

# CONTENTS

Host Chapter.....	xii
Conferences and Expositions Committee and Transactions Staff.....	xii
State of the Society, William A. Harrison, 2008–2009 ASHRAE President.....	xiii
Inaugural Address, Gordon Holness, 2009–2010 ASHRAE President.....	xv
Technical Program.....	xix

## TRANSACTIONS PAPERS

<b>LO-09-001</b> Determining Off-Normal Solar Optical Properties of Drapery Fabrics Nathan Kotey, John L. Wright, and Michael Collins.....	3
<b>LO-09-002</b> Solar Gain through Windows with Shading Devices: Simulation Versus Measurement (RP-1311) Nathan A. Kotey, John L. Wright, Charles S. Barnaby, and Michael R. Collins.....	18
<b>LO-09-003</b> Improving Load Calculations for Fenestration with Shading Devices (RP-1311) Charles S. Barnaby, John L. Wright, and Michael R. Collins.....	31
<b>LO-09-004</b> Simulation Model for Ground Loop Heat Exchangers C. Yavuzturk, A.D. Chiasson, and J.E. Nydahl.....	45
<b>LO-09-005</b> A Design Tool for Hybrid Geothermal Heat Pump Systems in Heating-Dominated Buildings A.D. Chiasson and C. Yavuzturk.....	60
<b>LO-09-006</b> A Design Tool for Hybrid Geothermal Heat Pump Systems in Cooling-Dominated Buildings A.D. Chiasson and C. Yavuzturk.....	74
<b>LO-09-007</b> IEA-ECBCS Annex 41 Whole Building Heat, Air, and Moisture Response Hugo S.L.C. Hens.....	88
<b>LO-09-008</b> From EMPD to CFD—Overview of Different Approaches for Heat Air and Moisture Modeling in IEA Annex 41 Monika Woloszyn, Carsten Rode, Angela Sasic Kalagasidis, Arnold Janssens, and Michel De Paepe.....	96
<b>LO-09-009</b> Reliability of Transient Heat and Moisture Modeling for Hygroscopic Buffering Staf Roels, Chris James, Prabal Talukdar, and Carey J. Simonson.....	111
<b>LO-09-010</b> Grease Particle Emission Characterization from Seven Commercial Kitchen Cooking Appliances and Representative Food Products (RP-1375) Thomas H. Kuehn, Bernard A. Olson, James W. Ramsey, and Joshua M. Rocklage.....	126
<b>LO-09-011</b> Revised Heat Gain Rates from Typical Commercial Cooking Appliances from RP-1362 Rich Swierczyna, Paul Sobiski, and Don Fisher.....	138
<b>LO-09-012</b> Capture and Containment Ventilation Rates for Commercial Kitchen Appliances Measured during RP-1362 Paul Sobiski, Rich Swierczyna, and Don Fisher.....	161
<b>LO-09-013</b> High Performance Computing with High Efficiency Steve Greenberg, Amit Khanna, and William Tschudi.....	179
<b>LO-09-014</b> Introducing Using the Heat Wheel to Cool the Computer Room Robert Sullivan, Marcel Van Dijk, and Mees Lodder.....	187

