

# 2018 ASHRAE Winter Conference

## Conference Papers



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CH-18-C001

Building Automation System Alarm Management for Operation and Maintenance Decision Making  
Han Li, Associate Member ASHRAE; Azizan Aziz; Erica Cochran; Bertrand Lasternas

CH-18-C002

Recognizing Broad Applicability of Healthcare Facility Resilience Design Elements  
Sean Lawler, PE, Member ASHRAE; Willa Small Kuh; Joss Hurford, CEng.

CH-18-C003

Resilient Design, Commissioning and Operation of the Canadian High Arctic Research Station  
Michael David Brown, Student Member ASHRAE; Jean-François Pelletier, Eng., Member ASHRAE;  
Guillaume Castonguay, Eng.; Cynthia Ann Cruickshank, PhD

CH-18-C004

Energy Saving Performance of Buoyancy-Driven Natural and Hybrid Ventilation  
Yoshihide Yamamoto, PhD, Member ASHRAE; Shuzo Murakami, PhD, Fellow ASHRAE; Hisaya Ishino, PhD,  
Member ASHRAE; Kimiko Kohri, PhD, Member ASHRAE

CH-18-C005

Nationwide Savings Analysis of A Variety of Energy Conservation Measures  
Defeng Qian, Student Member ASHRAE; Yanfei Li, Student Member ASHRAE; Fuxin Niu, PhD, Student  
Member ASHRAE; Zheng O'Neill, PhD, PE, Member ASHRAE

CH-18-C006

Heat Recovery Potential from Urban Underground Infrastructures  
Graeme Maidment, PhD CEng; Nicholas Boot-Handford; Joseph Grice; Gareth Davies, PhD; William  
Dennis; Akos Revesz; Abayomi Ajileye

CH-18-C007

Identifying Peak and Base Energy Consumption Hour Ranges for Commercial Buildings Using a Non-  
Parametric Method  
Hongxiang Fu, Student Member ASHRAE; Juan-Carlos Baltazar, PhD, PE, Member ASHRAE; David E.  
Claridge, PhD, PE, Fellow ASHRAE

~~CH-18-C008~~ **Withdrawn**

CH-18-C009

Liquid Removal through Vibrations on a Flexible Film for Condensing/Dehumidification  
Ryan Huber, Student Member ASHRAE; Giselle Guanés, Student Member ASHRAE; Melanie M. Derby,  
PhD, Member ASHRAE

CH-18-C010

A New Model for Frost Growth Incorporating Droplet Condensation and Crystal Growth Phases  
Ellyn Harges, Student Member ASHRAE; Lorenzo Cremaschi, PhD, Member ASHRAE

CH-18-C011

Thermal-Hydraulic Performance of Wavy-Fin Heat Exchanger Under Dehumidifying Condition  
Kashif Nawaz, PhD, Member ASHRAE; Mohammad Sultan Khan, PhD, Member ASHRAE

CH-18-C012

Frost Growth on Hydrophilic and Hydrophobic Substrates: The Role of Surface Wettability  
Andrew D. Sommers, PhD, Associate Member ASHRAE; Colton W. Gebhart; Christian J.L. Hermes, EngD

CH-18-C013

Round-Tube-Plate-Fin Heat Exchanger Joining Process; Determining Interference Fit Between Tubes and Fin-Collars Resulting from the Expansion Process  
Roger Tetzloff

CH-18-C014

Design Optimization of Active Chilled Beam for an Office Space using Large Eddy Simulation  
Abdullah Karimi, Associate Member ASHRAE

CH-18-C015

An Optimal Integrated Approach to Design and Operate Ice Thermal Storage for Typical HVAC Systems  
Nabil Nassif, PhD, PE, Member ASHRAE; Fouad AIRifaie, Student Member; Nihal AIRaees, Student Member ASHRAE

CH-18-C016

The BAS/HVAC Office: Organizing People to Use BAS to Optimize Building Performance  
Orvil Dillenbeck, BSc, P.Eng, Member ASHRAE; Don Sheppard

CH-18-C017

How Focusing on Acoustics in the Human Environment Improves Standards and Guidelines, and Creates Better Buildings  
Erik Miller-Klein, PE, INCE Board Certified, Member ASHRAE

CH-18-C018

Commercial HVAC Load Sizing Calculations Gone Wrong  
Liam Buckley, C. Eng., ASHRAE BEMP, Member ASHRAE

