## **CONTENTS**

Program State of Inaugura	the Society by Billy R. Manning, ASHRAE 1994-95 President  al Address by 1995-96 President Richard B. Hayter  al Program Abstracts	x xi . xiv
	TECHNICAL PAPERS	
3880	Is the Actual Heat Loss Factor Substantially Smaller Than You Calculated? by Mingsheng Liu and David E.	
3881	Claridge	
3882	T. Chow, and W.L. Tse	
3883	Algorithms for Modeling Secondary Solar Heat Gain by Christopher Dunne, Susan Reilly, Gregory Ward, and Frederick Winkelmann	
3884	Prediction of Room Thermal Response by CFD Technique with Conjugate Heat Transfer and Radiation Models by Qingyan Chen, Xiudong Peng, and A.H.C. van Paassen	
3885	Thermal Comfort Aspects of Cold Air Distribution System by Masaki Shioya, Noriyasu Sagara, Katsuhiro Miura, Shin-ichi Tanabe, Yuji Tsubota, and Ryuji Yanagihara	
3886 3887	The Effect of Coolant Flow Conditions on the Performance of an Absorber by A. Terrence Conlisk	
3888	Conditions by A.N. Hawkins, M.H. Hosni, and B.W. Jones	
3889	Field Measurements of Boundary-Layer Flows in Ventilated Rooms by Jianshun S. Zhang, C.Y. Shaw, Lan C. Nguyen-Thi, Robert A. MacDonald, and Gemma Kerr	
3890 3891	Airflow Studies in a Forced Ventilated Chamber with Low Partitions by W.K. Chow and K.F. Tsui Energy Savings Using Air Curtains Installed in High-Traffic Doorways by Eric B. Lawton and Ronald H.	
3892	Howell	136
3893	A. Chappell	144 149
3894	Expert System to Determine Energy-Saving Retrofit Potential of Public Buildings by Thomas M. Gatton, Steve Jaeger, Yongil Lee, and Mark A. Beaudry	163
3895	Effect of Time Resolution on Statistical Modeling of Cooling Energy Use in Large Commercial Buildings by Srinivas Katipamula, T. Agamí Reddy, and David E. Claridge	
3896	The Analysis of Deep Basement Heat Loss by Measurements and Calculations by Peter Sobotka, Hiroshi Yoshino, and Shin-ichi Matsumoto	186
3897	On-Line Prediction for Load Profile of an Air-Conditioning System by Akiomi Kimbara, Shigeru Kurosu, Ryuzi Endo, Kazuyuki Kamimura, Tadahiko Matsuba, and Atsushi Yamada	198
3898	Development of Ventilation Rates and Design Information for Laboratory Animal Facilities—Part I: Field Study (RP-730) by Ronaldo G. Maghirang, Gerald L. Riskowski, Leslie L. Christianson, and Paul C. Harrison	208
3899 3900	Fault Direction Space Method for On-Line Fault Detection by Yi Jiang, Jisheng Li, and Xudong Yang Experimental Study of Hay-Drying with a Liquid-Desiccant System by Atila Ertas, H.A.K.M. Azizul, Timothy T.	219
3901	Maxwell, and Ilker Kiris  Experimental Study of Temperature, Pressure, Humidity, and/or Density Effects on Vane Anemometers (RP-	229
3902	698) by Fathi Finaish, Roger George, Harry J. Sauer, Jr., and Ronald H. Howell	<ul><li>240</li><li>252</li></ul>
3903	Overview of the ASHRAE Annotated Guide to Load Calculation Models and Algorithms (RP-741) by Jeffrey D. Spitler and J.D. Ferguson	260
3904	Determination of the 1%, 2.5%, and 5% Occurrences of Extreme Dew-Point Temperatures and Mean Coincident Dry-Bulb Temperatures (RP-754) by Donald G. Colliver, Hanzhong Zhang, Richard S. Gates, and	
3905	K. Tom Priddy	265
	Ryuichiro Yoshie	287

3906	Fire/Smoke Damper Study to Determine Dynamic Closure Capability and Leakage Performance (RP-680) by	000
3907	Prasad Bhatt	302
3907	High-Pressure Tribometer by Hyung K. Yoon, Carl H. Poppe, and Cristino Cusano	322
3908	Experimental Comparison on Performance of Rotary Compressors with Different HFC-134a-Compatible	· ·
	Lubricants by H.L. Yu, R.Y. Li, and D.K. Chen	335
3909	Inorganic Fluoride Uptake as a Measure of Relative Compatibility of Molecular Sieve Desiccants with	
3910	Fluorocarbon Refrigerants by Alan P. Cohen and C. Scott Blackwell	341
3910	Conditions on Cooling Output and COP by Bidyut B. Saha, Elisa C. Boelman, and Takao Kashiwagi	348
3911	Experimental Investigation of a Silica Gel-Water Adsorption Refrigeration Cycle—The Influence of Operating	0.0
	Conditions on Cooling Output and COP by Elisa C. Boelman, Bidyut B. Saha, and Takao Kashiwagi	358
