Contents

Conference Papers

LV-17-C001
The Potential for Integration of Ground Energy from Underground Railway Tunnels
Akos Revesz; Issa Chaer, PhD, CEng; Jolyon Thompson, PhD, CEng; Maria Mavroulidou, PhD; Mike Gunn, PhD; Graeme Maidment, PhD, CEng

LV-17-C002
Analysis of Heat-Source Water Supply Network between Two Buildings Utilizing Ground Heat and Exhaust Heat
Eikichi Ono; Katsuhira Miura, PhD, Member ASHRAE; Naoyoshi Ichikawa; Tomohiro Teranishi; Taro Ohno; Takeshi Wada

LV-17-C003
Metering Measurement Challenges and Monitoring of a Large-Scale Ground-Source Heat Pump (GSHP) System
Metkel Yebiyo, PhD; Graeme Maidment, PhD, CEng; Alex Paurine, PhD, CEng; Tony Day, PhD, CEng
LV-17-C004

**Energy and Water Environmental Trade-Offs of Data Center Cooling Technologies**
Beth Whitehead, PhD; Robert Tozer, PhD, CEng, Member ASHRAE; Deborah Andrews, PhD; Sophia Flucker, CEng

LV-17-C005

**Thermosyphon Cooler Hybrid System for Water Savings in an Energy-Efficient HPC Data Center: Modeling and Installation**
Thomas Carter, PE, Member ASHRAE; Zan Liu, PhD, Associate Member ASHRAE; David Sickinger, Associate Member ASHRAE; Kevin Regimbal; David Martinez

LV-17-C006

**Case Study: Using Simulation Techniques to Optimize a Migration in an Existing Mission-Critical Data Center**
Christian Pastrana, PE, Member ASHRAE; Tom Wu, Member ASHRAE

LV-17-C007

**Restoring Acceptable HVAC Performance with Ultraviolet Germicidal Irradiation (UVGI) Coil Treatment**
Timothy Leach, Member ASHRAE; Graham Taylor, PE, Member ASHRAE

LV-17-C008

**Analysis of Airflow Distribution and Contaminant Flow Path in the Hospital Operating Room**
Kishor Khankari, PhD, Fellow ASHRAE

LV-17-C009

**Proposed Outdoor Air Ventilation Rates for Health Care Facilities**
Travis R. English, PE, Member ASHRAE; Abdel Darwich, PE, Member ASHRAE; Maya Salabasheva, PE, Member ASHRAE; Heather Platt, PE, Member ASHRAE; Erica Stewart, Member ASHRAE

LV-17-C010

**A Newborn Incubator with a Laminar Flow Unit**
M. Zeki Yilmazoglu, PhD; Atilla Biyikoglu, PhD, Member ASHRAE

LV-17-C011

**Environmental Parameters for Decontamination Rooms in Sterile Processing Departments in U.S. Hospitals**
Maya Salabasheva, PE, Member ASHRAE; Travis English, PE, Member ASHRAE; Erica Stewart, Member ASHRAE
LV-17-C012
Sensitivity of Energy and Exergy Performances of Heating and Cooling Systems to Auxiliary Components
Ongun B. Kazanci, Student Member ASHRAE; Masanori Shukuya, PhD; Bjarne W. Olesen, PhD, Fellow ASHRAE

LV-17-C013
Simulation of a Flue-Gas-Driven Open Absorption System for Waste Heat Recovery from Fossil Fuel Boilers
Zhenying Wang; Xiaoyue Zhang; Zhen Li, PhD, Member ASHRAE

LV-17-C014
Metropolitan Integrated Cooling and Heating
Gareth Davies, PhD; Nicholas Boot-Handford; Joseph Grice; William Dennis; Rose Rami; Ashley Nicholls; Graeme Maidment, PhD, CEng

LV-17-C015
Women in the Refrigeration Industry
Ina Colombo, PhD; Catarina Marques, PhD; Judith Evans, PhD; Micheal Kauffeld, PhD; Didier Coulomb; Gratiela Tarlea, PhD

LV-17-C016
Thermal Insulation System for Energy-Efficient Green Buildings in Tropical Countries
Krishna Kumar Mitra