CH-18-C019

Dynamic HVAC Operations with Real-Time Vision-Based Occupant Recognition System  
Siliang Lu; Erica Cochran Hameen, PhD; Azizan Aziz

CH-18-C020

Case Study: How to Handle a 50% Increase in Occupancy While Maintaining Indoor Air Quality  
Michael McFarland

CH-18-C021

Inference of Thermal Preference Profiles for Personalized Thermal Environments

Seungjae Lee, Student Member ASHRAE; Panagiota Karava, PhD, Associate Member ASHRAE; Ilias Bilonis, PhD, Athanasios Tzempelikos, PhD, Member ASHRAE

CH-18-C022

Field Studies of the Impact of Demand Response on Occupant's Thermal Comfort and Their Adaptive Behavior in a University Campus

Sama Aghniaey, Student Member ASHRAE; Thomas M. Lawrence, PhD, PE, Fellow ASHRAE

CH-18-C023

NUMERICAL INVESTIGATION OF SMOKE CONTROL IN SWITCHGEAR ROOM

Essam E. Khalil, Fellow ASHRAE; Esmail ElBialy; Mohamed Ibrahim; Mohamed A. Fares

CH-18-C024

Use CFD Modeling Tool to Study Impact of Energy-saving HVLS Fans on Fire Safety in Large Spaces

Xiaolei Chen, PhD; Frank Wang, PE

CH-18-C025

Atrium Smoke Management in Commercial Buildings

M.M.S. Ahmed; E.E. Khalil, Fellow ASHRAE; M.M.A. Hassan; H.O. Haridi

CH-18-C026

Next-Generation Pump Systems Optimize Energy Efficiency for Commercial Building

Greg Pimento, PEng, MBA; Mark Sullivan

CH-18-C027

Zone Specific Airflow Rate Optimization by Incorporating PI Controller in a General Purpose Commercial CFD Code

Andrew Page, Member ASHRAE; Deepak Kandra, PE

CH-18-C028

Case Study: Prestigious Event Center Achieves Sustainability Goals Using the Indoor Air Quality Procedure of ASHRAE 62.1

Marwa Zaatari, PhD, Member ASHRAE

CH-18-C029

Constructing Operating Room HVAC With Performance Assurances; An Alternate Approach

Travis R. English, PE, Member ASHRAE; Jessica Grey; Nabil Mikhail, PE, Member ASHRAE

CH-18-C030

Modeling a Hospital in South Louisiana for Evaluation of Potential Energy Savings

Zahra Sardouienasab, Student Member ASHRAE; Sally Anne McInerney, PE, PhD, Member ASHRAE; Peng Yin, PhD, Member ASHRAE; Chris Morgan, PE, Member ASHRAE

CH-18-C031

Dynamics of Semi Unidirectional Air Flows

Kishor Khankari, PhD, Fellow ASHRAE

CH-18-C032

Airside Thermal and Hydraulic Performance of a Bare Tube Heat Exchanger with Diameter of 0.8 mm

#### Under Dehumidifying Conditions

Zhiwei Huang, Student Member ASHRAE; Jiazhen Ling, Associate Member ASHRAE; Yunho Hwang, Fellow Member ASHRAE; Reinhard Radermacher, Fellow Member ASHRAE

#### CH-18-C033

Development of a Method for Testing Air-Side Fouling Effects on Outdoor Heat Exchangers (RP-1705)  
Mehdi Mehrabi, Student Member ASHRAE; David Yuill, PhD, PE, Member ASHRAE

#### CH-18-C034

Field Evaluation of Condensing Heating Rooftop Units (RTUs) in 100% Outside Air Applications  
Douglas Kosar, Member ASHRAE; Paul Glanville, PE, Associate Member ASHRAE; Patricia Rowley, Associate Member ASHRAE; Sama Halasa; Wayne Fang; Shawn Scott

#### CH-18-C035

Learning from the Vernacular: The Impacts of Massive Perforated Screen Shades on Building Energy Savings and Thermal Comfort in Two Different Hot Climate Zones  
Ihab Elzeyadi, Ph.D., FEIA, LEED<sup>AP</sup>, Member ASHRAE; Ayesha Batool PCATP. A-IAP. M. Arch, Affiliate ASHRAE

