

CONTENTS

Host Chapter	xii
Program Committee and Transactions Staff	xii
State of the Society, Donald G. Colliver, Ph.D., P.E., 2002-2003 ASHRAE President	xiii
Inaugural Address, Richard H. Rooley, FEng., 2003-2004 ASHRAE President	xv
Technical Program	xix

TECHNICAL PAPERS

4628	A Study of a Natural Convection Immersed Condenser Heat Pump Water Heater Vince C. Mei, Fang C. Chen, Ronald E. Domitrovic, Joe K. Kilpatrick, and Julia A. Carter	3
4629	Effect of Airflow Maldistribution on Pressure Drop and Thermal Performance of Heat Exchangers in Residential Heat Pump Systems Amgad Elgowainy	9
4630	Performance Analysis of Axial Fans in Residential Heat Pump Systems Amgad Elgowainy, Daniel Feinstein, and Ismael Rodriguez	15
4631	CFD Analysis of Ventilation System Performance for Enclosed Parking Garages Moncef Krarti and Arselene Ayari	21
4632	Two Energy Efficiency Measures for Constant Air Volume Exhaust Systems: Using Dampers and Variable Frequency Drives Gang Wang and Mingsheng Liu	30
4633	Improve Energy and Comfort Performance of Large Office Buildings Using Integrated Interior and Exterior Zone Air-Handling Units Li Song and Mingsheng Liu	36
4634	Measured Performance of Conventional and High-Velocity Distribution Systems in Attic and Space Locations Edward A. Vineyard, Randall L. Linkous, and Evelyn Baskin	45
4635	A Methodology for Analyzing the Association Between Student Performance and Indoor Air Quality Chad Dorgan	52
4636	A Network Model to Simulate Performance of Variable Refrigerant Volume Refrigeration Systems Wenxing Shi, Shuangquan Shao, Xianting Li, Xiaofeng Peng, and Xudong Yang	61
4637	A Parametric Analysis of a Grid-Independent BCHP System— Focusing on Impact of Technological Advancements Ali A. Jalalzadeh-Azar	69
4638	A Tuning Method for PID Controller Using Optimization Subject to Constraints on Control Input K. Ozawa, Y. Noda, T. Yamazaki, K. Kamimura, and S. Kurosu	79
4639	An Overview of Particulate Matter in Indoor Environments: Sources and Effects Zhongchao Tan and Yuanhui Zhang	89
4640	Application of Particle Image Velocimetry for the Measurement of the Airflow Characteristics in an Aircraft Cabin Hailong Mo, M.H. Hosni, and B.W. Jones	101

4641	Building Energy Use and Control Problems: An Assessment of Case Studies Morteza M. Ardehali, Theodore F. Smith, John M. House, and Curtis J. Klaassen	111
4642	Building (Thermal) Mass in Dynamic Diurnal Cycles: An Experiment in Kenya David M. Ogoli	122
4643	Evaluation of an Infrared Two-Stage Heating System in a Commercial Application R.D. MacDonald, M.E. Armstrong, and K.G. Boyd	131
4644	Experimental Validation of Design Cooling Load Procedures: The Radiant Time Series Method Ipseng lu, Chanvit Chantrasrisalai, David S. Eldridge, and D.E. Fisher	139
4645	Experimental Validation of Design Cooling Load Procedures: Facility Design (RP-1117) David Eldridge, D.E. Fisher, Ipseng lu, and Chanvit Chantrasrisalai.....	151
4646	Experimental Validation of Design Cooling Load Procedures: The Heat Balance Method (RP-1117) Chanvit Chantrasrisalai, D.E. Fisher, Ipseng lu, and David S. Eldridge	160
4647	Large Eddy Simulation of Combustion in Compartment Fires Wei Zhang and Richard Roby	174
4648	Leakage of Ducted Air Terminal Connections: Part 1, Experimental Procedure and Data Reduction (RP-1132) Sunil Sahu and Stephen A. Idem.....	185
4649	Leakage of Ducted Air Terminal Connections: Part 2, Experimental Results (RP-1132) Sunil Sahu and Stephen A. Idem.....	196
4651	Modeling and Development of Compression Heat Pumps in Integrated Ventilation and Heat Supply Units for Passive Solar Houses Andreas Bühring, Gerhard Schmitz, and Karsten Voss	207
4652	Performance Comparisons of a Unitary Split System Using Microchannel and Fin-Tube Outdoor Coils (RP-1195) Jun-Hyeung Kim and Eckhard A. Groll	219
4653	Pressure Loss Data for PVC Pipe Elbows, Reducers, and Expansions (RP-1193) William J. Rahmeyer	230
4654	Pressure Loss Data for PVC Pipe Tees (RP-1193) William J. Rahmeyer	252
4655	Reevaluation of the Gordon-Ng Performance Models for Water-Cooled Chillers Wei Jiang and T. Agami Reddy	272
4656	Survey of Available Data on Secondary Properties of the Ammonia-Water Solution and Sensors for Their Measurements (RP-1041) Dawen Lu and Donald L. Fenton	288
4657	Smoke Extraction System Requirement for Basements and Performance-Based Fire Engineering Approach L. Zhao and W.K. Chow	299