3912	A Semi-Empirical Method for Modeling a Reciprocating Compressor in Refrigeration Systems by Predrag	
3913	Popovic and Howard N. Shapiro	367
0010	AL-Khalidy and A. Zayonia	383
3914	ASHRAE's New Application Guide for Absorption Cooling/Refrigeration Using Recovered Heat by Chad B.	
0045	Dorgan, Charles E. Dorgan, and Steven P. Leight	392
3915 3916	PI Control of Fan Speed to Maintain Constant Discharge Pressure by Kalman I. Krakow and Sui Lin Effects of Surface Enhancement, Film-Feed Supply Rate, and Bundle Geometry on Spray Evaporation Heat	398
3310	Transfer Performance (RP-668) by Shane A. Moeykens, Brian J. Newton, and Michael B. Pate	408
3917	The Effects of Nozzle Height and Orifice Size on Spray Evaporation Heat Transfer Performance for a Low-	
	Finned, Triangular-Pitch Tube Bundle with R-134A (RP-668) by Shane A. Moeykens and Michael B. Pate	420
3918	An Evaluation of the ASHRAE Method for Predicting Capillary Tube-Suction Line Heat Exchanger Performance	404
3919	(RP-762) by Robert R. Bittle, W. Robert Stephenson, and Michael B. Pate	434
0010	and Zahid H. Ayub	443
3920	Flammability Limits of Ammonia-Air Mixtures (RP-682) by Ayaz S. Khan, Randy D. Kelley, Kirby S. Chapman,	
0001	and Donald L. Fenton	454
3921	Operating Characteristics of a Flare/Oxidizer for the Disposal of Ammonia from an Industrial Refrigeration Facility (RP-682) by Donald L. Fenton, Kirby S. Chapman, Randy D. Kelley, and Ayaz S. Khan	463
3922	Combustion Characteristics Review of Ammonia-Air Mixtures by Donald L. Fenton, Ayaz S. Khan, Randy D.	100
	Kelley, and Kirby S. Chapman	476
3923	Investigation of Ammonia-Secondary Fluid Systems in Supermarket Refrigeration Systems by Timothy P.	400
3924	McDowell, John W. Mitchell, and Sanford A. Klein	486
002.	Stewart, Jr., Robert W. Clark, Lisa A. Stickler, and Charles K. Saunders	497
3925	System Performance Comparison of R-507 with R-502 by Jeffrey W. Linton, W. Keith Snelson, Andrew R.	
2006	Triebe, and Patrick F. Hearty	502
3926	Measurement of Two-Phase Refrigerant Liquid-Vapor Mass Flow Rate—Part I: Venturi and Void Fraction Meters by Amad Abdul-Razzak, Mamdouh Shoukri, and Jen-Shih Chang	511
3927	Measurement of Two-Phase Refrigerant Liquid-Vapor Mass Flow Rate—Part II: Turbine and Void Fraction	0
	Meters by Amad Abdul-Razzak, Mamdouh Shoukri, and Jen-Shih Chang	523
3928	Measurement of Two-Phase Refrigerant Liquid-Vapor Mass Flow Rate—Part III: Combined Turbine and Venturi	
	Meters and Comparison with Other Methods by Amad Abdul-Razzak, Mamdouh Shoukri, and Jen-Shih Chang	532
3929	Cost Optimal Analysis and Load Shifting Potentials of Cold Storage Equipment by Michael Kintner-Meyer and	002
	Ashley F. Emery	539
3930	ASHRAE RP-766: Study of Operational Experience with Thermal Storage Systems by Robert A. Potter, Jr.,	E 40
3931	Douglas P. Weitzel, Dion J. King, and Daisie D. Boettner	549
0001	Doug J. Bronson, and Dennis L. O'Neal	558
	SYMPOSIUM PAPERS	
SD-95-1	Research Initiatives in Commercial Kitchen Ventilation	
	On Development of a CFD Platform for Prediction of Commercial Kitchen Ventilation Flow Fields by E.G.	
