

CONTENTS

Host Chapter	xi
Program Committee and Transactions Staff	xi
State of the Society, Donald G. Colliver, Ph.D., P.E., 2002-2003 ASHRAE President	xii
Technical Program	xv

TECHNICAL PAPERS

4598	Comparison in Control Performance Between PID and H_{∞} Controllers for HVAC Control Y. Noda, T. Yamazaki, T. Matsuba, K. Kamimura, and S. Kurosu	3
4599	Literature Review of Artificial Intelligence and Knowledge-Based Expert Systems in Buildings and HVAC&R System Design Itzhak Maor and T.A. Reddy	12
4600	Study on Fuzzy Control for HVAC Systems—Part One: FFSI and Development of Single-Chip Fuzzy Controller Jili Zhang, Jinping Ou, and Dexing Sun	27
4601	Study on Fuzzy Control for HVAC Systems—Part Two: Experiments of FFSI in Testing Room Dynamic Thermal System Jili Zhang, Jinping Ou, and Dexing Sun	36
4602	A New Sequencer Controller for Multistage Systems of Known Relative Capacities Timothy I. Salsbury and Bin Chen	44
	<i>Abstract only; published in the International Journal of Heating, Ventilating, Air-Conditioning and Refrigerating Research.</i>	
4603	Air Filter-Associated Fan Energy Consumption in Variable Air Volume Systems Mingsheng Liu, David E. Claridge, and Song Deng	45
4604	Development of Pressurization Airflow Design Criteria for Spaces Under Required Pressure Differentials Wei Sun	52
4605	Simplified Modeling of Cross-Ventilation Airflow Guilherme Carrilho da Graça and P.F. Linden	65
4606	Validation of a CFD Model for Temperature and Particulate Concentration in a Test Room with Mixed Air and Displacement Ventilation Daniel J. Hirnikel	80
4607	Simplified Numerical Models for Complex Air Supply Diffusers Jelena Srebric and Qingyan Chen	90
	<i>Abstract only; published in the International Journal of Heating, Ventilating, Air-Conditioning and Refrigerating Research.</i>	
4608	An Investigation of Zinc Oxide Corrosion of Galvanized Steel in Cooling Towers (RP-988) William E. Stewart, Jr., and David Wieliczka	91
4609	Characterization of Framing Factors for Wood-Framed Low-Rise Residential Buildings (RP-904) Stephen C. Carpenter and Christopher Schumacher	101
4610	Climate Classification for Building Energy Codes and Standards: Part 1—Development Process Robert S. Briggs, Robert G. Lucas, and Z. Todd Taylor	109
4611	Climate Classification for Building Energy Codes and Standards: Part 2—Zone Definitions, Maps, and Comparisons Robert S. Briggs, Robert G. Lucas, and Z. Todd Taylor	122

4612	Comparison of Four Models for Thermal Response Test Evaluation Signhild E.A. Gehlin and Göran Hellström	131
4613	Demonstration of Multimedia Electronic Information Enhancements for a Handbook Chapter CD-ROM: Overview (RP-1017) Ergun Akleman, Jeff S. Haberl, Frederic I. Parke, Sajan Skaria, H. John Halstead, and Malcolm Andrews	143
4614	Determining Undisturbed Ground Temperature for Thermal Response Test Signhild E.A. Gehlin and Bo Nordell	151
4615	Economic Prediction of HVAC Systems at Different Design Stages Fulin Wang	157
4616	Effects of Environmental Conditions on the Sorption of VOCs on Building Materials—Part II: Model Evaluation (RP-1097) Jinsong Zhang, Jianshun S. Zhang, and Qingyan Chen	167
4617	First Principles Modeling of Thermal Sensation Responses in Steady-State and Transient Conditions Dusan Fiala, Kevin J. Lomas, and Martin Stohrer	179
4618	Impact of Operating Hours on Long-Term Heat Storage and the Design of Ground Heat Exchangers Stephen P. Kavanaugh	187
4619	Improving the Process of Certified and Witnessed Factory Testing for Chiller Procurement Joseph P. Corcoran and T. Agami Reddy	193
4620	Integrated Retrofitting Strategy for Enhanced Energy Efficiency in a Tropical Building S.C. Sekhar and K.J. Phua	202
4621	Microbial Volatile Organic Compounds with Emphasis on Those Arising from Filamentous Fungal Contaminants of Buildings (RP-1072) W. Elliott Horner and J. David Miller	215
4622	Moisture Sensor Technology—A Summary of Techniques for Measuring Moisture Levels in Building Envelopes William M. Healy	232
4623	Performance of an Air Cooling Coil Under Frosting Conditions Donald J. Cleland and Antony N. O'Hagan	243
4624	Recent Activities on Solar Air Conditioning C.A. Balaras, A.A. Argiriou, E. Michel, and H.M. Henning	251
4625	Evaluation of BIPV Power Generation Characteristics Masaki Shioya, Tadashi Ito, Hiroshi Matsukawa, and Kosuke Kurokawa	261
4626	Effects of Improper Product Loading on the Performance of an Open Vertical Meat Display Case Ramin Faramarzi, Bruce Coburn, and Rafik Sarhadian	267
4627	Numerical Investigations into the Performance of Doorway Vertical Air Curtains in Air-Conditioned Spaces Theodoros C. Pappas and Savvas A. Tassou	273