4658	Solid Sorption Gas-Fired Heat Pump Amgad Elgowainy, Samuel Shelton, and James Hogan	305
4659	Test Method for Organic Acid Removal by Adsorbents Used in Liquid Line Filter Driers (RP-1028) Stephen L. Gunderson and Robert E. Kauffman.....	313
4660	Passive Thermal Energy Storage in Refrigerated Trailers Pedro Juan Martínez, José Manuel Pinazo, and Alfredo Velázquez.....	324
4661	Void Fraction Effects on Heat and Mass Transfer Coefficients in Aspen Pads of Various Thickness José Arturo Pérez-Galindo, Alfredo Payán Rodríguez, and Ernersto Villalobos-Sánchez	329
4663	Comparison of Air Exchange Efficiency and Contaminant Removal Effectiveness as IAQ Indices Atila Novoselac and Jelena Srebric.....	339
4664	A Field Study of the Thermal Environment in Residential Buildings in Harbin Zhao-Jun Wang, Gang Wang, and Le-Ming Lian	350
4665	The Uncertainty Associated with Thermal Comfort Louay M. Chamra, W. Glenn Steele, and Kien Huynh	356
	A Review of Experimental Investigations of Absorption of Water Vapor in Liquid Films Falling Over Horizontal Tubes J.D. Killion and S. Garimella.....	366
	<i>Abstract only; published in the International Journal of Heating, Ventilating, Air-Conditioning and Refrigerating Research.</i>	

SYMPOSIUM PAPERS

KC-03-01

System Interactions in Forced-Air Heating and Cooling Systems, Part II: Continuous Fan Operation (RP-1165) Lixing Gu, Muthusamy V. Swami, and Philip W. Fairey	371
Evaluation of Flow Capture Techniques for Measuring HVAC Grille Airflows Iain S. Walker and Craig P. Wray.....	380
Duct Leakage in New Washington State Residences: Findings and Conclusions David Hales, Andrew Gordon, and Michael Lubliner.....	393
Field Evaluation of a New Device to Measure Air Handler Flow Paul W. Francisco and Larry Palmiter	403
Effect of Airflow and Heat Input Rates on Duct Efficiency John W. Andrews	413

KC-03-02

Inverse Modeling Toolkit: Numerical Algorithms (RP-1050) John Kelly Kissock, Jeff S. Haberl, and David E. Claridge.....	425
Inverse Model Toolkit: Application and Testing (RP-1050) Jeff S. Haberl, Atch Sreshthaputra, David E. Claridge, and John Kelly Kissock	435
Comparison of Methods for Predicting Monthly Post-Retrofit Energy Use in Buildings Zhiqiang Chen, Ron M. Nelson, and Daniel A. Ashlock	449

KC-03-03

Removing Variable Heat Rate Effects from Borehole Tests	
Richard A. Beier and Marvin D. Smith	463
Minimum Duration of In-Situ Tests on Vertical Boreholes	
Richard A. Beier and Marvin D. Smith	475
Assessment of the Viability of Hybrid Geothermal Heat Pump Systems with Solar Thermal Collectors	
Andrew D. Chiasson and Cenk Yavuzturk	487

KC-03-04

Performance Test Results for a Large Coupled Indoor/Outdoor Environmental Simulator (C-I/O-ES)	
T.J. Herrmann, J.S. Zhang, Z. Zhang, J. Smith, X. Gao, H. Li, W. Chen, and S. Wang	503
Using Large Eddy Simulation to Study Airflows In and Around Buildings	
Yi Jiang, Mingde Su, and Qingyan Chen	517
Flow Characteristics of a Local Exhaust System	
Walid Chakroun and Mir Mujtaba A. Quadri	527
Development of a Stereoscopic Particle Image Velocimetry System for Full-Scale Room Airflow Studies, Part II: Experimental Setup	
Yigang Sun and Yuanhui Zhang	540
Comparison of Air Exchange Efficiency and Contaminant Removal Effectiveness as IAQ Indices	
Atila Novoselac and Jelena Srebric	
(See Technical Paper 4663, p. 339)	

KC-03-05

An Hourly Building Simulation Tool to Evaluate Hybrid Desiccant System Configuration Options	
Hugh I. Henderson, Jr., and James R. Sand	551
Baseline and IES Performance of a Direct-Fired Desiccant Dehumidification Unit Under Various Environmental Conditions	
A.Y. Petrov, A. Zaltash, E.A. Vineyard, S.D. Labinov, D.T. Rizy, and R.L. Linkous	565
Performance Comparison of Waste Heat-Driven Desiccant Systems	
Matthew Cowie, Xiaohong Liao, and Reinhard Radermacher	572