	Schaub, A.J. Baker, N.D. Burk, E.B. Gordon, and P.G. Carswell	581
	Application and Enhancement of the Standard Test Method for the Performance of Commercial Kitchen Ventilation Systems by Vernon A. Smith, Richard T. Swierczyna, and Charles N. Claar	594
	Impact of Reduced Exhaust and Ventilation Rates at "No-Load" Cooking Conditions in a Commercial Kitchen	504
	During Winter Operation by Anthony J. Spata and Suzanne M. Turgeon	606
SD-05.2	Fan-Tracking Strategies and Solutions to Meet ANSI/ASHRAE 62-1989	
JD-30-2	Minimum Outside Air Control Methods for VAV Systems by David M. Flovitz	613

	Building Pressure Controls to Comply with the Americans with Disabilities Act and ASHRAE Standard 62-1989 by Gil Avery	619
	Minimum Ventilation Control for VAV Systems: Fan Tracking vs. Workable Solutions by John P. Kettler Strategies for Outdoor Airflow Control from a Systems Perspective by George J. Janu, Jarrell D. Wenger, and	625
	Clay G. Nesler	631
SD-95-3	<b>Experiences in Global Control Strategies</b> A System Approach to Optimal Control for HVAC and Building Systems by John M. House and Theodore F.	
	Smith	
	White	688
SD-95-4	International Efforts in Radiant Cooling	
	COOLP: A Computer Program for the Design and Analysis of Ceiling Cooling Panels by Birol I. Kilkis Control Strategy for Cooled Ceiling Panels by Patrik Sprecher, Beat Gasser, Oskar Böck, and Peter	703
	Kofoed	711 717
	Development of a Model to Simulate the Performance of Hydronic Radiant Cooling Ceilings by Corina Stetiu and Helmut E. Feustel	730
	Is There a Risk of Draft in Rooms with Cooled Ceilings? Measurement of Air Velocities and Turbulences by Martin Behne	744
CD 05 5	Advanced Building Envelope Framing Thermal Measurements and Modeling	
SD-95-5	Validating the Isothermal Planes Method for R-Value Predictions by Harold A. Trethowen	755
	The Thermal Performance of Steel-Framed Walls by C. Edward Barbour and John Goodrow	766
	Frame Walls by Jan Kosny and Jeffrey E. Christian	
	Attic Construction with Sheathing-Applied Insulation by William B. Rose	
SD-95-6	Atrium Design Methods	
	Atrium Buildings from the Perspective of Function, Indoor Air Quality, and Energy Use by Ida Bryn	
	Aozasa	
	Natural Ventilation in Atria by Karl T. Andersen	866
SD-95-7	International Symposium on Underfloor Air Distribution Integrated Access Floor HVAC: Lessons Learned by R.W. Shute	977
	Development and Application of an Underfloor Air-Conditioning System with Improved Outlets for a "Smart" Building in Tokyo by Katashi Matsunawa, Hiroshi lizuka, and Shin-ichi Tanabe	
	Underfloor Air Distribution Systems: Benefits and When to Use the System in Building Design by Blair T. McCarry	മറാ
	Experimental Study on the Floor-Supply Displacement Ventilation System by Takashi Akimoto, Tatsuo Nobe, and Yoshihisa Takebayashi	
CD_05_0	Refrigeration Lubricant Technology Update	
30-93-0	Control of Refrigerant Vapor Release from Polyol Ester/Halocarbon Working Fluids by Andrew Swallow,	
	Andrew Smith, and Barry Greig	
	Mahmood Sabahi, and Sibtain Hamid	
	Umekichi Sasaki	940 947
CD 05 0		571
	Heat Recovery Ventilators—A Technology for a Better Environment  Heat Recovery Ventilators in Multifamily Residences in the Arctic by Paul T. Ninomura and Raj Bhargava  Design of Multi-Coil Run-Around Heat Exchanger Systems for Ventilation Air Heating and Cooling by Allan B.	961
	Johnson, Robert W. Besant, and Greg J. Schoenau	967