SYMPOSIUM PAPERS

CH-03-01 Advances in Supermarket Refrigeration

Analysis of Advanced, Low-Charge Refrigeration for Supermarkets David H. Walker and Van D. Baxter	285
Secondary Refrigeration—European Experiences Zafer Ure	293
Effects of Improper Product Loading on the Performance of an Open Vertical Meat Display Case Ramin Faramarzi, Bruce Coburn, and Rafik Sarhadian (See Technical Paper 4626, page 267)	
Interactions Between the Environment and Open Refrigerated Display Cabinets in Retail Food Stores—Design Approaches to Reduce Shopper Discomfort Savvas A. Tassou and Weizhong Xiang	299

CH-03-02 Innovations and Advances in Room Air Distribution

Temperature Control and Zoning in Underfloor Air Distribution Systems Kenneth J. Loudermilk.....	307
Influence of Air Exchange Through Small Openings Between Rooms Huang Yinong, Shuichi Hokoi, Nobuo Nakahara, Satoru Takada, and Hisashi Miura	315
Numerical Investigations into the Performance of Doorway Vertical Air Curtains in Air-Conditioned Spaces Theodoros C. Pappas and Savvas A. Tassou (See Technical Paper 4627, page 273)	
Displacement Ventilation—Smart Way to Deal with Increased Heat Gains in the Telecommunication Equipment Room Mark Howe, Dale Holland, and Andrey Livchak	323

CH-03-03 Water Treatment Topics for Enhanced System Safety and Performance

Demand-Based, Real-Time Control of Microbial Growth in Air-Conditioning Cooling Water Systems Mita Chattoraj, David L. Stonecipher, and Scott A. Borchardt.....	331
A Review of Methodologies for Potable Water Disinfection in Buildings and a Discussion of Current Issues Regarding <i>Legionella</i> Risk Assessment and Monitoring Mark A. Crosby, William J. Beer, and Anthony M. Rossi.....	339
Physical Water Treatment for the Mitigation of Mineral Fouling in Cooling-Tower Water Applications (RP-1155) Young I. Cho, SungHyuk Lee, and Wontae Kim	346

CH-03-04 Optimum Control Strategies for Variable Flow Pumping

What Is the Control Area? Mark C. Hegberg	361
Pump Differential Pressure Setpoint Reset Based on Chilled Water Valve Position Brian J. Moore and D. Scott Fisher	373
Control of Variable Speed Pumps for HVAC Water Systems James B. (Burt) Rishel.....	380

CH-03-05 Absorption/Sorption Heat Pumps and Refrigeration Systems

Absorption Systems for Combined Heat and Power: The Problem of Part-Load Operation
Gershon Grossman and Joseph E. Rasson393

Proof-of-Concept Design and Experimental Validation of a
Waste Heat Driven Absorption Transport Refrigerator
Michael A. Garrabrant.....401

Modeling of Local Measured Heat and Mass Transfer
Variations in a Microchannel Ammonia-Water Absorber
J. Mark Meacham and Srinivas Garimella412

Vapor Pressure and Specific Heat of LiBr-H₂O at High Temperature
Jim Langeliers, Paul Sarkisian, and Uwe Rockenfeller.....423

CH-03-06 Current Issues in Duct Design, Construction, and Airflow Measurement

A Duct Performance Model That Includes the Effects of Leakage
Vandana Nigam and Stephen Idem431

Predicting Performance of Reinforced, Circular Spiral Lockseam Ducts Under Negative Pressure
John B. Gierzak439

Main Loss Coefficient Measurements for Flat Oval Tees and Laterals (RP-690)
Stephen Idem.....456

Improving Airflow Measurements by a New Inlet Nozzle Contour
Dieter R. Goettling and Lars Goettsching462