KC-03-06

Data Set for Validating Simulation Tools for Radiant/Convective Systems (RP-1140)	
David G. Scheatzle	583
Passive Performance of a High-Mass Residence: Actual Data vs. Simulation	
Vinay S. Ghatti, David Scheatzle, Harvey Bryan, and Marlin Addison	598
A Radiant Residence—Actual Performance and Simulation Result (RP-1140)	
Xin He and David G. Scheatzle	606
Experimental Validation of the EnergyPlus Low-Temperature Radiant Simulation	
Chanvit Chantrasrisalai, Vinay Ghatti, D.E. Fisher, and D.G. Scheatzle	614

KC-03-07

Energy Conservation Benefits of a Dedicated Outdoor Air System with Parallel Sensible Cooling by Ceiling Radiant Panels Jae-Weon Jeong, Stanley A. Mumma, and William P. Bahnfleth	627
Applications of Heating and Cooling Thermal Slabs for Different Buildings and Climates Pierfrancesco Brunello, Michele De Carli, Massimo Tonon, and Roberto Zecchin	637
Investigation of a Condenser-Linked Radiant Cooling System Using a Heat Balance Based Energy Simulation Program Richard K. Strand	647
New European Standard Proposal for Design and Dimensioning of Embedded Radiant Surface Heating and Cooling Systems Bjarne W. Olesen, M. Koschenz, and C. Johansson.....	656

KC-03-08

Application of Control Charts for Detecting Faults in Variable-Air-Volume Boxes Jeffrey Schein and John M. House.....	671
An Improved Method for Fault Detection and Diagnosis Applied to Packaged Air Conditioners Haorong Li and James E. Braun	683
Design of an Energy and Maintenance System User Interface for Building Occupants Clifford C. Federspiel and Luis Villafana	693
Design of a Maintenance and Operations Recommender Clifford C. Federspiel and Luis Villafana	705

KC-03-09

Integrating Constructability Into Cleanroom Design Donald E. Acker.....	715
Cleanroom Integration—The Architect's Role Michael K. Uyeda	722
Integrating Technology Changes Into Microelectronic Cleanrooms Philip J. Naughton	725
Cleanroom Energy Benchmarking Results William F. Tschudi and Tengfang Xu.....	733

KC-03-10

An Adaptive Conflation Between CFD and Thermal Simulation for Modeling Indoor Airflow and Convective Heat Transfer at Internal Building Surfaces Ian Beausoleil-Morrison and Joe Clarke.....	743
Integration of Airflow and Energy Simulation Using CONTAM and TRNSYS Timothy P. McDowell, Steven Emmerich, Jeff W. Thornton, and George Walton.....	757

Toward External Coupling of Building Energy and Airflow Modeling Programs Ery Djunaedy, J.L.M. Hensen, and M.G.L.C. Loomans	771
On the Effects of Decoupling Airflow and Heat Balance in Building Simulation Models Per Sahlin	788
Infiltration and Natural Ventilation Model for Whole Building Energy Simulation of Residential Buildings Michael P. Deru and Patrick J. Burns	801

KC-03-11

Analysis and Validation of Particle Separation Efficiency in a Centrifugal Field Under Laminar and Perfect Mixing Conditions Yuanhui Zhang.....	815
Effectiveness of Local Supply Ventilation in Improving Worker Zone Air Quality in Swine Confinement Buildings—A Pilot Study Sheryll B. Jerez and Ronaldo G. Maghirang.....	822
Total Air Age in the Room Ventilated by Multiple Air-Handling Units: Part 1, An Algorithm Dongning Li, Xianting Li, Xudong Yang, and Chunpeng Dou	829
A New Mass Transfer Based Model of VOC Emissions from Building Materials Ying Xu, Yinping Zhang, and Tongbao Cheng	837

KC-03-12

Measured Winter Performance of Storm Windows Joseph H. Klems.....	847
A Comparison of Calculated and Measured Indoor-Side Window Temperature Profiles John L. Wright and Alexander G. McGowan.....	857
Future Advanced Windows for Zero-Energy Homes Joshua Apte, Dariush Arasteh, and Yu Joe Huang	871

KC-03-13

Investigation of Human Thermal Comfort Under Highly Transient Conditions for Automotive Applications—Part 1: Experimental Design and Human Subject Testing Implementation Yanzheng (Don) Guan, Mohammad H. Hosni, Byron W. Jones, and Thomas P. Gielda	885
Investigation of Human Thermal Comfort Under Highly Transient Conditions for Automotive Applications—Part 2: Thermal Sensation Modeling Yanzheng (Don) Guan, Mohammad H. Hosni, Byron W. Jones, and Thomas P. Gielda	898
Literature Review of the Advances in Thermal Comfort Modeling Yanzheng (Don) Guan, Mohammad H. Hosni, Byron W. Jones, and Thomas P. Gielda	908
A Field Study of the Thermal Environment in Residential Buildings in Harbin Zhao-Jun Wang, Gang Wang, and Le-Ming Lian (See Technical Paper 4664, p. 350)	
The Uncertainty Associated with Thermal Comfort Louay M. Chamra, W. Glenn Steele, and Kien Huynh (See Technical Paper 4665, p. 356)	