	Integrating Run-Around Heat Exchanger Systems into the Design of Large Office Buildings by Prajwal Dhital, Robert W. Besant, and Greg J. Schoenau	979

SD-95-10 Durability Testing of Fenestration Systems Performance of Solar-Coated Architectural Laminated Glass Under Accelerated Weathering Conditions by Richard A. Berh and Paul A. Kremer Pictorian Conditions on the Design of Weathering Tests for Fenestration Systems by Larry W. Masters, John L. Scott, and Choices in the Design of Weathering Tests for Fenestration Systems by Larry W. Masters, John L. Scott, and Determination of Argon Concentration and Assessment of the Durability of High-Performance insulating Glass Units Pilled with Argon Gas by A.H. Elimathy and Said A. Yusuf  Determination of Argon Concentration and Assessment of the Durability of High-Performance insulating Glass Snigle-Pass reliable with Argon Gas by A.H. Elimathy and Said A. Yusuf  Snigle-Pass reliable with Argon Gas by A.H. Elimathy and Said A. Yusuf  Compound A. Side Healt Transfer and Pressure Drop Characteristics of Microlin Tubes by C.B. Chlou, C.C. Wang, and D.C. Lu Compound A. Side Healt Transfer and Pressure Drop Characteristics of Microlin Tubes by C.B. Chicu, C.C. Wang, W.C. Cheng, and D.C. Lu Compound A. Side Healt Transfer and Pressure Drop Characteristics of Microlin Tubes by C.B. Chloud C.C. Wang, and D.C. Lu Compound A. Side Healt Transfer and Pressure Drop Characteristics of Microlin Tubes by C.B. Characteristics of A. P. Characteristics of Microlin Tubes by C.B. Characteristics of A. P. Characteristics of Microlin Tubes by C.B. Characteristics of A. P. Characteristics of Microlin Tubes by C.B. Characteristics of Charac	Desiccant Outdoor Air Preconditioners Maximize Heat Recovery Ventilation Potentials by Milton Meckler	992
Single-Phase Heat Transfer and Pressure Drop Characteristics of Microfin Tubes by C.B. Chiou, C.C. Wang, and D.C. Lu. Compound Air-Side Heat Transfer Enhancement in a Cross-Flow Refrigerant-to-Air Heat Exchanger by Michael D. Blanford, Michael M. Ohadi, and Serguel V. Desistatoun. 1049 Evaporation of R-22 in a 7-mm Microfin Tube by C.S. Kuo, C.C. Wang, W.Y. Cheng, and D.C. Lu. On-Line Measurement of Oil Concentrations of R-134a/Oil Mixtures with a Density Flowmeter by Ahmed Bayini, John R. Thome, and Daniel Favrat (submitted to the International Journal of Heating, Ventilating, Air-Conditioning and Refrigerating Research)  SD-95-12 After R-22 and R-502, What? See also Technical Paper 3925 HCFC-22 Atternatives for Air Conditioners and Heat Pumps by Donald B. Bivens, Mark B. Shiflett, Ward D. Wells, Glenn S. Sheaty, A. (Michij Yokozeki, Donna M. Patron, Kelly A. Kolliopoulos, Charles C. Aligood, and Tuneen E.C. Chisolm. 1065 Performance Tests of R-22 and R-32/R-125/R-134a Mixture for Baseline Air Conditioning and Liquid Overfeeding Operations by Vince C. Mel, F.C. Chen, D.T. Chen, and EP. HuangFu. 1072 SD-95-13 Design Methods and Installation Cost Comparisons of Commercial GSHP Systems A Comparison of Measured and Predicted Performance of a Ground-Source Heat Pump System in a Large Building by RLD. Cane and S.B. Clemes. 1081 A Design Method for Commercial Ground-Coupled Heat Pumps by Steve Kavanaugh. 1082 A Design Method for Commercial Ground-Goupled Heat Pumps by Steve Kavanaugh. 1083 A Capital Cost Comparison of Commercial Ground-Source Heat Pump Systems by Kevin Rafferty. 