy Musser, Ph.D., P.E., Associate Member and Kim Bunz, University of Nebraska

Matt Radik, University of Nebraska, Omaha, NE

Sponsor: TC 05.09 Enclosed Vehicular Facilities

This paper provides an overview of existing guidance, regulations, and design approaches to control diesel exhaust from locomotives operating in buildings. First, design guidance and standards for exposure to major components of diesel exhaust is reviewed. Next, issues regarding engine design, fuel composition, and outdoor emissions control strategies and their potential impact on current and future indoor emissions are discussed. Ventilation approaches that have been implemented in existing facilities are presented. The review highlights both approaches and information that will be useful to designers planning or retrofitting this type of facility.

Simple Approach to Evaluate the View Factors Between Internal Heat Source and their Environment (4732)

Tuesday, June 29

9 a.m. to 11 a.m.

Qingpeng Wei, Ph.D., and Yi Jiang, Ph.D., P.E., Member, Tsinghua University, Beijing, China

It is important to determine the view factors between internal heat source surfaces and their environment in order to better understand the thermal radiation in rooms. With reasonable approximation to the theoretical derivation, a simple approach to evaluate the view factors between internal heat sources and their surroundings is presented in this paper. The approach is based on the contour-integral representation and the superposition principle of view factors. The integral intermediate value theorem is applied to reduce the complexity of calculation. The simple approach is validated through comparison with a theoretical method for several basic configurations.

Simulation and Performance Analysis of Lithium Bromide/Water for Absorption Heat Transformer Cycle Systems (4733)

Tuesday, June 29

9 a.m. to 11 a.m.

C.C. Chuang, Ph.D., National Taipei University of Technology, Taipei, Taiwan, R.O.C.; D.C. Sue, P.E., National Taipei University of Technology, Taipei, Taiwan, R.O.C. and Pacific Engineers and Constructors, Ltd.; and Y.T. Lin, National Taipei University of Technology, Taipei, Taiwan, R.O.C.

Waste heat resources can be used to drive absorption heat pumps (AHP) when operated in the reverse Carnot Cycle. An AHP recovers heat that otherwise would be rejected to the environment and it can produce cooling energy or recover heat for further use. The absorption heat transformer (AHT) is an inverted AHP; hence an inverted reverse cycle can be applied. The AHT has excellent performance recovering the waste energy from the industrial process and increasing a portion of that energy to a higher temperature. This study is based on using LiBr/H₂O solution as a working fluid for the performance evaluation of a single-effect AHT.

Smoke Control for Retail Shops with Cabin Design (4734)

Tuesday, June 29

9 a.m. to 11 a.m.

W.K. Chow, Ph.D., Member, The Hong Kong Polytechnic University, Hunghom Kowloon, Hong Kong, China

It is not feasible to provide dynamic smoke exhaust for the entire hall in some terminals or malls with big volume space. The cabin design is commonly used with a ceiling roof covering the retail areas, giving smaller shops. Active fire protection systems including dynamic smoke exhaust and fire suppression systems are expected to be installed. In this paper, design aspects of smoke control system in such retail shops will be discussed. It is found that fire suppression systems should be provided. The new concept of using a water mist system as reported earlier will further be confirmed.

Study on Typical Meteorological Years and their Effect on Building Energy and Renewable Energy Simulations (4735)

Tuesday, June 29

9 a.m. to 11 a.m.

H. Yang, Ph.D., Member and L. Lu, Ph.D., The Hong Kong Polytechnic University, Hong Kong, China

This paper investigates the generation of typical meteorological year (TMY) and example weather year (EWY) for Hong Kong, and studies their effects on the simulation results of the performance of building energy and renewable energy systems. According to various methodologies, different TMYs and EWYs were calculated using Hong Kong's weather data from the past 22 years. The results were used for a building energy simulation and for a hybrid solar-wind energy simulation, as two case studies, to study their effect on the simulation results.

Thermal Performance Characteristics of an Energy Efficient, Healthy House (4736)

Tuesday, June 29

9 a.m. to 11 a.m.

E.A. Ibrahim, Ph.D., P.E., H. Aglan, Ph.D., P.E., M. Khan, Ph.D. and M. Bhuyan, Tuskegee University, Tuskegee, AL; R. Wendt and Sherry Livengood, Oak Ridge National Laboratory, Oak Ridge, TN

A collaborative effort between ORNL and Tuskegee University has resulted in an energy-efficient, healthy house that is built on Tuskegee's experiment station farm to conduct various energy efficiency and indoor-air quality studies. The house is well insulated and possesses other energy-efficiency features such as, airtight construction, reflective roofing and unventilated crawl space. The energy efficiency and thermal performance of the house are investigated in view of electric power consumption as well as indoor and outdoor temperature and relative humidity data. The data were collected over three periods during the heating season of 2002.

Proposed Tools and Capabilities for Pro-Active Multi-Building Load Management: Part 1- Customer Aggregation (RP-1146) (4737)

Tuesday, June 29

9 a.m. to 11 a.m.

Sponsor: TC 07.04 Building Operation Dynamics

T. Agami Reddy, Ph.D., P.E., Member, Drexel University, Philadelphia, PA; Leslie K. Norford, Ph.D., Member, Tabors Caramanis and Associates, Cambridge, MA

This paper summarizes part of the work performed under ASHRAE 1146-RP, Building Operation and Dynamics within an Aggregated Load. The paper identifies conditions under which aggregating individual building loads is attractive for managing total, multi-building load, and identifies and evaluates operating and control strategies for use in individual buildings that will reduce energy operating costs at the aggregate level by taking advantage of the diversity in demand among buildings. Research was done in two phases.

Proposed Tools and Capabilities for Pro-Active Multi-Buildings Load Management: Part 2- Aggregated Operation (RP-1146) (4738)

Tuesday, June 29 9 a.m. to 11 a.m.