LV-17-C017
Experimental Investigation of Potential Energy Savings and Payback Periods in Renewing Old Split-Type Air Conditioners
Abdullah Alabdulkarem, PhD, CEM, Member ASHRAE; Zeyad Almutairi, PhD; Turki Alqahtani; Majed Alshahrani; Khaled Alawaad

LV-17-C018
Zheng O’Neill, PhD, PE, Member ASHRAE; Aaron Henry, Student Member ASHRAE; Charles O’Neill, PhD

LV-17-C019
Comfort Guaranteed Energy-Saving Algorithm in Hospitality Buildings
Kyung Jae Kim, PhD; Kwanwoo Song, MD; Sangsun Choi, MD; Hyunsuk Min, MD; Gunhyuk Park, PEng; Dae-eun Yi, MD; Jungil Seo, PEng; Cheol-Soo Park, PhD; Ki-Uhn Ahn, MD; Hye-Jung Cho, PhD
LV-17-C020
**A Case Study on How Energy Use and Efficiency in Religious Facilities Compares to Other Types of Commercial Buildings**
Trevor J. Terrill; Bryan P. Rasmussen, Member ASHRAE

LV-17-C021
**Performance Assessment of Fanger’s PMV in a UK Residential Building in Heating Season**
Faisal Durrani, PhD; Safwan Samsuddin, Student Member ASHRAE; Mahroo Eftekhari, PhD, Member ASHRAE; Yoshitaka Uno

LV-17-C022
**Integrating Energy-Efficiency Performance in Processes for the Dairy Industry**
Oliver Königseder, Associate Member ASHRAE

LV-17-C023
**An Application of Energy Conservation Measures to A Middle-Sized Factory Using Energy Management System**
Tomohiro Konda, Nobuyuki Minami, Koji Maeda, Kyoshiro Oto, Chosei Kaseda

LV-17-C024
**Energy Efficiency in Buildings Located Inside Oil Refineries**
Abdel K. Darwich, PE, CEng, HFPD, Member ASHRAE

LV-17-C025
**General-Purpose Building Energy Simulation Program ‘BEST’ for the Energy-Saving Standards in Japan**
Iwao Hasegawa, Member ASHRAE; Shuzo Murakami, PhD, Fellow ASHRAE; Hisaya Ishino, PhD, Member ASHRAE; Fumio Nohara, Member ASHRAE; Hiroshi Ninomiya, Member ASHRAE; Reika Iida

LV-17-C026
**The Development of the Database of the Equipment Characteristics for the Building Energy Simulation Tool**
Kohichi Shinagawa, Member ASHRAE; Shuzo Murakami, PhD, Fellow ASHRAE; Hisaya Ishino, PhD, Member ASHRAE; Takashi Yanai, PhD; Yukihiro Kawazu, PhD
LV-17-C027
Features and Capabilities of an Integrated Building Energy Simulation Tool, BEST, Developed in Japan
Hisaya Ishino, PhD, Member ASHRAE; Shuzo Murakami, PhD, Fellow ASHRAE; Kimiko Kohri, PhD, Member ASHRAE; Isao Makimura; Fumio Nohara, Member ASHRAE

LV-17-C028
Simulation Method of HVAC Systems Using Self-Adjusting Templates for the Building Energy Simulation Tool
Hiroshi Ninomiya, Member ASHRAE; Shuzo Murakami, PhD, Fellow ASHRAE; Hisaya Ishino, PhD, Member ASHRAE; Tatsuo Nagai, PhD, Member ASHRAE; Fumio Nohara, Member ASHRAE; Iwao Hasegawa, Member ASHRAE

LV-17-C029
Real-Time Data Monitoring to Get Building Operation on Track
Celeste Cizik, PE, Member ASHRAE; Matt Cooper, PE, Member ASHRAE

LV-17-C030
Centrifugal Compressors in Air-Cooled Packaged Chillers: Coincidence of Market Forces and Technology
Raymond Good, PE, Member ASHRAE

