

ASHRAE[®]

TRANSACTIONS

ASHRAE ANNUAL CONFERENCE

June 23–27, 2012

San Antonio, Texas



2012

Volume 118

PART 2

CONTENTS

Host Chapter and Conferences and Expositions Committee	xii
State of the Society Address, Ron Jarnagin, 2011–2012 ASHRAE President.....	xiii
Inaugural Address, Thomas E. Watson, 2012–2013 ASHRAE President.....	xv
Technical Program	xix

CONFERENCE PAPERS

SA-12-C001	Achieving Deep Energy Savings in Existing Buildings through Integrated Design Dave Moser, Guopeng Liu, Weimin Wang, and Jian Zhang	3
SA-12-C002	Right Steps for Retrofits: Byron G. Rogers Federal Office Building Case Study Kendra Tupper, Nicole Hammer, Rick Osbaugh, and Michelle Swanson	11
SA-12-C003	Current Performance of Ground Source Heat Pumps for Space Conditioning and for Water Heating under Simulated Occupancy Conditions Moonis R. Ally, Jeffrey D. Munk, Van D. Baxter, and Anthony C. Gehl.....	19
SA-12-C004	Measured Impact on Space Conditioning Energy Use in a Residence Due to Operating a Heat Pump Water Heater inside the Conditioned Space Jeffrey D. Munk, Moonis R. Ally, and Van D. Baxter	27
SA-12-C005	Thermal Storage Properties of a Hybrid Ground Source Heat Pump Amanda Pertzborn, Greg Nellis, and Sanford Klein	34
SA-12-C006	Field Trials of a Waterless Home Heating and Humidification Technology Dexin Wang, Shawn Scott, Ainan Bao, and William Liss	42
SA-12-C007	Environmental Noise Case Studies: Air-Cooled Refrigeration Chiller Installations near Residential Structures Jack B. Evans, Chad N. Himmel, and Joshua D. Leasure	50
SA-12-C008	Field-Test of the New ASHRAE/CIBSE/USGBC Performance Measurement Protocols: Intermediate and Advanced Level Indoor Environmental Quality Protocols Hyojin Kim and Jeff S. Haberl.....	58
SA-12-C009	An Experimental and Simulation Study of Lighting Performance in Offices with Automated Roller Shades Hui Shen and Athanasios Tzempelikos.....	66
SA-12-C010	Impacts of Air Filters on Energy Consumption in Typical HVAC Systems Nabil Nassif	74
SA-12-C011	Design and Analysis of an Integrated Heat and Energy Recovery Ventilation System with Economizer Control for Net-Zero Energy Solar Houses Carl Yu Chen, Jiten Mistry, Alan S. Fung, Wey H. Leong, and Sumeet Jhingan	82
SA-12-C012	Validation Methodology to Allow Simulated Peak Reduction and Energy Performance Analysis of Residential Building Envelope with Phase Change Materials Paulo Cesar Tabares-Velasco, Craig Christensen, and Marcus V.A. Bianchi	90

SA-12-C013	A Comparison of Thermal Comfort between the Archetype Sustainable Homes at the Kortright Centre for Conservation Agatha Pyrka and Alan S. Fung	98
SA-12-C014	Long-term Evaluation of Internal Thermal Comfort with Different Kinds of Glazing Systems and Window Sizes: from Energetic Considerations to Users' Comfort A. Gasparella, F. Cappelletti, G. Pernigotto, and P. Romagnoni.....	106
SA-12-C015	Occupant Perceptions of an Indoor Thermal Environment in a Naturally Ventilated Building Salman Ilyas, Ashley Emery, Judith Heerwagen, and Dean Heerwagen	114
SA-12-C016	What We Have Learned From 20 Years of HVAC System Commissioning E. Thomas Lillie	122
SA-12-C017	Modeling and Optimization of HVAC Systems Using Artificial Intelligence Approaches Nabil Nassif	133
SA-12-C018	Beyond the Shoebox: Thermal Zoning Approaches for Complex Building Shapes Lillian Smith	141
SA-12-C019	A Simulation and Experimental Study of the Impact of Passive and Active Façade Systems on the Energy Performance of Building Perimeter Zones Ying-Chieh Chan and Athanasios Tzempelikos	149
SA-12-C020	Uncertainties in Achieving Energy Savings from HVAC Maintenance Measures in the Field Kristin Heinemeier, Marshall Hunt, Marc Hoeschele, Elizabeth Weitzel, and Brett Close	157
SA-12-C021	Laboratory Measurements of HVAC Installation and Maintenance Faults Robert Mowris, Ean Jones, and Robert Eshom	165
SA-12-C022	Energy Modeling Basics: A Brave New World for Young Building Modeling Professionals Jared A. Higgins	173
SA-12-C023	DOE Commercial Building Energy Asset Rating: An Application of Centralized Modeling Tool Na Wang, Will Gorrissen, Viraj Srivastava, and Cody Taylor	178
SA-12-C024	Calibration of a Building Energy Model Considering Parametric Uncertainty Zheng O'Neill, Bryan Eisenhower, Vladimir Fonoberov, and Trevor Bailey	189
SA-12-C025	Use of Flexible Research Platforms (FRP) for BIM and Energy Modeling Research Piljae Im and Mahabir Bhandari	197
SA-12-C026	Using Energy Models to Verify Utility Consumption Jared A. Higgins, Stephen D. Foster, and J. Ryan Bailey	205
SA-12-C027	Investigating the Performance of Two Types of Solar Domestic Water Heating (SDWH) Systems with Drain Water Heat Recovery through Computer Simulation and Experimental Analysis Kamyar Tanha, Alan S. Fung, and Wey H. Leong	214
SA-12-C028	Decision Making for HVAC&R System Selection for a Typical Office Building in the UK Mehdi Shahrestani, Runming Yao, and Geoffrey K Cook	222
SA-12-C029	Laboratory Evaluation of Aftermarket Boiler Control System Patricia Rowley and Paul Glanville.....	230