Sponsor: TC 07.04 Building Operation Dynamics

Leslie K. Norford, Ph.D., Member, Massachusetts Institute of Technology, Cambridge, MA; T. Agami Reddy, Ph.D., P.E., Member, Drexel University, Philadelphia, PA

ASHRAE 1146-RP, Building Operation and Dynamics Within an Aggregated Load, was meant to identify situations under which aggregating individual building loads is attractive for managing total, multi-building load; and identify and evaluate operating and control strategies for use in individual buildings that will reduce energy operating costs at the aggregate level by taking advantage of the diversity in demand among buildings.

Verification of a Neural Network-Based Controller for Commercial Ice Storage (4739)

Tuesday, June 29, 2004 9:00 AM - 11:00 AM

Darrell D. Massie, Ph.D., P.E., Member, U.S. Military Academy, West Point, NY; Jan F. Kreider, Ph.D., P.E., Member, University of Colorado, Boulder, CO; Peter Curtiss, Ph.D., P.E., Member, Curtiss Engineering, Boulder, CO

Wind Effects on Performance of Static Smoke Exhaust Systems: Horizontal Ceiling Vents (4740)

Tuesday, June 29 9 a.m. to 11 a.m.

W.K. Chow, Ph.D., Member and J. Li, The Hong Kong Polytechnic University, Hong Kong, China

For static smoke exhaust systems such as horizontal ceiling vents, buoyancy of the smoke layer is the driving force for smoke removal. However, wind effect should also be considered as the smoke layer interface height can be raised up or pulled down, depending on the conditions. Key equations on calculating the smoke exhaust rates and the required vent area will be reviewed first in this paper. Modifications of those equations with wind effects are discussed.

An Oil Circulation Observer for Estimating Oil Concentration and Oil Amount in Refrigerant Compressors (4741)

Xiang-Dong He, Ph.D., Member, Daikin U.S. Corp., Cambridge, MA; Tao Cheng, Massachusetts Institute of Technology, Cambridge, MA; Shinichi Kasahara, Daikin Air Conditioning R&D Lab, Osaka, Japan; and Harry H. Asada, Massachusetts Institute of Technology, Cambridge, MA

This paper presents an innovative oil circulation observer to estimate oil concentration and oil amount in refrigerant compressors. This model based dynamic observer is based on oil models for the components of an air conditioning or refrigeration system. Oil models for HVAC&R components have been developed in this paper to estimate oil mass and refrigerant mass in each component. Experimental testing has been conducted to verify the performance of this dynamic observer for steady state operation and dynamic processes. This has direct applications for safe and reliable operation of residential and commercial air conditioning and refrigeration systems.

TUESDAY, 6/29 10:15 A.M. TO

12:15 P.M.

Symposium NA-04-08

Modeling Moisture Sorption/Desorption by Building Materials

Room: Jackson C/D (PM)

Tuesday, June 29 10:15 a.m. to 12:15 p.m.

Sponsor: TC 04.07 Energy Calculations

Chair: Jan Kosny, Ph.D., Member, Oak Ridge National Laboratory, Oak Ridge, TN

In residential and small commercial buildings, humidity of rooms and moisture conditions of building envelope materials depend on correlations between each other. The driving force is a moisture exchange that takes place over the interior surfaces. These moisture-generated effects depend strongly on thermal conditions of indoor spaces and enclosure elements of buildings. In addition, moisture and humidity conditions have significant impact on how buildings are operated. For instance the indoor humidity control is one of the main reasons for ventilation, but also one that has a clear impact on the energy consumption.

1. Evaluation of Moisture Buffer Effects by Performing Whole-Building Simulations

Carsten Rode, Ph.D., Technical University of Denmark, Kongens Lyngby, Denmark; Nathan Mendes, Pontifical Catholic University of Paraná, Brazil; Karl Grau, Danish Building and Urban Research, Denmark

2. Effect of Moisture on Hygrothermal and Energy Performance

Dariusz Gawin, D.Sc., Marcin Koniarczyk and Aldona Wieckowska, Ph.D., Technical University of Lodz, Al. Politechniki, Poland; Elisabeth Kossecka, D.Sc., Polish Academy of Sciences, Warsaw, Poland

3. Moderating Indoor Conditions with Hygroscopic Building Materials and Outdoor Ventilation

Carey Simonson, Ph.D., Associate Member, University of Saskatchewan, Saskatoon, SK, Canada; Mikael Salonvaara, Member, VTT Building and Transport, Finland; Tuomo Ojanen, VTT Building and Transport, Finland

4. Predicting Indoor Temperature and Humidity Conditions Including Hygrothermal Interactions with the Building Envelope

Andreas Holm, Ph.D., Member, H.M. Kunzel, D. Zirkelbach and K. Sedlbauer, Fraunhofer-Institut Bauphysik, Germany

Seminar 38

Advancing Burner Technology

Room: Presidential Ballroom C (P2)

Tuesday, June 29 10:15 a.m. to 12:15 p.m.

Sponsor: TC 06.10 Fuels and Combustion

Chair: Raymond Albrecht, P.E., Member, New York State Energy Research and Dev. Authority, Albany, NY

Improving technology for burners for all fuels provides benefits of reduced air pollutant emissions and improved efficiency, and flexibility for the development of fired appliances with new configurations. Market acceptance of such new technologies is impacted by benefits, regulatory drivers, costs, training requirements and service organization acceptance. Also of increasing importance are electric power requirements, modulation capability and noise. Several new combustion technologies, which may impact the future design of residential and commercial sector fired equipment, are presented.