1095 SD-95-14 Measured and Predicted Altriflow in Large Spaces: Results of IEA Annex 26 Theoretical Considerations on Natural Ventilation by Thermal Buoyancy by Karl T. Andersen. 1103 Airlow in a World Exposition Pavilion Studied by Scale-Model Experiments and Computational Fluid Dynamics by Peter V. Nielsen. 1104 New Force States of States States of States	Performance of Solar-Coated Architectural Laminated Glass Under Accelerated Weathering Conditions by Richard A. Behr and Paul A. Kremer	1015
See also Technical Paper 3925 HCFC-22 Alternatives for Air Conditioners and Heat Pumps by Donald B. Bivens, Mark B. Shiflett, Ward D. Wells, Glenn S. Shealy, A. (Michi) Yokozeki, Donna M. Patron, Kelly A. Kolliopoulos, Charles C. Allgood, and Tuneen E.C. Chisolm  1065 Performance Tests of R-22 and R-32/R-125/R-134a Mixture for Baseline Air Conditioning and Liquid Overfeeding Operations by Vince C. Mei, F.C. Chen, D.T. Chen, and EP. HuangFu  1072  SD-95-13 Design Methods and Installation Cost Comparisons of Commercial GSHP Systems  A Comparison of Measured and Predicted Performance of a Ground-Source Heat Pump System in a Large Building by R.L.D. Cane and S.B. Clemes  A Design Method for Commercial Ground-Coupled Heat Pumps by Steve Kavanaugh  A Design Method for Commercial Ground-Coupled Heat Pumps by Steve Kavanaugh  A Capital Cost Comparison of Commercial Ground-Source Heat Pump Systems by Revin Rafferty  1095  SD-95-14 Measured and Predicted Airflow in Large Spaces: Results of IEA Annex 26  Theoretical Considerations on Natural Ventilation by Thermal Buoyancy by Karl T. Andersen  1103  Airflow in a World Exposition Pavilion Studied by Scale-Model Experiments and Computational Fluid Dynamics by Peter V. Nielsen  1118  Energy-Efficient Measures to Avoid Downdraft from Large Glazed Facades by Per Heiselberg, H. Overby, and Erik Bjorn  1127  Numerical Modeling of Heat Transfer by Radiation and Convection in an Atrium with Thermal Inertia by Alfred Moser, Frank Off, Alois Schälin, and Xiaoxiong Yuan  1126  SD-95-15 Air Quality in Animal Facilities  Dust Control Strategies for Livestock Buildings—A Review by Ronaldo G. Maghirang, Gerald L. Riskowski, Lesile L. Christianson, and Harvey B. Manbeck  1169  1179  SD-95-15 Air Quality in Animal Facilities  Dust Control Strategies for Livestock Buildings—A Review by Ronaldo G. Maghirang, Gerald L. Riskowski, Lesile L. Christianson, and Harvey B. Manbeck  1180  1192  SD-95-16 New Developments in Domestic Refrigerator for Swine Building Dust by Yongcheng Chen, Yuanhui Zh	Single-Phase Heat Transfer and Pressure Drop Characteristics of Microfin Tubes by C.B. Chiou, C.C. Wang, and D.C. Lu	1049
A Comparison of Measured and Predicted Performance of a Ground-Source Heat Pump System in a Large Building by R.L.D. Cane and S.B. Clemes	See also Technical Paper 3925  HCFC-22 Alternatives for Air Conditioners and Heat Pumps by Donald B. Bivens, Mark B. Shiflett, Ward D. Wells, Glenn S. Shealy, A. (Michi) Yokozeki, Donna M. Patron, Kelly A. Kolliopoulos, Charles C. Allgood, and Tuneen E.C. Chisolm	
Theoretical Considerations on Natural Ventilation by Thermal Buoyancy by Karl T. Andersen	A Comparison of Measured and Predicted Performance of a Ground-Source Heat Pump System in a Large Building by R.L.D. Cane and S.B. Clemes	1088