<b>LO-09-015</b>	Waterside Economizing in Data Centers: Design and Control Considerations Jeff Stein.....	192
<b>LO-09-016</b>	Withdrawn	
<b>LO-09-017</b>	Convergence of Telecommunications and Data Centers David V. Quirk.....	201
<b>LO-09-018</b>	Hurdles in Deploying Liquid Cooling in NEBS Environment Herman Chu .....	211
<b>LO-09-019</b>	Comparisons of Numerical Predictions and Field Tests in a Road Tunnel Ahmed H. Kashef.....	221
<b>LO-09-020</b>	CFD Study of Smoke Movement during the Early Stage of Tunnel Fires: Comparison with Field Tests Yoon J. Ko, George V. Hadjisophocleous, and Ahmed Kashef.....	232
<b>LO-09-021</b>	Evaluation of a Novel Liquid-Flooded Ericsson Cycle Cooler for Vending Machine Applications Jason Hugenroth, James Braun, Eckhard Groll, and Galen King.....	241
<b>LO-09-022</b>	Experimental Investigation of the Effect of Various Parameters on the Infiltration Rates of Single Band Open Vertical Refrigerated Display Cases with Zero Back Panel Flow Mazyar Amin, Dana Dabiri, and Homayun K. Navaz.....	255
<b>LO-09-023</b>	Wind Effects on Smoke Control Ray Sinclair and Michael A. Ratcliff.....	266
<b>LO-09-024</b>	Pressurization of Floors to Improve Life Safety During a High-Rise Fire W.Z. Black .....	278
<b>LO-09-025</b>	Specific Energy Consumption (SEC) for the Integrated Circuit Assembly and Testing (IC A/T) Industry in Taiwan A. Chang, S.-C. Hu, T. Xu, D. Y.-L. Chan, and R. T.-C. Hsu.....	290
<b>LO-09-026</b>	Humidification of Large-Scale Cleanrooms by Adiabatic Humidification Method in Subtropical Areas: An Industrial Case Study Jacky Chen, Shih-Cheng Hu, Liang-Han Chien, James J.M. Tsao, and Tee Lin.....	299
<b>LO-09-027</b>	<i>NOTE: This paper is located between LO-09-073 and LO-09-76.</i>	
<b>LO-09-028</b>	Comparison of Airflow and Contaminant Distributions in Rooms with Traditional Displacement Ventilation and Under-Floor Air Distribution Systems Kisup Lee, Tengfei Zhang, Zheng Jiang, and Qingyan Chen.....	306
<b>LO-09-029</b>	Air Distribution Effectiveness with Stratified Air Distribution Systems (RP-1373) Kisup Lee, Zheng Jiang, and Qingyan Chen .....	322
<b>LO-09-030</b>	In-Situ Performance of Stratified Air Distribution Systems in Two Canadian Buildings Marianne Bérubé Dufour, Dominique Derome, Boualem Ouazia, Michel Tardif, Radu Zmeureanu, André Potvin, and Silvestre Célis-Mercier .....	334
<b>LO-09-031</b>	Discussion of Design Method and Optimization on Airflow Distribution in a Large-Space Building with Stratified Air-Conditioning System C. Huang and X. Wang.....	345

<b>LO-09-032</b>	Contaminant Transport and Filtration Issues with DOAS Stanley A. Mumma.....	350
<b>LO-09-033</b>	Role of Safety Factors in the Design of Dedicated Outdoor-Air Systems John Murphy .....	358
<b>LO-09-34</b>	Building Heat Load Contributions from Medium and Low Voltage Switchgear— Part I: Solid Rectangular Bus Bar Heat Losses (RP-1395) Warren N. White and Emilio C. Piesciorovsky .....	369
<b>LO-09-35</b>	Building Heat Load Contributions from Medium and Low Voltage Switchgear— Part II: Component and Overall Switchgear Heat Gains (RP-1395) Emilio C. Piesciorovsky and Warren N. White .....	382
<b>LO-09-36</b>	Performance Evaluation of Ceiling Mounted Personalized Ventilation System Bin Yang, Arsen Melikov, and Chandra Sekhar.....	395
<b>LO-09-37</b>	Modeling of the Human Body to Study the Personal Micro Environment Ryan K. Dygert, Jackie S. Russo, Thong Q. Dang, and H. Ezzat Khalifa.....	407
<b>LO-09-38</b>	Improved Performance of Personalized Ventilation by Control of the Convection Flow around Occupant Body Zhecho D. Bolashikov, Arsen Melikov, and Miroslav Krenek.....	421
<b>LO-09-39</b>	Test Apparatus and Procedure to Measure Inlet Installation Effects of Propeller Fans (RP-1223) M.N. Young, C. Darvennes, and S. Idem.....	432
<b>LO-09-40</b>	Aerodynamic Performance and System Effects of Propeller Fans (RP-1223) M.N. Young, C. Darvennes, and S. Idem.....	442
<b>LO-09-41</b>	Acoustic System Effects of Propeller Fans Due to Inlet Installations (RP-1223) C. Darvennes, M.N. Young, and S. Idem.....	443
<b>LO-09-42</b>	A Closer Look at CO <sub>2</sub> as a Refrigerant Norbert Müller and Jijo Oommen Joseph.....	456
<b>LO-09-43</b>	A Comparative Study of the Effect of Initial Turbulence on the Performance of an Open Vertical Refrigerated Multi-Deck— A Numerical Study and its Experimental Validation Y.F. Chen, H.W. Lin, W.D. Hsieh, J.Y. Lin, and C.C. Wang .....	463
<b>LO-09-44</b>	An Experimental Evaluation of HVAC-Grade Carbon Dioxide Sensors— Part I: Test and Evaluation Procedure Som S. Shrestha and Gregory M. Maxwell .....	471
<b>LO-09-45</b>	Biological and Metal Contaminants in HVAC Filter Dust Federico Noris, Jeffrey A. Siegel, and Kerry A. Kinney.....	484
<b>LO-09-46</b>	CCLEP Reduces Energy Consumption by More than 50% for a Luxury Shopping Mall L. Wu, M. Liu, X. Pang, G. Wang, J. Wang, and T.G. Lewis.....	492
<b>LO-09-47</b>	Chemical Off-Gassing from Indoor Swimming Pools (RP-1083) Richard C. Cavestri and Donna Seeger-Clevenger .....	502