1. Ultra-Clean, Low-Swirl Combustion for Heating and Power Generation
Robert Cheng, Ph.D., Lawrence Berkeley National Laboratory, Berkeley, CA
2. FIR Burner Experience
David Cygan, Gas Technology Institute, Des Plaines, IL
3. Commercialization Challenges for Oilheat Combustion in the 21st Century
Kurt Oswald, Ph.D., Member, R.W. Beckett Corp., Elyria, OH
4. Porous Media Oil Burner
Thomas Butcher, Ph.D., Member, Brookhaven National Laboratory, Upton, NY

Seminar 39

Codes and Standards and Research Update

Room: Tennessee Ballroom A (T2)

Tuesday, June 29 10:15 a.m. to 12:15 p.m.

Sponsor: TC 05.10 Kitchen Ventilation

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

Updates on the status of research and as related to kitchen ventilation are discussed. This includes projects on the effect on hood performance of appliance position and diversity underneath a hood; and development of a method of test to determine fractional grease efficiency of kitchen exhaust grease extractors. Additionally, an overview is provided on what updates have been made to national codes and standards as they relate to kitchen ventilation.

1. 1202-RP: Appliance Diversity Update
Richard T. Swierczyna, Associate, Architectural Energy Corp., Wood Dale, IL
2. Development of a Standard Method of Test for Commercial Kitchen Grease Removal Systems
Thomas H. Kuehn, Ph.D., P.E., Fellow; Bernard A. Olson, Ph.D.; James W. Ramsey, Ph.D., Member, University of Minnesota, Minneapolis, MN
3. UL 710 Revision Proposals
Roy A. Meacham, Underwriters Laboratory Inc., Camas, WA
4. Update on International Mechanical Code
Douglas J. Horton, D.J. Horton and Associates Inc., Batavia, IL
5. Fire Extinguishing Requirements for Commercial Cooking Appliances and Exhaust Hoods
Phillip O. Morton, Gaylord Industries, Tualatin, OR

Seminar 40

Commercial Aircraft Cabin Air Quality Research

Room: Tennessee Ballroom D/E (T2)

Tuesday, June 29 10:15 a.m. to 12:15 p.m.

Sponsor: TC 09.03 Transportation Air Conditioning

Chair: G. Scott Earnest, Ph.D., P.E., CDC, NIOSH, Cincinnati, OH

Cabin air quality on commercial aircraft is an increasingly important area of new research. ASHRAE is working on a standard, 161P, that addresses this issue, and its content likely will be influenced by the findings of related research. A series of studies have been conducted to investigate cabin air quality and the potential for disease transmission on commercial aircraft. The studies presented here involve the use of aerosol science, computational fluid dynamics, particle image velocimetry, and bioaerosol sampling to investigate cabin air quality and disease transmission on commercial aircraft.

1. Experimental Characterization of Airflows in Aircraft Cabins
Yuanhui Zhang, Ph.D., P.E., Member, University of Illinois, Urbana, IL
2. Monitoring Bioaerosols for Commercial Passenger Aircraft
Lauralynn Taylor, CDC, NIOSH, Cincinnati, OH
3. Computational Prediction of Particulate Transport and Dynamic Modeling of Particle Generation
Allen Badeau, CDC, NIOSH, Morgantown, WV
4. Treatment of Aircraft Ground Air Sources for VOC Removal
Claire Nurcombe, Airbus, Hamburg, Germany

Seminar 41

LEED and Thermal Energy Storage: Case Studies of Green TES Design

Room: Presidential Ballroom B (P2)

Tuesday, June 29 10:15 a.m. to 12:15 p.m.

Sponsor: TC 06.09 Thermal Storage

Chair: Richard Kooy, P.E., Member, A. Epstein and Sons International, Inc., Chicago, IL

LEED's 10 points for energy are based on ASHRAE 90.1, which is correctly based on energy cost reduction, not energy

reduction. With thermal energy storage's track record on energy cost reductions, it is a strong tool in getting points in green design. However, the real reason thermal energy storage is green is that it is more efficient to generate and deliver power at night, with normally an associated reduction in emissions. Innovative building designs using a variety of ice-based off-peak cooling systems are highlighted.

1. Off-Peak Cooling and LEED Gold in California

Mark M. MacCracken, P.E., Member, CALMAC Mfg. Corp., Englewood, NJ

2. LEED Gold for Utility HQ Building

Scott Sine, P.E., Member, H. T. Lions, Allentown, PA

3. NJ School System Uses 100% Outdoor Air and TES for 3 LEED Projects

Leon Shapiro, Member, ADA Systems, Carol Stream, IL

Seminar 42

Models for Automated Building/HVAC Fault Detection and Diagnostics

Room: Tennessee Ballroom B (T2)

Tuesday, June 29

10:15 a.m. to 12:15 p.m.

Sponsor: TC 07.05 Smart Building Systems; TC 04.07 Energy Calculations

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

Model-based reasoning represents an important approach to automating the detection and diagnosis of faults in HVAC and other building systems, especially in situations where the underlying systems, processes and physical relationships are well known but large amounts of data are not available. This seminar starts with an overview of the different types of models for fault detection and diagnosis and their strengths, weaknesses and best applications. This is followed by a set of presentations, three of which highlight different models and one that focuses on configuring models for automated

1. An Introduction to Modeling Techniques for Automated Fault Detection and Diagnostics

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

2. Real-time EnergyPlus: A Simulation Model for Whole Building Fault Detection and Diagnosis

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

3. A Library of Component Reference Models for Fault Detection (AHU and Chiller)

Peng Xu, Ph.D., P.E., Member, Lawrence Berkeley National Laboratory, Berkeley, CA

4. Data for Configuring Models for Automated Cx.: What Do We Need and Where Can We Find It?

Richard M. Kelso, Ph.D., P.E., Fellow, University of Tennessee, Knoxville, TN; and Jonathan A. Wright, Ph.D., Member, Loughborough University, Loughborough, UK

5. A Simple Model for Automated Energy-System Diagnostics and Predictive Control

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

Seminar 43

New Developments in Energy Recovery Ventilation Technology, Standards and Guidelines

Room: Presidential Ballroom A (P2)

Tuesday, June 29

10:15 a.m. to 12:15 p.m.