#### CH-18-C036

The Influence of Lighting Conditions, Shading Patterns and Weather on Occupant Visual Preferences in Perimeter Building Zones  
Jie Xiong, PhD, PE; Athanasios Tzempelikos, PE

#### CH-18-C037

Economic Feasibility of Hybrid Solar-Combined Cooling, Heating and Power (CCHP) Systems for a Large Office in California  
Hyeunguk Ahn, Student Member ASHRAE; Donghyun Rim, PhD Associate Member ASHRAE; James D. Freihaut, PhD, Member ASHRAE

#### CH-18-C038

Experimental Study on Heating Emitters in an Environmental Chamber  
Duan Wu, PhD, Member ASHRAE

#### CH-18-C039

Life-Cycle Assessment of Building Renovation in Latvia  
Anatolijs Borodinecs, Dr.sc.ing., Member ASHRAE; Aleksandrs Geikins; Jurgis Zemitis, Dr.sc.ing.

#### CH-18-C040

Data-Driven Framework to Find the Physical Association between AHU and VAV Terminal Unit – Pilot Study  
June Young Park, Student Member ASHRAE; Bertrand Lasternas; Azizan Aziz

#### CH-18-C041

Cyber Security for Internet Connected HVAC/R Components  
Christian Ellwein, PhD, Member ASHRAE; Heinrich Steinhart, Prof. Dr. Ing

CH-18-C042

Business Cases for Improved Control and Internet of Things in HVAC/R  
Christian Ellwein, PhD, Member ASHRAE

CH-18-C043

A Sensitivity Effect on Virtual In-situ Sensor Calibration in Building Energy Systems  
Sungmin Yoon, Student Member ASHRAE; Yuebin Yu, PhD, PE, Member ASHRAE

CH-18-C044

Optimization of Microchannel Condenser with Phase Separation in the Header  
Jun Li, MS, Student Member ASHRAE; Pega Hrnjak, PhD, Fellow Member ASHRAE

CH-18-C045

Indirect Evaporative Cooling with Thermally Reactivated Desiccant Dehumidification for a Net Zero Energy, Hybrid Residential Dwelling  
James Leidel, Member ASHRAE; Valeriy Maisotsenko, PhD, Member ASHRAE; Pouyan Pourmovahed, Student Member ASHRAE

CH-18-C046

Dynamic Thermal Analysis of Soil Temperature Distribution in an Urban Park Landscape above an Enclosed Rail Yard for In-Slab Cooling System Design, Controls, and Sizing  
Kirsten Salmins, Member ASHRAE; Deepak Kandra, PE; Raymond Quinn, PE, Member ASHRAE

CH-18-C047

Analysis and Performance of a Residential Indoor Vertical Plant Production Unit  
Jonathan Maisonneuve, PhD, Associate Member ASHRAE; Pouyan Pourmovahed, Student Member ASHRAE; Lianqing Zhu, PhD; Mingli Dong, PhD

CH-18-C048

On the Modeling of Flow Regimes around Cooling Towers  
Essam E. Khalil, Fellow Member ASHRAE; Mohamed S. Omar, Associate Member ASHRAE; Waleed Abdelmaksoud

CH-18-C049

CFD Analysis of Dispersion of Particles and Gases in Buildings for Optimal IAQ Sensor Positioning  
Gen Pei, MS, Student Member ASHRAE; Donghyun Rim, PhD, Associate Member ASHRAE; Matthew Vannucci, Student Member ASHRAE

CH-18-C050

Characteristics and Causes of Outliers in Inverse Modeling of Residential Building Energy Use Data  
Huyen Do, MSc, Student Member ASHRAE; Kristen Cetin, PhD, PE, Associate Member ASHRAE; Trevor Andersen, Student Member ASHRAE

CH-18-C051

Control-Oriented Modeling of an Air-Based Electric Thermal Energy Storage Device  
Jennifer Date; José A. Candanedo, PhD; Andreas Athienitis, PhD, PE, Fellow Member ASHRAE; Karine Lavigne

CH-18-C052

Effective Cooling of Server Boards in Data Centers by Liquid Immersion Based on Natural Convection Demonstrating PUE below 1.04

Morito Matsuoka, PhD, Member ASHRAE; Kazuhiro Matsuda; Hideo Kubo

CH-18-C053

Proposal of Cooling System for High Performance Computing by Drip-Feeding Cooling