LV-17-C031
A Heat Pipe Indirect/Direct Evaporative Cooling/Humidification Design for Natatorium IAQ, and Energy Savings Too
C. Mike Scofield, PE, Fellow ASHRAE; Jeff Stein, PE, Member ASHRAE; Douglas Yost; William Martin, PE, Member ASHRAE

LV-17-C032
Sustainability in Energy and Water: Air-Cooled versus Water-Cooled Heat Rejection
Omar Hawit, PE, Member ASHRAE; Trevor Jaffe, PE, Member ASHRAE; Coral Pais, Member ASHRAE

LV-17-C033
Energy Cost of Architectural Walls around a Cooling Tower and Mitigation Measures
O.A. Qureshi, Associate Member ASHRAE; P.R. Armstrong, PhD, Member ASHRAE

LV-17-C034
Reuse of Ablution Water for Mosque Air Conditioning Using Indirect Direct Evaporative Cooling (IDEC) Technology in Saudi Arabia
Ayman Youssef, PE, PhD, Member ASHRAE; Adel Hamid, Member ASHRAE; Konstantinos Vatopoulos
LV-17-C035
**Performance-Based Outcomes—A Bookend Approach Project: Stone 34**
Michael Frank, PE, Member ASHRAE; Michael Hedrick, PE, Associate Member ASHRAE; Matt Nielsen, PE, Associate Member ASHRAE

LV-17-C036
**Results from 20 Field Monitoring Projects on Rack and Flight Conveyor Dishwashers in Commercial Kitchens**
Amin Delagah, Associate Member ASHRAE; Rodney Davis; Michael Slater; Angelo Karas

LV-17-C037
**Withdrawn**

LV-17-C038
**The Effects of Exterior Vegetation Systems on Building Energy Use**
Shaojie Yuan, Student Member ASHRAE; Donghyun Rim, PhD, Associate Member ASHRAE

LV-17-C039
**Energy Demands for Commercial Buildings with Climate Variability Based on Emission Scenarios**
Carlo Bianchi, Student Member ASHRAE; Daniel L. Mendoza, PhD; Richard C. Didier, Student Member ASHRAE; Thomas T.D. Tran, Student Member ASHRAE; Amanda D. Smith, PhD, Associate Member ASHRAE

LV-17-C040
**Measured Thermal Comfort and Sensation in Highly Transient Environments**
Erin Eckels, Student Member ASHRAE; Meredith Schlabach, Member ASHRAE; Michael Young, PhD; Steven Eckels, PhD, Member ASHRAE

LV-17-C041
**Predicting Envelope and Micro Cogeneration Design Conditions for Future Climates**
Ryan J. Milcarek, Student Member ASHRAE; Shaun Turner, Student Member ASHRAE; Rui Zhang, Student Member ASHRAE; Jeongmin Ahn, PhD, Member ASHRAE; Jianshun Zhang, PhD, Fellow ASHRAE

LV-17-C042
**Can Using Active Air UV-C Technology Reduce the Amount of Bacteria and/or Fungus in the Air and Improve Indoor Air Quality?**
Linda D. Lee, PhD, Member ASHRAE

LV-17-C043
**Withdrawn**
LV-17-C044
Effects of Airflow Rates on VOC Removal Performances of Oxidation-Based Air Cleaning Technologies
Chang-Seo Lee, PhD, PE, Associate Member ASHRAE; Fariborz Haghighat, PhD, PE, Fellow ASHRAE; Ali Bahloul, PhD

LV-17-C045
Exposure of Airline Staff to TCPs From Engine Oil
Hans de Ree, Marc Houtzager, Huub Agterberg, John Havermans, Jan Bos

LV-17-C046
The Nature of Particulates in Aircraft Bleed Air Resulting from Oil Contamination
Byron W. Jones, PhD, PE, Fellow ASHRAE; Shahin Nayyeri Amiri, PhD; Jake W. Roth; Mohammad H. Hosni, PhD, Fellow ASHRAE

LV-17-C047
Experimental Determination of the Characteristics of Lubricating Oil Contamination in Bleed Air
David R. Space; Anil K. Salgar; Dale A. Scheer; Byron W. Jones, PhD, PE, Fellow ASHRAE; Shahin Nayyeri Amiri, PhD