SA-12-C030	Using Steady State Predictions to Improve the Transient Response of a Water to Air Heat Exchanger David A. Hodgson, Peter M. Young, Charles W. Anderson, Douglas C. Hittle, William S. Duff, and Daniel B. Olsen	237
SA-12-C031	A High-Efficiency, Reduced-Emissions, Combustion Control System for Commercial and Industrial Boilers Guido Poncia, Christoph Haugstetter, David Liscinsky, Junqiang Fan, Joseph Mantese, Meredith Colket, Heidi Hollick, Ricardo Garvey, Yan Zhang, Kenneth Swanson, Michael McCarron, and Duffy Parlett	245
SA-12-C032	Hybrid Solar Thermal and Ground Source Heat Pump System Farzin M. Rad, Alan S. Fung, and Wey H. Leong	253
SA-12-C033	Zero Refrigeration for Data Centres in the USA Robert Tozer and Sophia Flucker	261
SA-12-C034	The Challenge of Low Energy Design in Low Energy Cost States Stephen W. Duda	269
SA-12-C035	Targeting a Net-Zero Energy Student Center: Part 1—Thermal and Electrical Load Minimization Trevor Caldwell, Kelton Friedrich, Brad Gregus, Ryan Verschuere, Jordan Anderson, Aaron Murenbeeld, Kaveh Arfaei, Mahsa Boroumand, David S. Wilkinson, and James S. Cotton	276
SA-12-C036	Targeting a Net-Zero Energy Student Center: Part 2—Systems to Meet Building Loads Kelton Friedrich, Trevor Caldwell, Brad Gregus, Ryan Verschuere, Jordan Anderson, Aaron Murenbeeld, Kaveh Arfaei, Mahsa Boroumand, David S. Wilkinson, and James S. Cotton	284
SA-12-C037	Contaminant Removal Effectiveness of Displacement Ventilation Systems During Heating Season; Summary Results from Three Field Studies Boualem Ouazia, Iain Macdonald, Michel Tardif, Alexandra Thompson, and Daniel Booth	292
SA-12-C038	Supply Air CO ₂ -Based Demand-Controlled Ventilation for Multi-Zone HVAC Systems Nabil Nassif	300
SA-12-C039	Modeling and Analysis for Mixed-Mode Cooling of Buildings Jianjun Hu and Panagiota Karava	308
SA-12-C040	Contaminants in Hotel Room Exhaust Air W. Brad M. Stanley and Bryan K. Ligman	316
SA-12-C041	Evaluation of Thermal Comfort in Low Load Homes Supplied by High Sidewall Air Jets El Hassan Ridouane	322
SA-12-C042	Experimental Study on Ceiling Radiant Cooling Panel System with Personal Floor Diffuser Sei Ito, Minoru Kawashima, Yoshito Arai, Michiya Suzuki, Koji Murakami, and Tatsuo Nobe	330
SA-12-C043	Determining the Cost-Effectiveness of Various Sub-Metering Strategies Christine C. Maurer, Peter Rojeski, Jr., and Matt Davey	338