Kazuhiro Matsuda; Morito Matsuoka, PhD, Member ASHRAE; Yuichiro Miyake

CH-18-C054

Cooling System with Nearly Zero Cooling Power for Server Rooms

Naoki Aizawa

CH-18-C055

Data Center Sustainability Index

Robert Tozer, PhD, CEng, Member; Sophia Flucker, CEng; Deborah Andrews, PhD; Beth Whitehead, PhD, Jon Summers, PhD

CH-18-C056

Efficient Cooling and Heat Recovery with VRF Systems in Embedded Data Centers

Micah Sweeney; Mukesh Khattar, PhD, Fellow ASHRAE; Ron Domitrovic, PhD, Member ASHRAE

CH-18-C057

Performance Enhancement of Urban Ground Source Heat Pumps through Interactions with Underground Railway Tunnels

Akos Revesz, Student Member; Issa Chaer, PhD, CEng; Jolyon Thompson, PhD, CEng; Maria Mavroulidou, PhD; Mike Gunn, PhD; Graeme Maidment, PhD, CEng

CH-18-C058

Preliminary Analysis of the Impact of Gas-Fired Heat Pump on Heating and Cooling Energy Consumption of a Library Building

Altamash Ahmad Baig, Student Member ASHRAE; Alan S. Fung, PhD, PEng, FCSME, Member and SBA ASHRAE

CH-18-C059

Longitudinal Evidence of Inverter-driven Heat Pump Performance in Low-load Residential Buildings

Philip Agee, Student Member ASHRAE; Georg Reichard, PhD, Member ASHRAE; Andrew McCoy, PhD

CH-18-C060

Laboratory and Field Evaluation of a Gas Heat Pump-Driven Residential Combination Space and Water Heating System

Paul Glanville, Member ASHRAE; Daniel Suchorabski; Chris Keinath, Member ASHRAE; Michael Garrabrant, Member ASHRAE

CH-18-C061

Comparing Atmospheric Stability Versus HVACR Equipment Chemical Stability of New Low GWP Olefin Based Refrigerants

Steve Kujak, Member ASHRAE; Elyse Sorenson, Member ASHRAE

CH-18-C062

Investigation of Low GWP Flammable Refrigerant Leak from Rooftop Units

Ahmed Elatar, PhD; K. Dean Edwards, PhD; Ahmad Abu-Heiba, Member ASHRAE; Viral Patel, PhD, Member ASHRAE; Van Baxter, ASHRAE Director-at-Large; Mingkan Zhang, PhD, Member ASHRAE; Omar Abdelaziz, PhD, Member ASHRAE

CH-18-C063

Performance of Low GWP Refrigerant R-516A in an Air-Cooled Chiller

Kenneth Schultz, PhD, Member ASHRAE; Marcos Perez-Blanco, PhD

CH-18-C064

A Simulation Study on the Performance of Radiant Ceilings Combined with Free-Hanging Horizontal Sound Absorbers

Ongun B. Kazanci, PhD, Associate Member ASHRAE; Bjarne W. Olesen, PhD, Fellow ASHRAE; Nils Rage; L. Marcos Domínguez, Student Member ASHRAE

CH-18-C065

Simulation Study of Active Ceilings with Phase Change Material in Office Buildings for Different National Building Regulations

Hajan Farhan, Student Member ASHRAE; Eleftherios Bourdakis, Student Member ASHRAE; Casper Stefansen, Student Member ASHRAE; Bjarne W. Olesen, PhD, Fellow ASHRAE; Ongun B. Kazanci, PhD, Associate Member ASHRAE

CH-18-C066

Simulation Study of Performance of Active Ceilings with Phase Change Material in Office Buildings under Extreme Climate Conditions

Casper Stefansen, Student Member ASHRAE; Hajan Farhan, Student Member ASHRAE; Eleftherios Bourdakis, Student Member ASHRAE; Ongun B. Kazanci, PhD, Associate Member ASHRAE; Bjarne W. Olesen, PhD, Fellow ASHRAE

CH-18-C067

The Influence of a Radiant Panel System with Integrated Phase Change Material on Energy Use and Thermal Indoor Environment

Lin Flemming Nielsen, Student Member ASHRAE; Eleftherios Bourdakis, Student Member ASHRAE; Ongun Berk Kazanci, PhD, Associate Member ASHRAE; Bjarne W. Olesen, PhD, Fellow ASHRAE