LV-17-C048
Field Measurements of Solar Reflectivity for In-Service Single-Ply Roof Membranes
Mathew Dupuis, PhD, PE; Maciek Rupar

LV-17-C049
Parametric Analysis of the Operation of Nocturnal Radiative Cooling Panels Coupled within Room PCM Ceiling Panels
E. Bourdakis, Student Member ASHRAE; O.B. Kazanci, Student Member ASHRAE; T.Q. Péan; B.W. Olesen, PhD, Fellow ASHRAE

LV-17-C050
Comparative Performance Evaluation of Transparent and Opaque BIPV/T Collectors: Roof and Façade Integration
Raghad Kamel, PhD, Member ASHRAE; Navid Ekrami, Student Member ASHRAE; Alan S. Fung, PhD, PEng, Member ASHRAE

LV-17-C051
Building Impacts of Code-Compliant Ventilation in Multi-Family Dwellings
Jesse A. Fisher, PE, Member ASHRAE
LV-17-C052
**Life-Cycle Cost Optimization of Residential Buildings**
Yeonjin Bae, Student Member ASHRAE; W. Travis Horton, PhD, Member ASHRAE

LV-17-C053
**Investigation of Potential Energy Savings in Retrofitting a Residential Building at Riyadh’s Weather Conditions**
Mohamad Alrished; Abdullah Alabdulkarem, PhD, Member ASHRAE

LV-17-C054
**Real-World Assessment of Three Residential Variable-Capacity Air Conditioners of Varying SEER**
Walter Hunt, Member ASHRAE; Sean Gouw, PE, Member ASHRAE; Jerine Ahmed, Member ASHRAE

LV-17-C055
**Comparison of Building Energy Simulation Models for Residential Homes**
Henry Liu, PE, Associate Member ASHRAE; A.S. (Ed) Cheng, PhD, PE, Member ASHRAE

LV-17-C056
**Whole-Building Fault Detection: A Scalable Approach Using Spectral Methods**
Michael Georgescu, PhD, Affiliate Member ASHRAE; Sophie Loire, PhD; Don Kasper; Igor Mezic, PhD

LV-17-C057
**The Impact of Traffic-Related Air Pollutants on the Indoor Air Quality of a Naturally Ventilated Building**
Zheming Tong, PhD, Student Member ASHRAE; Yujiao Chen; Ali Malkawi, PhD

LV-17-C058
**Ductless Car Park Ventilation—Global Trends and Design Practices**
Troy Goldschmidt, Member ASHRAE

LV-17-C059
**A Case Study in a High-Rise Office Building by Comparing VRP and IAQP with Field Measurements**
Marwa Zaatari, PhD, Member ASHRAE
LV-17-C060
Experimental Measurement of the Friction Loss of Airflow in a Flexible-Duct Air Distribution System
Samad Gharehdaghi, Student Member ASHRAE; Samir Moujaes, PhD, PE, Member ASHRAE

LV-17-C061
The Social Dynamics of a Project
David Yancosky

LV-17-C062
A Comparison of Stochastic and Deterministic Optimization Algorithms on Virtual in-situ Calibration in Building Systems
Sungmin Yoon, Student Member ASHRAE; Yuebin Yu, PhD, PE, Member ASHRAE

LV-17-C063
Risk of Condensation Analysis of Common Concrete Balcony Configurations
Farhad Hemmati, Student Member ASHRAE; Ali Vaseghi, Student Member ASHRAE; Fitsum Tariku, PhD, Member ASHRAE

LV-17-C064
Duck—The Volcano is Coming!: Proposed Methodology for a Building Grid Asset Score
Alexi Miller, PE, Associate Member ASHRAE; Jim Edelson, Member ASHRAE

LV-17-C065
Infrared Thermography for Building Envelope Analysis
David M. Underwood, Member ASHRAE; Dahtzen Chu, Member ASHRAE

LV-17-C066
Experimental Study on Heating Emitters in an Environmental Chamber
Duan Wu, PhD, Member ASHRAE