Sponsor: TC 05.05 Air-to-Air Energy Recovery

Chair: Matthew L Friedlander, Member, RenewAire LLC, Madison, WI

Continuing advances in energy-recovery ventilation technology are accompanied by advances in understanding of its application. In particular, more and more information is available to help designers of equipment and systems understand how energy-recovery components behave as parts of entire mechanical systems. Presentations will discuss Canadian work with integrated mechanical systems, behavior of energy-recovery components, calculation of integrated system efficiency, and the impact of energy recovery on sensible heat ratios.

1. Air-to-Air Energy Recovery in Integrated Small Scale HVAC Systems

Peter K. Grinbergs, Associate, Nutech Brands, London, ON, Canada

2. Effect of Cross-Stream Air Leakage on the Performance of Total Energy Recovery Wheels

Gerald Martin, Member, Air Energy Research Corporation, Minneapolis, MN

3. ARI Guideline V - Characterizing the Efficiency of Energy Recovery Ventilation and Informing the Design of HVAC Systems

Bede W. Wellford, Member, Airxchange, Inc., Rockland, MA

4. Building Load Sensible Heat Ratios, Energy Recovery and Humidity Control

John Dieckmann, Member, TIAX LLC, Cambridge, MA

Forum 19

10:15 a.m. to 11:05 a.m.

Fractionation Measurement of Refrigerant Blends

Room: Jackson A/B (PM)

Tuesday, June 29

10:15 a.m. to 11:05 a.m.

Sponsor: TC 03.01 Refrigerants and Secondary Coolants; SPC 177P

Moderator: Rajiv Singh, Ph.D., Member, Honeywell, Buffalo, NY

Standard committee SPC-177P is being formed to define a standardized test apparatus, method, and procedures for experimentally conducting fractionation analyses of refrigerant blends that is consistent with their thermodynamic vapor-liquid equilibrium (VLE) properties to determine the worst case fractionated formulated composition of refrigerant blends. This forum seeks input from the ASHRAE community.

Forum 20

11:15 a.m. to 12:05 p.m.

Test and Balance and Commissioning: Can Both Be Done by the Same Agency?

Room: Jackson A/B (PM)

Tuesday, June 29

11:15 a.m. to 12:05 p.m.

Sponsor: TC 07.07 Testing and Balancing

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

Testing, adjusting and balancing is a prerequisite for commissioning. Some agencies provide both test and balance and commissioning services. Others believe that the services must be provided separately due to potential conflicts of interest. This forum discusses both options with the intent of providing guidance to the technical and project committees on future programs and publications.

WEDNESDAY, 6/30 8 A.M. TO

10 A.M.

Technical Session 1

Room: Tennessee Ballroom A (T2)

IAQ, Dehumidification, Split System A/C, and Occupant Comfort Issues

Room: Tennessee Ballroom A (T2)

An Air-Conditioning Model Validation and Implementation into a Building Energy Analysis Software (4697)

Wednesday, June 30

8 a.m. to 10 a.m.

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

An empirical model for a split air-conditioning system with an air-cooled condensing unit and an indoor evaporator unit is presented. The model is intended for hourly building energy simulations. The agreement between the results from the simulation model in ESP-r/H3K and those from the HVAC BESTEST is good. Results also show the importance of software testing and validation in increasing the confidence in simulation results.

Application of Advanced Software Technologies and Engineering Standards to Improve the Process of HVAC Systems Design (4698)

Wednesday, June 30

8 a.m. to 10 a.m.

Micha Ciach and Aleksandra Duda, ABB Corporate Research, Krakow, Poland; Micha Januszczak, University of Mining and Metallurgy, Krakow, Poland

The software platform designed and implemented in order to improve and optimize engineering processes of selection, configuration and design of indoor air quality equipment, products and systems has been presented. Up-to-date software technologies have been used in order to construct the platform, supporting designs of complex air distribution equipment and implemented as Web-based and standalone application.

Dehumidification Characteristics of Commercial Building Applications (RP-1121) (4699)

Wednesday, June 30

8 a.m. to 10 a.m.

Michael J. Brandemuehl, Ph.D., P.E., Member and Thosapon Katejanekarn, University of Colorado, Boulder, CO

ASHRAE 1121-RP, Evaluating the Ability of Unitary Equipment to Maintain Adequate Space Humidity Levels: Phase 1, was established to develop a plan to guide the evaluation of humidity control by unitary HVAC equipment. Part of the development of the plan involved the evaluation of dehumidification requirements in different building applications and different climates. This paper describes the analysis of building load characteristics to identify and describe key factors that affect humidity control in various commercial building applications. Results indicate that ventilation loads dominate the dehumidification characteristics of most commercial buildings and dramatically affect the sensible heat ratio of system loads.

Indoor Air Quality of an Energy Efficient, Healthy House with Mechanically Induced Fresh Air (4700)

Wednesday, June 30

8 a.m. to 10 a.m.

Robert L. Wendt, Oak Ridge National Laboratory, Oak Ridge, TN; Heshmat A. Aglan, Ph.D., P.E., Tuskegee University, Tuskegee, AL; Sherry E. Livengood, Oak Ridge National Laboratory, Oak Ridge, TN; M. Khan, Ph.D. and Essam Ibrahim, Ph.D., P.E., Tuskegee University, Tuskegee, AL

Issues associated with indoor air quality (IAQ) and its impact on occupant health have prompted research into the design and construction of healthy houses. Most of the houses constructed have been "upscale housing." An affordable, energy-efficient, healthy house was built at Tuskegee University with features that improve IAQ, reduce energy consumption, and do not increase the cost of the house beyond the means of the targeted homeowners. Initial tests of the house indicate that meeting the sometimes competing priorities of affordability, energy efficiency and IAQ will require a more balanced combination of system operation than simply keeping the ventilation turned on.