<b>LO-09-48</b>	Cold Weather Destratification Energy Savings of a Warehousing Facility Mark Armstrong, Bill Chihata, and Ron MacDonald .....	513
<b>LO-09-49</b>	Comfort, Energy Consumption, and Economics of a School with Energy Recovery Melanie Fauchoux, Carey Simonson, and David Torvi.....	519
<b>LO-09-50</b>	Common Data Definitions for HVAC&R Industry Applications (RP-1354) Jason Glazer.....	531
<b>LO-09-51</b>	Communication Performance of BACnet Web Service over the Global Internet Chuzo Ninagawa, Tomotaka Sato, and Yahiko Kawakita .....	545
<b>LO-09-52</b>	Comparative Analysis of Optimization Approaches to Design Building Envelope for Residential Buildings Daniel Tuhus-Dubrow and Moncef Krarti.....	554
<b>LO-09-53</b>	Comparison Between a Radiant Floor and Two Radiant Walls on Heating and Cooling Energy Demand Michele De Carli, Angelo Zarrella, and Roberto Zecchin.....	563
<b>LO-09-54</b>	Condensate Harvesting from Large Dedicated Outside Air-Handling Units with Heat Recovery Frank L. Painter .....	573
<b>LO-09-55</b>	Delivering Sustainability Promise to HVAC Air Filtration— Part I: Classification of Energy Efficiency for Air Filters Christine Sun and Dan Woodman .....	581
<b>LO-09-56</b>	Case Study of Demand Shifting with Thermal Mass in Two Large Commercial Buildings Peng Xu .....	586
<b>LO-09-57</b>	Dynalene/Water Correlations to Be Used for Condensation of CO <sub>2</sub> in Brazed Plate Heat Exchangers (RP-1394) Niel Hayes and Amir Jokar .....	599
<b>LO-09-58</b>	Effects of Jet Inclination Angle and Geometrical Parameters on Air Curtain Performance Samir R. Traboulsi, Ali Hammoud, and M. Farid Khalil .....	617
<b>LO-09-59</b>	Electrical Energy Impacts of Residential Building Codes for Homes in Austin, Texas John Trowbridge .....	630
<b>LO-09-60</b>	Energy Conservation Effects of Heat Source Systems for Business Use by Advanced Centrifugal Chillers Kenji Ueda, Yoshie Togano, and Yoshiyuki Shimoda .....	640
<b>LO-09-61</b>	Withdrawn	
<b>LO-09-62</b>	Evaluation of Typical Weather Year Selection Approaches for Energy Analysis of Buildings (RP-1477) Donghyun Seo, Joe Huang, and Moncef Krarti .....	654
<b>LO-09-63</b>	Experimental Investigation of Orbiting Thrust Bearing Using Wide and Shallow Circular Pockets Amit Vaidya and Farshid Sadeghi .....	668
<b>LO-09-64</b>	Experimental Measurement and Uncertainty Analysis on the Energy Performance of a Chilled Water Cooling Coil Ryan D. Warren, Rahul L. Navale, Ron M. Nelson, and Curtis J. Klassen.....	676