LV-17-C067
Full- and Part-Load Performance Evaluation of a Variable Refrigerant Flow (VRF) System Using an Occupancy-Simulated Research Building
Piljae Im, PhD, Member ASHRAE; Mini Malhotra, PhD, Member ASHRAE; Jeffrey D. Munk, Member ASHRAE; Jehyeon Lee

LV-17-C068
Development of Water-Based Hybrid VRF System for Buildings
Naofumi Takenaka; Soshi Ikeda; Shinichi Wakamoto; Yuji Motomura; Koji Yamashita, PhD
Effects of Acoustic Ceiling Units on the Cooling Performance of Thermally Activated Building Systems (TABS)
L. Marcos Dominguez; Nils Rage; Ongun B. Kazanci, Student Member ASHRAE; Bjarne W. Olesen, PhD, Fellow ASHRAE

Modeling and Simulation of Membrane-Based Dehumidification and Energy Recovery Process
Zhiming Gao, PhD; Omar Abdelaziz, PhD, Member ASHRAE; Ming Qu, PhD, Member ASHRAE

Modeling of Stack Effect in High-Rise Buildings under Winter Conditions—Evaluating the Validity of Field Observations
Steven Strege, PE, Member ASHRAE; Michael Ferreira, PE

Scale Modeling of Smoke Spread in High-Rise Shafts During Fires
Dahai Qi, Student Member ASHRAE; Liangzhu (Leon) Wang, PhD, Member ASHRAE; Radu Zmeureanu, PhD, Member ASHRAE; Guanchao Zhao, Student Member ASHRAE

Comparison of Smoke Management Software and Experimental Measurements of Smoke Properties during a Structural Fire
Guanchao Zhao, Student Member ASHRAE; W.Z. Black, PhD, PE, Life Member ASHRAE; Liangzhu (Leon) Wang, PhD, Member ASHRAE

Feasibility of Combined Water-Source Heat Pump with Thermal Energy Storage in Multi-Family Dwellings
Mohammad Tehranian, Student Member ASHRAE; Hessam Taherian, PhD, Member ASHRAE

The Application of Icephobic Coatings to Air-Source Heat Pumps
Cara Martin, Associate Member ASHRAE; Song Li, Associate Member ASHRAE; Ron Domitrovic, PhD, Member ASHRAE; John Bush, PE, Member ASHRAE; Paul Oppenheim, PhD, PE, Member ASHRAE

Development and Evaluation of a Low-Cost Gas Absorption Heat Pump
Paul Glanville, PE, Member ASHRAE; Chris Keinath, PhD, Member ASHRAE; Michael Garrabrant, PE, Member ASHRAE
Air Dehumidification Using Desiccant-Coated Oblique Fin Plate Frame Structure
Mrinal Jagirdar, PhD; Poh Seng Lee, PhD; Ghim Wei Ho, PhD

Zero-Equation Turbulence Models for Large Electrical and Electronics Enclosure Applications
Pratik Dhoot; James W. VanGilder, PE, Member ASHRAE; Zachary M. Pardey, Associate Member ASHRAE; Christopher M. Healey, PhD

Wenyu Shan, Student Member ASHRAE; Donghyun Rim, Associate Member ASHRAE

Indoor-Side Convection Coefficients for Complex Fenestration Systems with Roller Blinds
S.S.M. Foroushani, Student Member ASHRAE; J.L. Wright, Member ASHRAE; M.R. Collins, Member ASHRAE; D. Naylor

Comparative Study of Optimized Small-Diameter Tube-Fin Heat Exchangers versus Traditional, Larger-Diameter Tube-Fin Heat Exchanger Designs
Dennis Nasuta, Associate Member ASHRAE; Shekhar Sarpotdar, PhD; Cara Martin, Associate Member ASHRAE

Correlating Swirl Behavior in Low-Reynolds-Number Flows in Wavy-Fin Heat Exchanger
D. Shi, Student Member ASHRAE; M.A. Jog, PhD; R.M. Manglik, PhD, Member ASHRAE

Computational Study of Laminar-Flow Heat Transfer Characteristics of Offset Strip Fin Channels
C.C. Bhave; S. Madhavan; M.A. Jog, PhD; R.M. Manglik, PhD, Member ASHRAE