Wednesday, June 30

8 a.m. to 10 a.m.

Symposium NA-04-09

Load Calculations

Room: Presidential Ballroom B (P2)

Wednesday, June 30

8 a.m. to 10 a.m.

Sponsor: TC 04.01 Load Calculation Data and Procedures; TC 09.02 Industrial Air Conditioning

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

Load calculations require knowledge of the internal heat gains from equipment and processes. This symposium discusses how to gather this information without overestimating the heat load and provides an overview of the conduction transfer function and

periodic response factor methods of calculating conduction heat transfer. The results of RP 1104, Heat Loss from Electrical and Control Equipment in Industrial Plants, are presented. The work provides updated estimates of equipment heat loss used for load calculations.

1. Application of Conduction Transfer Functions and Periodic Response Factors in Cooling Load Calculation Procedures

Daniel E. Fisher, Ph.D., P.E., Member and Ipseng lu, Oklahoma State University, Stillwater, OK

2. Heat Loss from Electrical and Control Equipment (RP-1104)

Warren White, Ph.D., Chris Cruz and Anil Pahwa, Ph.D., Kansas State University, Manhattan, KS

3. We're on Deadline, Printing Press Heat Gain Is More (or Less) than Just Motor Load

Dennis J. Wessel, P.E., Fellow, Karpinski Engineering, Inc., Cleveland, OH

4. Heat Transfer Across a Cavity with 3 HT Modes (4696)

Mohamed A. Antar, Ph.D. and Lindon C. Thomas, KFUP.m., Dhahran, Saudi Arabia

Seminar 44

Computer Modeling of Labs for Environmental Control

Room: Tennessee D/E (T2)

Wednesday, June 30

8 a.m. to 10 a.m.

Sponsor: TC 09.10 Laboratory Systems; TC 04.10 Indoor Environmental Modeling

Chair: J. Patrick Carpenter, P.E., Member, Kling, Philadelphia, PA

Laboratory environments typically involve competing concerns for safety and comfort. These are driven by exhaust air make-up, equipment cooling loads and room air pressurization and dilution. Many of these concerns are not uniform within a space, and most designs often fail to see the complex effects of localized temperature and air velocity variations within rooms. This seminar demonstrates how the use of sophisticated modeling tools such as CFD can provide a detailed understanding of these effects that better informs engineers and allows solutions that maximize worker safety and comfort while possibly also improving energy effectiveness.

1. Controlling Cold Drafts from Supply Diffusers

Glenn D. Schuyler, P.E., Member, RWDI, Guelph, ON, Canada

2. Effect of Supply Diffusers on Laboratory Ventilation

Scott D. Reynolds, P.E., Member, CAES, Binghamton, NY

3. Contamination Removal Effectiveness: Computations and Considerations for the Lab Environment

Andrew Manning, Ph.D., Associate Member, Flomerics, Southborough, MA

4. Laboratory Design Using Airflow Modeling

Walter R. Schwarz, Ph.D., Member, Fluent, Inc., Lebanon, NH

Seminar 45

Design Considerations to Limit Dispersion of Immediately Harmful Contaminants in Large Buildings and Enclosed Vehicular Facilities

Room: Jackson C/D (PM)

Wednesday, June 30

8 a.m. to 10 a.m.

Sponsor: TC 05.09 Enclosed Vehicular Facilities; TC 05.06 Control of Fire and Smoke; TC 09.09 Mission Critical Facilities, Technology Spaces and Electronic Equipment

Chair: Paul C. Miclea, P.E., Member, Earth Tech, Inc., Oakland, CA

There is concern for criminal acts of discharging harmful contaminants in large buildings and transit systems to create panic or harm the occupants. Ventilation systems in such facilities have not been designed to address these cases and therefore there is no criteria to prevent the dispersion of harmful contaminants and minimize the risk to occupants. This seminar is recommended to generate ideas for future consideration for the design of new facilities and the best approach to managing risks. Specific options under consideration by Washington Metro and other agencies will be discussed along with the applicable engineering tools.

1. Protection of Washington Metro Stations from Tunnel Fire Smoke with Jet Fans Ventilation System

Igor Maevski, Ph.D., P.E., Member, Jacobs Engineering, New York, NY; and Kanu Desai, P.E., WMATA, Washington, D.C.

2. Dispersion Characteristics of Aerosol Contaminants in Underground Facilities

Greg Sanchez, P.E., Member, New York City Transit, New York, NY

3. Can We Limit the Access of CB Substances in Enclosed Transit Facilities?

Kirk McDaniel, P.E., Member, Earth Tech, Inc., Oakland, CA

4. Importance of Emergency Preparedness and Evacuation Drills

Barney Smits, P.E., Associate, BART - San Francisco Bay Area Rapid Transit, Oakland, CA

5. Practical Means to Isolate the Station from the Tunnels in Case of a CBR Event

Paul C. Miclea, P.E., Member, Earth Tech, Inc., Oakland, CA

Seminar 46

Emergency Cooling of Essential Facilities with Thermal Energy Storage

Room: Tennessee Ballroom B (T2)

Wednesday, June 30

8 a.m. to 10 a.m.

Sponsor: TC 06.09 Thermal Storage; TC 09.09 Mission Critical Facilities, Technology Spaces and Electronic Equipment

Chair: Brian M. Silveti, P.E., Member, Calmac Manufacturing Corp., Englewood, NJ

More commonly used for operating cost and energy savings, the minimal energy required to discharge thermal storage systems makes them ideal candidates for emergency cooling in the event of power failure. Critical design and cost issues such as chiller reset and recovery times, backup power requirements and integration concerns are discussed. The actual experience of

owner/operators under emergency conditions are summarized, specific installations described and the potential for TES as emergency capacity assessed.