CH-03-07 Advances and Issues in Residential Thermal Distribution Efficiency

System Interactions in Forced-Air Heating and Cooling Systems, Part I:
Equipment Efficiency Factors (RP-1165)
Lixing Gu, Muthusamy V. Swami, and Philip W. Fairey475

Insights Into Improved Ways to Measure Residential Duct Leakage (RP-1164)
Paul W. Francisco, Larry Palmiter, and Bob Davis485

Air Handler Leakage: Field Testing Results in Residences
James B. Cummings, Charles R. Withers, Jr.,
Janet McIlvaine, Jeffrey K. Sonne, and Matthew J. Lombardi496

Comparison Between Predicted Duct Effectiveness from Proposed
ASHRAE Standard 152P and Measured Field Data for Residential Forced Air Cooling Systems
Jeffrey A. Siegel, Jennifer A. McWilliams, and Iain S. Walker503

Thermal Comfort Assessment of Conventional and
High-Velocity Distribution Systems for Cooling Season
Evelyn Baskin and Edward A. Vineyard.....513

CH-03-08 Air-to-Carbon Dioxide Heat Exchangers

Two-Phase Flow Pattern, Heat Transfer, and Pressure Drop in Microchannel Vaporization of CO₂
Jostein Pettersen523

Experimental Heat Transfer Coefficients of CO₂ in a Microchannel Evaporator
Yuan Zhao, Michael M. Ohadi, and Francis H.R. França533

Contribution of Heat Exchangers in Improved Performance of New Generation Automotive Air-Conditioning System with R-744 Michael Giannavola, Jianmin Yin, Clark Bullard, and Pega Hrnjak	542
---	-----

CH-03-09 Recent Advances in Energy Simulation: Building Loads

Whole Building Energy Simulation with a Three-Dimensional Ground-Coupled Heat Transfer Model Michael Deru, Ron Judkoff, and Joel Neymark	557
Modeling Transient Performance of Two-Dimensional and Three-Dimensional Building Assemblies (RP-1145) Stephen C. Carpenter, Jan Kosny, and Elisabeth Kossecka	566
Whole Building Hygrothermal Simulation Model Carsten Rode and Karl Grau	572
ASHRAE Toolkit for Building Load Calculations (RP-987) Curtis O. Pedersen, Daniel E. Fisher, Richard J. Liesen, and Richard K. Strand	583

CH-03-10 Improvements in Fenestration Analysis

THERM Simulations of Window Indoor Surface Temperatures for Predicting Condensation Christian Kohler, Dariush Arasteh, and Robin Mitchell.....	593
Quantification of Air Leakage Effects on the Condensation Resistance of Windows A.H. Elmahdy.....	600
Solar Heat Gain through a Skylight in a Light Well Joseph H. Klems	607

CH-03-11 International Thermal Storage Developments

Chilled Water Storage in Western Australia William P. Bahnfleth, Graeme R. McLeod, and Steven L. Bowins	617
Thermal Energy Storage Systems Utilizing Cutoff Wall-Enclosed Aquifers Makoto Nakamura, Takaaki Shimizu, and Shuichi Hokoi.....	626
Phase-Change Materials and Chemical Reactions for Thermal Energy Storage Fredrik Setterwall.....	633

CH-03-12 Interoperable Computer Applications

Identifying Building Design Information Necessary for Commissioning and Proper System Operation (RP-1032) Larry Luskay	639
A Data Model for Capturing Life-Cycle Data for Re-Use During Building Commissioning (RP-1032) James Forester.....	655
Software Interoperability for Energy Simulation Robert J. Hitchcock	661

**CH-03-13 Recent Advances in Tube-Side Multiphase Flow Visualization,
Heat Transfer, and Pressure Drop Correlation**

Predicting Heat Transfer During Flow Boiling in Minichannels and Microchannels Satish G. Kandlikar and Mark E. Steinke.....	667
Heat Transfer and Pressure Drop for Condensation of Refrigerant R-404A at Near-Critical Pressures Yirong Jiang and Srinivas Garimella.....	677
Evaluation of Existing Evaporative Heat-Transfer Models in Horizontal Microfin Tubes Louay M. Chamra, Meng-Onn Tan, Chea-Chun Kung, and Soon-Seng Tang	689
Pressure Drop and Visualization of R-134a Two-Phase Flow in a Rectangular Microchannel Xiao Tu and Predrag S. Hrnjak.....	703
Index of Technical and Symposium Papers, Volume 109, Part 1.....	711

Society Business will be published in Part 2 of *ASHRAE Transactions*, Volume 109.