Refrigerant-Compatible MEMS Pressure and Temperature Sensor Chip
Tom Kwa, PhD, Associate Member ASHRAE

Assessment of Next-Generation Refrigerant R-514A as Replacement for R-123 in Centrifugal Chillers
Kenneth Schultz, PhD, Member ASHRAE; Erica Gallant, Member ASHRAE
LV-17-C086
Chemical Stability Assessments of R-514a and R-1233zd(E)
Julie Majurin, Associate Member ASHRAE; Elyse Sorenson, Associate Member ASHRAE; Daryl Steinke; Morgan Herried

LV-17-C087
Continuous Tuning of Refrigerant Charge to Improve DX Equipment Performance
Michael K. West, PhD, PE, Member ASHRAE; Richard Combes, PE, PhD, Member ASHRAE

LV-17-C088
Evaluation of Total Equivalent Global Warming Impacts of Supermarket Refrigeration Systems
Meredith Woy; A.S. (Ed) Cheng, PhD, PE, Member ASHRAE

Technical Papers

LV-17-001
Accounting for Non-Quadratic Behavior of AHU Systems in Determination of Airflow Rate
Mikhail Nudelman, PE, Member ASHRAE; Ed Kernerman, PhD, PE; Nicholas Muscolino, Associate Member ASHRAE

LV-17-002
Analysis of Refrigeration and HVAC Impacts on Supermarket Energy Performance (RP-1467)
Michael J. Brandemuehl, PhD, PE, Fellow ASHRAE; Penelope Cole

LV-17-003
BIM-Enabled Operations and Maintenance Work Processes (RP-1609)
Robert J. Hitchcock, PhD, Member ASHRAE; John Butterfield, PE; Elizabeth Ford Wilkins, PE; Francisco Forns-Samso

LV-17-004
Comparison of Approaches to Deep Energy Retrofit of Buildings with Low and High Internal Loads and Ventilation Requirements
Michael Case, PhD, Associate Member ASHRAE; Alexander Zhivov, PhD, Member ASHRAE; Don Fisher, Life Member ASHRAE; Richard Liesen, PhD, Member ASHRAE

LV-17-005
Deep Energy Retrofit of Presidio Army Barracks
Jay Tulley, PE; Alexander Zhivov, PhD, Member ASHRAE; Brian Clark, PE, CPMP
LV-17-006

Deep Energy Retrofits in Federal Buildings: The Value, Funding Models, and Best Practices
Matt Jungclaus, Affiliate Member ASHRAE; Cara Carmichael; Chris McClurg, PE; Margaret Simmons; Randall Smidt; Kinga Porst Hydras, Member ASHRAE; Sharon Conger; Alexander Zhivov, PhD, Member ASHRAE; Fred Winter; John Shonder, Member ASHRAE; Cyrus Nasseri, Member ASHRAE

LV-17-007

Determination of Heat Transfer Coefficient Between Heated Floor and Space Using the Principles of ANSI/ASHRAE Standard 138 Test Chamber
M. Fatih Evren, Student Member ASHRAE; Abuzer Özsunar, PhD; Atilla Biyikoglu, PhD, Member ASHRAE; Birol Kilkis, Fellow ASHRAE

LV-17-008

Determination of Solar Heat Gain Coefficients for Semitransparent Photovoltaic Windows: An Experimental Study
Konstantinos Kapsis, PhD, Student Member ASHRAE; Andreas Athienitis, PhD, PEng, Member ASHRAE; Stephen Harrison, PhD, PEng, Member ASHRAE

LV-17-009

Development of a Heat Transfer Model for Ceiling Radiant Cooling Panels through a Combined Experimental and Simulation Study
Jyotirmay Mathur, PhD, Member ASHRAE; Mahabir Bhandari, PhD, Member ASHRAE; Vivek Kumar; Yasin Khan; Prateek Srivastava

LV-17-010

Diurnal and Seasonal Experimental Performance of a Solar Collector-cum-Regenerator
Gezahegn H. Tafesse, PhD; S.C. Mullick, PhD; Sanjeev Jain, PhD, Member ASHRAE