1. Use of Stratified Thermal Storage as Emergency Cooling Capacity

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

2. Application Decisions and Implementation of TES for Mission Critical Facilities

David C. Tootle, P.E., Member, EYP Mission Critical Facilities, Inc., Washington, D.C.

3. Emergency Back-up Cooling for a Data Center

Amy Wortman, Member, Baltimore Aircoil Company, Baltimore, MD

Seminar 47

How Can We Get Thermal Science Concepts Across to Students?

Room: Cheekwood F (MM)

Wednesday, June 30 8 a.m. to 10 a.m.

Sponsor: Student Affairs Committee

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

Students enter courses in engineering and science with a set of beliefs and intuitions about physical phenomena. These beliefs serve as their basis for understanding course material and often, their explanations are not consistent or compatible with the established ideas on the phenomena. Faculty at a number of institutions are experimenting with ways to enhance learning so students better understand the material. Some of the modern approaches used in engineering are presented.

1. Project-Based Instruction in Air-Conditioning and Refrigeration

Ty Newell, Ph.D., Member, University of Illinois, Urbana, IL

2. Problem-Based Learning in Engineering Thermodynamics

Karim Nasr, Ph.D., Member, Kettering University, Flint, MI

3. Concept-Based Instruction in Aeronautical Engineering

David Darmofal, Ph.D., Massachusetts Institute of Technology, Cambridge, MA

4. Teaching and Learning Concepts in Fluid Mechanics

John W Mitchell, Ph.D., P.E., Fellow, University of Wisconsin, Madison, WI

Seminar 48

Overcoming Barriers to Geothermal Systems

Room: Presidential Ballroom A (P2)

Wednesday, June 30 8 a.m. to 10 a.m.

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

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

There may be several impediments and obstacles in the rapid growth of geothermal applications. The biggest hindrance is cost. This seminar discusses steps and design methodologies to economize installation cost in new installations. It also features examples of how maintenance and operating cost can be reduced in open and closed loop systems.

1. Benefits Beyond Energy: Experiences from a Wisconsin School

Steven W. Carlson, P.E., Member, CDH Energy Corp., Evansville, WI

2. GSHP Designs for Lower Cost and Higher Quality

Steve P. Kavanaugh, Ph.D., Fellow, University of Alabama, Tuscaloosa, AL

3. Open Loop Systems: The Good, the Bad and the Ugly

Kevin D. Rafferty, Member, Klamath Falls, OR

4. Canadian Experience: Overcoming GSHP System Barriers

R.L. Douglas Cane, P.E., Member, Caneta Research, Inc., Mississauga, ON, Canada

Seminar 49

Residential Roofing and Attic Technologies

Room: Presidential Ballroom C (P2)

Wednesday, June 30 8 a.m. to 10 a.m.

Sponsor: TC 04.04 Building Materials and Building Envelope Performance

Chair: Theresa A Weston, Ph.D., Member, DuPont, Richmond, VA

Recent research and practical experiences with building energy efficient residential roofs and attics are discussed.

Presentations, based on building science principles, introduce practical methods of improving roof and attic systems for residential construction throughout North America. Some of the common themes covered by speakers include effective air cavity flow, ventilation principles, energy savings, moisture control and ice damming.

1. Highlights of Two Decades of Cooling Related Roofing Research at Florida Solar Energy Center

Danny S. Parker, Associate, Florida Solar Energy Center, Cocoa, FL

2. Energy Impact Due to Attic Ventilation

Andre O. Desjarlais, Associate, Oak Ridge National Laboratory, Oak Ridge, TN

3. Sloped Roofs: Ice Damming, Ventilation and Air Leakage

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

4. Constructing Unvented Roofs in Cold Climates, Hot Climates and Everything in Between

Joseph W. Lstiburek, Ph.D., P.E., Member, Building Science Corp., Westford, MA

5. Practical Methods to Seal Attics with Breathable Membranes

Tony D Zatkulak, DuPont, Richmond, VA

Forum 21**8 a.m. to 10 a.m.**

Performance Criteria for Evaluating Radiant Heating Systems

Room: Jackson A/B (PM)

Wednesday, June 30 8 a.m. to 10 a.m.

Sponsor: TC 06.05 Radiant Space Heating and Cooling**Moderator:** Kirby S. Chapman, Ph.D., Member, Kansas State University, Manhattan, KS

This forum discusses performance criteria necessary to evaluate radiant and load-sharing heating and cooling systems. Discussion topics include distributed thermal comfort in residential, industrial, commercial and local heating/cooling situations and energy consumption. Of particular interest is the ability of the heating and/or cooling system to deliver occupant thermal comfort to specific locations within the conditioned space and the energy cost required to deliver that thermal comfort.

WEDNESDAY, 6/30 10:15 A.M. TO 12:15 P.M.

Seminar 50

Best Choice Cooling System Airflow Rates for Different Climates

Room: Cheekwood F (MM)

Wednesday, June 30 10:15 a.m. to 12:15 p.m.

Sponsor: TC 06.03 Central Forced Air Heating and Cooling Systems**Chair:** James B. Cummings, Member, Florida Solar Energy Center, Cocoa, FL

The nominal air flow rate for DX cooling systems is 400 cfm/ton. However, there may be different optimal air flow rates for different climates, because the air flow rate substantially impacts the SHR (dehumidification performance) of the system. In relatively dry climates, air flow rates greater than 400 cfm/ton may provide the best compromise between EER and SHR. In hot and humid climates, flow rates smaller than 400 cfm/ton may provide significant improvement in dehumidification performance without greatly impacting cooling system efficiency.