TECHNICAL PAPERS

SA-12-001	Simulations of Chilled Water Cooling Coil Delta-T Characteristics Zhiqin Zhang, Hui Li, and Jingjing Liu	349
SA-12-002	Using Energy Flow Analysis to Assess Energy Savings from Recirculation Controls in Multi-Family Central Domestic Hot Water Systems Yanda Zhang, Charlotte Bonneville, Stephen Wilson, Michael Maroney, Jeff Staller, and Julianna Yun Wei	357
SA-12-003	Bayesian Analysis of Savings from Retrofit Projects John A. Shonder and Piljae Im	367
SA-12-004	Energy Savings Potential of Variable Condenser Water Flow Systems Zhiqin Zhang and Jingjing Liu	380
SA-12-005	Method for Estimating Energy Savings Potential of Chilled-Water Plant Retro-Commissioning Zhiqin Zhang and William D. Turner	388
SA-12-006	ASHRAE/IES Standard 90.1 Metal Building U-factors—Part 5: Mathematical Modeling of Wall Assemblies and Validation by Calibrated Hot Box Measurements Manoj K. Choudhary, Chris P. Kasprzak, David E. Musick, Mark J. Henry, and N. Douglass Fast	400
SA-12-007	Review and Economic Feasibility Study of the Currently Practiced New Housing Constructions in Ontario Aya Dembo and Alan S. Fung	409
SA-12-008	Reliability Modeling for Data Center Cooling Systems Bob Schuerger, Gardson Githu, Bob Arno, and Christopher Kurkjian	427
SA-12-009	The Development of Simplified Rack Boundary Conditions for Numerical Data Center Models (RP-1487) John Z. Zhai, Knud A. Hermansen, and Salah Al-Saadi	436
SA-12-010	Simulating Central Chiller Plant Loop Delta-T with Quadratic Regression Models Zhiqin Zhang and Jingjing Liu	450
SA-12-011	Calculation of Evaporation from Indoor Swimming Pools: Further Development of Formulas Mirza Mohammed Shah	460
SA-12-012	Short-Term Curtailment of HVAC Loads in Buildings (RP-1390) Lixing Gu and Richard Raustad	467
SA-12-013	Development of a Tool to Improve the Energy Efficiency of Existing Commercial and Institutional Buildings Angela Lewis	475
SA-12-014	Laboratory Testing of a Fabric Air Dispersion System D. Kulkarni, A.N. Nalla, S. Idem, and K. Gebke	484
SA-12-015	Ventilation Requirements for Refrigerating Machinery Rooms (RP-1448) Scot K. Wayne, Ronald L. Petersen, and Anke Beyer-Lout	491

SA-12-016	Secondary Control Strategies for Cycling of Air Conditioning and Refrigeration Systems Swaroop Nirmal Seshadri and Bryan P. Rasmussen	508
SA-12-017	Withdrawn	
SA-12-018	Development of High Efficiency Home Heating and Humidification Technology Dexin Wang, Ainan Bao, and William Liss	523
SA-12-019	Selection of Desiccant Equipment at Altitude (RP-1339) Nelson Fumo, Pedro J. Mago, and Eric Kozubal.....	531
SA-12-020	Thermal Performance and Charge Control Strategy of a Ventilated Concrete Slab (VCS) with Active Cooling Using Outdoor Air Yuxiang Chen, A.K. Athienitis, and Khaled Galal	556
SA-12-021	Thermal Performance of Building Envelope Details for Mid- and High-Rise Buildings (RP-1365) Patrick Roppel, Mark Lawton, and Neil Norris	569
SA-12-022	Parametric Investigation of PCM Thermal Properties on Temperature of Buildings in Toronto M. Ebrahim Poulad and Alan S. Fung	585
SA-12-023	Field Measurements of Thermal Conditions During Surgical Procedures for the Development of CFD Boundary Conditions (RP-1397) James S. McNeill, Zhiqiang (John) Zhai, and Jean Hertzberg	596
SA-12-024	Modeling Phase Change Materials with a Building Simulation Code Developed in MATLAB Sridhar Sadasivam, Dahai Zhang, Alan S. Fung, and Fabio Almeida	610
SA-12-025	Occupancy Simulation in Three Residential Research Houses Philip R. Boudreaux, Anthony C. Gehl, and Jeffrey E. Christian	625
SA-12-026	Study of the Degradation of Typical HVAC Materials, Filters and Components Irradiated by UVC Energy—Part I: Literature Search (RP-1509) Robert E. Kauffman	638
SA-12-027	Study of the Degradation of Typical HVAC Materials, Filters and Components Irradiated by UVC Energy— Part II: Polymers (RP-1509) Robert E. Kauffman and J. Douglas Wolf.....	648
SA-12-028	Design of Roofs for Increased Solar Potential BIPV/T Systems and Their Applications to Housing Units Caroline Hachem, Andreas Athienitis, and Paul Fazio	660
SA-12-029	Achieving Net-Zero Energy Conditions in Retrofit— A Case Study for a Performing Arts Building Using an Hourly Simulation Approach D.J. O'Connor, C.C. Yavuzturk, and J.E. Fuller	677
SA-12-030	HVAC Systems Commissioning in a Manufacturing Plant Yunhua Li, Bei Zhang, Mingsheng Liu, Lixia Wu, Jinrong Wang, and Tom Lewis	689
SA-12-031	Investigation of CO ₂ Tracer Gas-Based Calibration of Multi-Zone Airflow Models Steven C. Snyder, T. Agami Reddy, and William P. Bahnfleth	698

SOCIETY BUSINESS

2011–2012 ASHRAE Officers, Directors, Staff, and Council and Committee Members	713
2011–2012 ASHRAE Chapter Officers	718
2011–2012 ASHRAE Technical Committees, Task Groups, Technical Resource Groups, and Multidisciplinary Task Groups	722
2011–2012 ASHRAE Standard and Guideline Project Committees	758
ASHRAE Past Meetings	772
Society Presidents	774
ASHRAE Honors and Awards	776
2011–2012 ASHRAE Intersociety Representatives	794
ASHRAE Associate Societies	795
In Memoriam, July 2011 to June 2012	799
 Index of Conference and Technical Papers, Volume 118, Part 2	 803