LV-17-011

Effect of Supply Air Temperature on Air Distribution in a Room with Radiant Heating and Mechanical Ventilation
Xiaozhou Wu, PhD; Lei Fang, PhD; Bjarne W. Olesen, PhD, Fellow/Life Member ASHRAE; Jianing Zhao, PhD; Fenghao Wang, PhD

LV-17-012

Energy Analysis of LEED Silver Certified Dining Hall on an Academic Campus—A Revisit Three Years After its Initial Certification (GIA 14–15)
Stefan Bangerth, Student Member ASHRAE; Michael M. Ohadi, PhD, Fellow ASHRAE; Chauncey A. Jenkins
LV-17-013

Energy Solution for Laboratory Facilities
Lawrence R. Meisenzahl, Member ASHRAE

LV-17-014

Evaluation of Alternative Refrigerants for Mini-Split Air Conditioners
Omar Abdelaziz, PhD, Member ASHRAE; Som S. Shrestha, PhD, BEMP, Member ASHRAE

LV-17-015

Experimental Comparison of Energy-Optimal Coordinated Control Strategies for Heat Pump Systems
Chao Wang, Student Member ASHRAE; Bryan P. Rasmussen, PhD, PE, Member ASHRAE; Kyaw Wynn, Associate Member ASHRAE

LV-17-016

Experimental Measurement of Frosting Limits in Cross-Flow Air-to-Air Energy Exchangers
Mohammad Rafati Nasr, PhD, Associate Member ASHRAE; Carey J. Simonson, PhD, PEng, Fellow ASHRAE

LV-17-017

Implementation of Advanced DER EPC Business Models in Dormitories in Mannheim/Germany
Rüdiger Lohse, Martina Riel

LV-17-018

Infiltration and Heating Load Analysis of an Apartment with Respect to Window Type, Window Location, and Lock Operation
Jong Jun Park; Young Il Kim, PhD, PE, Member ASHRAE; Kwang-Seop Chung, PhD

LV-17-019

In-Situ Fan Curve Calibration for Virtual Airflow Sensor Implementation in VAV Systems
Alejandro Rivas Prieto, Student Member ASHRAE; Wesley M. Thomas; Gang Wang, PhD, PE, Member ASHRAE; Li Song, PhD, PE, Member ASHRAE

LV-17-020

Measurement and Verification of Efficiency Upgrades in Chilled-Water Systems
Abdul Qayyum Mohammed, Associate Member ASHRAE; Mohamed Tatari; John Seryak, PE; Shawn Brown, PhD
LV-17-021
Optimization under Economic Uncertainty: A Methodology to Determine the Effects of Solar Variability on Energy and Economics
Scott Bucking, PhD, Associate Member ASHRAE

LV-17-022
Development of a Portable, Small-Scale Multi-Nozzle Flowmeter with Exit Pressure Control
Sang Taek Oh, Associate Member ASHRAE; Young Il Kim, PhD, PE, Member ASHRAE; Kwang-Seop Chung, PhD

LV-17-023
Potential of U-Shaped Heat Pipe Heat Exchanger in Tropical Climates for Low Sensible Heat Ratio Applications
Amit Sharma, PhD; Sanjeev Jain, PhD, Member ASHRAE; S.C. Kaushik, PhD; Amit Kakkar

LV-17-024
Reducing the Need for Electrical Storage by Coupling Solar PVs and Precooling in Three Residential Building Types in the Phoenix Climate
Reza Arababadi, PhD, Student Member ASHRAE; Kristen Parrish, PhD

LV-17-025
Sequencing Control of Parallel Pumps in Variable-Flow Systems Using Wire-to-Water Efficiency
Gang Wang, PE, PhD, Member ASHRAE; Xuejing Zheng, PhD; Koosha Kiamehr, Student Member ASHRAE

LV-17-026
Wireless Heating Management System and Tenant Usage Behavior in Bulk-Metered Apartment Buildings: A Case Study
Zixiao Shi, Student Member ASHRAE; William O’Brien, PhD, Associate Member ASHRAE; Daniel Dicaire, PEng; Yitian Hu