1. Optimum Airflow Rates for Cooling Systems in Hot and Dry Climates
John Proctor, Member, Proctor Engineering Group, San Rafael, CA
 2. Air Flow Rate Experimental Data Relating to Energy Efficiency and Dehumidification Performance
Danny Parker, Member, Florida Solar Energy Center, Cocoa, FL
 3. Theoretical Discussion: Impacts of Airflow on Air Conditioner Performance
Hugh I. Henderson, P.E., Member, CDH Energy Corp., Cazenovia, NY
 4. Can Rating Methods Support Regional Needs: The Airflow Example? (Should SEER and SHR Be Rated at Different Air Flow Rates?)
Harvey Sachs, Ph.D., Member, ACEEE, Washington, D.C.
 5. Manufacturer's Recommendations for Equipment and Airflow Rate Selection for Different Climates
Roy R. Crawford, Ph.D. Member, Trane, Tyler, TX
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Seminar 51

District Energy Systems in Tennessee: Comparison of Chilled Water Pumping Schemes

Room: Presidential Ballroom B (P2)

Wednesday, June 30 10:15 a.m. to 12:15 p.m.

Sponsor: TC 06.02 District Energy**Chair:** Burkley M. Allen, P.E., Member, I.C. Thomasson Assoc, Inc., Nashville, TN

Designing a district energy system is often a moving target, with only partial control over how individual buildings are connected. This seminar will present four types of chilled water distribution systems, comparing design and operational experience in real-world circumstances. Systems include constant volume primary/secondary, constant volume distributed pumping, variable volume primary/secondary with tertiary pumps in buildings, and variable volume primary/secondary without building pumps. Representatives from college campuses and industry describe their systems and the challenges associated with each.

1. Constant Primary/Secondary System at University of Memphis
James E. Hellums, P.E., Member, University of Memphis, Nashville, TN
 2. Distributed Chilled Water Pumping at Tennessee Tech University
Larry W. Wheaton, Tennessee Technological University, Cookeville, TN
 3. Variable Volume Primary/Secondary at Vanderbilt University
James G. Galbreath, P.E., Member, Vanderbilt University, Nashville, TN
 4. Primary/Secondary with No Tertiary Pumps at Western Kentucky University
Don Stoneburg, P.E., Sodexo Campus Solutions, Bowling Green, KY
 5. Variable Primary at the University of Alabama
Mike O'Brien, P.E., Member, Heery International, Inc., Atlanta, GA
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Seminar 52

Lab Renovation Case Studies

Room: Tennessee Ballroom A (T2)

Wednesday, June 30 10:15 a.m. to 12:15 p.m.

Sponsor: TC 09.10 Laboratory Systems**Chair:** Joseph B. Schluck, Associate, AstraZeneca Pharmaceuticals, Wilmington, DE

As IAQ requirements, laboratory technologies and research changes, their support systems and environment must also change. This seminar focuses on the increasing importance and difficulty of lab renovations, both total refurbishment and partial refurbishment with minimal disturbance to occupants.

1. Challenging Lab Renovations in the Southeast

Andrew A. Dymek, P.E., Member, Newcomb & Boyd Consulting Engineers, Atlanta, GA

2. Does ASHRAE Laboratory Design Guidelines Apply to All Laboratories?

George P. Isherwood, P.E., Member, Peter Basso Associates, Inc, Troy, MI

3. Case Study of a 900,000 ft² Medical School

Gaylon Richardson, Fellow, Engineered Air Balance Co., Inc., Houston, TX

4. Laboratory Air Handler Replacements

George J. Sestak, P.E., Fellow, AstraZeneca Pharmaceuticals, Wilmington, DE

5. Commissioning Issues Encountered in Refurbishing a BioChem Lab

Jeff J. Traylor, Member, PWI Consulting Engineers, Durham, NC

Seminar 53

Liquid Source Heat Pump Experiences in Commercial Applications

Room: Tennessee Ballroom B (T2)

Wednesday, June 30 10:15 a.m. to 12:15 p.m.

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

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

This seminar looks at the conversion of a large historic warehouse to apartments and office space, using a water loop heat pump system; the use of geothermal technology to heat and cool a newly constructed YMCA; and the retrofitting of historic schools utilizing conventional heating and cooling to geothermal. The design goals, operation and economics as well as the obstacles are reviewed.

1. South Side on Lamar, a Residential Renaissance

James R. Meyer, P.E., Member, Nelco Architecture, Richardson, TX

2. Geothermal Heating and Cooling System for the Davis Family YMCA

Charles T. Hill, P.E., Apex Engineering, Canton, OH

3. Geothermal Heat Pumps and the Classroom Experience in Three Elementary Schools

David E. Anstrand, Manheim Township School District, Lancaster, PA

4. A Geothermal Heat Pump Retrofit of a Pre-Depression School

James R. Knowles, Shive-Hattery, Inc, Iowa City, IA

5. A Geothermal Heat Pump Retrofit of a Pre-Depression School

Tim R. Fehr, P.E., Associate, Shive-Hattery, Inc., Iowa City, IA

Seminar 54

Novel Ideas in Absorption Technology

Room: Jackson C/D (PM)

Wednesday, June 30 10:15 a.m. to 12:15 p.m.

Sponsor: TC 08.03 Absorption and Heat Operated Machines

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

Although the fundamentals of absorption technology are well established, researchers are constantly finding improvements to increase efficiency, reliability and the range of potential applications. This seminar features presentations from both academia and industry that focus on current and potential developments for absorption machinery and its integration into CHP

1. Numerical and Experimental Analysis of Flow in Ejectors and Study of Potential Performance-Enhancing Concepts

Hany A. M. Al-Ansary, Student Member, and Sheldon M. Jeter, Ph.D., Member, Georgia Institute of Technology, Atlanta, GA

2. Air-Cooled Absorption Chiller Options

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

3. Control of a Waste Heat-Driven Double Effect Absorption Chiller

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

4. Design and Testing of an Innovative Axial Flow Separator Suitable for All-Air HVAC Systems

Sheldon M. Jeter, Ph.D., Member, and J.R. Aspinwall, Student Member, Georgia Institute of Technology, Atlanta, GA

5. Heat Activated Dual Function Absorption Cycle

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

Seminar 55

Retro Commissioning

Room: Presidential Ballroom C (P2)

Wednesday, June 30 10:15 a.m. to 12:15 p.m.