Dust Control Strategies for Livestock Buildings—A Review by Ronaldo G. Maghirang, Gerald L. Riskowski, Leslie L. Christianson, and Harvey B. Manbeck	Theoretical Considerations on Natural Ventilation by Thermal Buoyancy by Karl T. Andersen	1118 1127 1136
Field Usage and Its Impact on Energy Consumption of Refrigerator/Freezers by Cynthia L. Gage	Dust Control Strategies for Livestock Buildings—A Review by Ronaldo G. Maghirang, Gerald L. Riskowski, Leslie L. Christianson, and Harvey B. Manbeck  A New Mathematical Model of Particle Size Distribution for Swine Building Dust by Yongcheng Chen, Yuanhui Zhang, and E.M. Barber  Identification of Oils to be Sprinkled in Livestock Buildings to Reduce Dust by Yuanhui Zhang, E.M. Barber, J.F. Patience, and J.J.R. Feddes  Estimation of Comfortable Temperatures for Small Laboratory Animals Using Thermography by Hiro-o Hachisu,	1169 1179
	Field Usage and Its Impact on Energy Consumption of Refrigerator/Freezers by Cynthia L. Gage Energy Consumption Testing of Innovative Refrigerator-Freezers by M.T. Wong, B.T. Howell, W.R. Jones, and D.L. Long	1211 1218

SD-95-17 Measurement of Two-Phase Refrigerant Flow	
See also Technical Paper 3926	
See also Technical Paper 3927	
See also Technical Paper 3928	
Measurement and Prediction of Two-Phase Flow Patterns for New Refrigerants Inside Horizontal Tubes by	
Nakhle Kattan, John R. Thome, and Daniel Favrat	1251
Walting Nation, Committee Thomas, and Damon Laviate	1201
SD-95-18 Atrium Design Tools	
A Design Tools	1061
A Design Tool for Glazed Spaces—Part II: Description by Maria Wali	1272
	12/2
Simplified Models for Air Stratification and Thermal Comfort in Atria by Kjell Kolsaker and Frode	4007
Frydenlund	1287
General Shading Model for Solar Building Design by Karl Grau and Kjeld Johnsen	1298
Guidelines for CFD Modeling of Atria by Peter G. Schild, Per O. Tjelflaat, and Dario Aiulfi	1311
SD-95-19 New Developments in Thermal Energy Storage Research	
See also Technical Paper 3929	
See also Technical Paper 3930	
Modeling of Hybrid Combustion Turbine Inlet Air Cooling Systems by J. Kevin Cross, William A. Beckman,	
John W. Mitchell, Douglas T. Reindl, and David E. Knebel	1335
Evaluation of RP-459 Algorithms for Modeling External Melt, Ice-on-Pipe Thermal Storage System Components	
(RP-733) by Jerold W. Jones and G.S. Shiddapur	1342
(, 25, 2, 25, 25, 25, 25, 25, 25, 25, 25,	
SD-95-20 Potential Benefits of Engine-Driven Heating and Cooling Systems	
Residential Gas Heat Pump Assessment: A Market-Based Approach by Patrick J. Hughes	1355
Estimating the Impact of Residential Gas Cooling Equipment on Electric Utility Summer Peak in Northern	1000
California by Bijayendra Kumar and Gary A. Nowakowski	1371
Field Performance of a 3-Ton Natural Gas Engine-Driven Heating and Cooling System by Gary Nowakowski,	1071
	1382
Gerald Merten, and John Brogan	
Gas Engine Heat Pump Performance in a Southern Climate by Vinton L. Wolfe, Jr., and Robert P. Getman .	1389
SOCIETY BUSINESS	
400F 00 AQUIDAF QU' D' Quantille Manchaus Quantille	4000
1995-96 ASHRAE Officers, Directors, Committee Members, and Staff	1399
ASHRAE Chapter Officers	1403
ASHRAE Technical Committees and Task Groups	1405
ASHRAE Standards Project Committees	1421
ASHRAE Past Meetings	1428 1430
Society Presidents	
ASHRAE Honors and Awards	1431
ASHRAE Intersociety Representatives	1440
ASHRAE Associate Societies	1441
In Memoriam	1443
Index of Technical and Symposium Papers, Volume 101, Part 2	1447