Sponsor: TC 07.09 Building Commissioning

Chair: Andrew P. Nolfo, P.E., Member, National Environmental Balancing Bureau, Sun City West, AZ

The requirements for retro-commissioning differ from commissioning a new facility. Speakers discuss the differences involved and present case studies that identify these requirements.

1. Retro-Commissioning Training

Charles H. Culp, Ph.D., P.E., Member, Texas A&M University, College Station, TX

2. Airport Terminal Retro-Commissioning

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

3. Lessons Learned from Retro Commissioning Federal Building

Timothy Corbett, Member, Social Security Administration, Baltimore, MD

4. Just How Good Is Our Best Building?

Stephens R. Wiggins, Member, Newcomb & Boyd, Atlanta, GA

Forum 22 10:15 a.m. to 11:05 a.m.**Figures of Merit for Comparing Alternative Humidity Control Equipment**

Room: Jackson A/B (PM)

Wednesday, June 30

10:15 a.m. to 11:05 a.m.

Sponsor: TC 08.12 Desiccant and Sorption Technology; TC 08.10 Mechanical Dehumidification Equipment and Heat Pipes

Moderator: Douglas Kosar, Member, University of Illinois at Chicago, Chicago, IL

Improving humidity control in today's buildings is of increasing concern. A range of components, including desiccant dehumidifiers, heat/enthalpy exchange assisted cooling coils, dual path cooling coils, and others, are options already integrated into air conditioning equipment in the marketplace. However, convenient measures to compare these equipment alternatives are not now available. This forum discusses potential options for figures of merit to enable humidity control performance comparisons that will assist in the design, test, selection, and specification of these equipment alternatives for building air conditioning applications.

Forum 23 10:15 a.m. to 11:05 a.m.**HACCP- Design Responses to New Food Processing Regulations (Mad Cows and Salad Bars - The Kitchen is the New Hot Zone)**

Room: Tennessee Ballroom D/E (T2)

Wednesday, June 30

10:15 a.m. to 11:05 a.m.

Sponsor: TC 09.11 Clean Spaces

Chair: E. Mitchell Swann, P.E., Member, MDC Systems, Berwyn, NJ

Recent events have heightened the public's concerns regarding safety and quality in our nation's food supply. Many of these concerns are more 'show' than 'go' sensationalized media coverage fueling volatile perceptions. Some, however, are legitimate issues highlighted by unfortunate events – E. Coli, Hepatitis, Salmonella. The FDA's response is employing a new policy, HACCP, in the food processing industry. HACCP's goal is to prevent the introduction of potential contaminants into food by controlling the methodologies used in food processing. This forum seeks to gather information from members on their experiences with HACCP, questions on interpretation of HACCP and their thoughts on where ASHRAE can add value to its members and the industry in this area.

Forum 24 10:15 a.m. to 11:05 a.m.**Is Dehumidification of Restaurants in Hot and Humid Climates a Concern?**

Room: Presidential Ballroom A (P2)

Wednesday, June 30

10:15 a.m. to 11:05 a.m.

Sponsor: TC 05.10 Kitchen Ventilation

Moderator: Rick A. Bagwell, Member, Halton Co., Scottsville, KY

Co-Moderator: Chris Stillwell, Trane Co., Columbus, OH

This forum discusses the needs of the restaurant and hospitality industry design community with respect to the impacts of hot and humid makeup air inside the facility. In the past it has been perceived that all hot and humid makeup air introduced in and around the kitchen hood is exhausted by the hood systems and does not impact the kitchen space itself. Is this a design issue that needs to be addressed by the industry?

Forum 25 11:15 a.m. to 12:05 p.m.**Dehumidification, How to Do It Properly: It's Not Just Another****Air Conditioner**

Room: Jackson A/B (PM)

Wednesday, June 30

11:15 a.m. to 12:05 p.m.

Sponsor: TC 08.10 Mechanical Dehumidification Equipment and Heat Pipes; TC 01.12 Moisture Management in Buildings

Moderator: Reinhold Kittler, P.E., Fellow, Hudson Industrial Consulting, Virginia Beach, VA

Moisture control in buildings has become an absolute necessity for new systems as well as retrofits. What guidelines do we need in our Handbooks for proper design? What codes and standards do we need?

Forum 26 11:15 a.m. to 12:05 p.m.**What Fire and Smoke Control Research Is Needed?**

Room: Presidential Ballroom A (P2)

Wednesday, June 30

11:15 a.m. to 12:05 p.m.

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

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

ASHRAE sponsored research is the foundation of much of ASHRAE Handbook material on fire and smoke control and ASHRAE's Principles of Smoke Management. Historically, ASHRAE sponsored research also has had an important impact on NFPA documents and the model building codes. What topics do we need to know more about? What things make up a good

research project? Should we change the direction of research projects, and focus more on fire issues and less on smoke issues?

Forum 27 **11:15 a.m. to 12:05 p.m.**

What's Needed for Controls and Fault Detection for Commercial Refrigeration Equipment?

Room: Tennessee Ballroom D/E (T2)

Wednesday, June 30 11:15 a.m. to 12:05 p.m.

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

Moderator: *John M. Gallaher, Member, Hussmann Corp., Suwanee, GA*

Each year, commercial refrigeration operators purchase millions of dollars worth of controls equipment for new or renovated refrigeration systems. This forum is determines what equipment is needed to provide proper control and fault detection for these installations. Information from this forum could be used in future research projects to develop commissioning guidelines for commercial refrigeration installations.