<b>LO-09-65</b>	Experimental Measurements of a Run-Around Membrane Energy Exchanger (RAMEE) with Comparison to a Numerical Model Blake Erb, Mehran Seyed Ahmadi, Carey J. Simonson, and Robert W. Besant .....	689
<b>LO-09-66</b>	Withdrawn	
<b>LO-09-67</b>	Field Measurements of Innovative Indoor Shading Systems in a Full-Scale Office Testbed E.S. Lee, D.L. DiBartolomeo, J.H. Klems, R.D. Clear, K. Konis, M. Yazdanian, and B.C. Park .....	706
<b>LO-09-68</b>	Field Studies in the United States and United Kingdom of the Effectiveness of Mechanical Ventilation Systems on Indoor Air Quality in Hospitality Venues where Smoking is Allowed in Relation to Outdoor Air Conditions Elia Sterling and Michael Glassco.....	729
<b>LO-09-69</b>	Frost Accumulation Control on an Upward-Facing Horizontal Flat Plate Using Electric Field Cesare Maria Joppolo and Luca Molinaroli.....	737
<b>LO-09-70</b>	Functional Exergy Efficiency at Near-Environmental Temperatures E.C. Boelman, P. Sakulpipatsin, H.J. van der Kooi, L.C.M. Itard, and P.G. Luscuere.....	748
<b>LO-09-71</b>	Improving Control and Operation of a Single Duct VAV System through CCLEP Young-Hum Cho, Mingsheng Liu, Xiufeng Pang, Jinrong Wang, and Thomas G. Lewis .....	760
<b>LO-09-72</b>	Withdrawn	
<b>LO-09-73</b>	Integral Design of School Ventilation W. Zeiler, G. Boxem, and D. Schuiling.....	769
<b>LO-09-74</b>	Withdrawn	
<b>LO-09-75</b>	Withdrawn	
<b>LO-09-27</b>	Required Duration for Borehole Test Validated by Field Data Yedi D. Liu and Richard A. Beier .....	782
<b>LO-09-76</b>	The Role of Plants in the Reduction of Heat Flux through Green Roofs:Laboratory Experiments Paulo Cesar Tabares-Velasco and Jelena Srebric .....	793
<b>LO-09-77</b>	Withdrawn	
<b>LO-09-78</b>	Thermal Modeling of Shading Devices of Windows A. Laouadi .....	803
<b>LO-09-79</b>	Ventilation of Sustainable Schools: Better than Traditional Schools? W. Zeiler and G. Boxem.....	815
<b>LO-09-80</b>	VFD Application for Constant Volume Air-Handling Units Young-Hum Cho, Mingsheng Liu, Gang Wang, Jinrong Wang, and Timothy Rauscher .....	824
<b>LO-09-81</b>	Withdrawn	
<b>LO-09-82</b>	Laboratory Evaluation and Modeling of Electrostatic Precipitation of PM Emissions from Poultry Buildings Roderick B. Manuzon and Lingying Zhao .....	831

<b>LO-09-83</b>	Large Eddy Simulation of Airflows in a Full Scale Room at Different Ventilation Rates Jianbo Jiang and Xinlei Wang .....	850
<b>LO-09-84</b>	Experimental and Numerical Study of Airflows in a Full-Scale Room Jianbo Jiang, Xinlei Wang, Yigang Sun, and Yuanhui Zhang .....	867
<b>LO-09-85</b>	Infiltration in ASHRAE's Residential Ventilation Standards Max Sherman .....	887
<b>LO-09-86</b>	A Method for Modifying Ventilation Airflow Rates to Achieve Equivalent Occupant Exposure Aaron Townsend, Armin Rudd, and Joseph Lstiburek .....	897
<b>LO-09-87</b>	Indoor Moisture in 30 Homes Using Unvented Gas Fireplaces Paul W. Francisco, Jeffrey R. Gordon, and William B. Rose .....	914
<b>LO-09-88</b>	A Calibrated Multi-Zone Airflow Model for Extension of Ventilation System Tracer Gas Testing Aaron Townsend, Armin Rudd, and Joseph Lstiburek .....	924
<b>LO-09-89</b>	The Validation of a VOC Diffusion Sink Model Based on Full-Scale Chamber Test (RP-1321) Qinqin Deng, Jianshun S. Zhang, and Xudong Yang .....	943
<b>LO-09-90</b>	An Improvement for Dynamic Twin Chamber Method to Measure VOC Diffusion Coefficient and Partition Coefficient Jianyin Xiong, Yinping Zhang, Wei Yan, and Zhongkai He .....	954
<b>LO-09-91</b>	Emerging Applications in Cryogenics—Nitrogen Injection for Reservoir Enhanced Oil Recovery Md. Didarul Islam, Mohamed Alshehhi, and Michael Ohadi .....	959
<b>LO-09-92</b>	Modeling and Optimization of a Cascaded Mixed Gas Joule-Thompson Cryoprobe System (RP-1472) Harrison Skye, Greg Nellis, and Sanford Klein .....	966
<b>LO-09-93</b>	Energy Design Guides for Army Barracks Dale Herron, Alexander Zhivov, and Michael Deru .....	984
<b>LO-09-94</b>	Achieving Energy Efficiency and Improving Indoor Air Quality in Army Maintenance Facilities Alexander Zhivov, Dale Herron, and Michael Deru .....	997
<b>LO-09-95</b>	Improving Energy Performance of Army Dining Facilities Michael Deru, Alexander Zhivov, Dale Herron, Donald Fisher, and Vernon Smith .....	1013

## **SOCIETY BUSINESS**

2008–2009 ASHRAE Officers, Directors, Staff, and Committee Members .....	1035
2008–2009 ASHRAE Chapter Officers .....	1039
2008–2009 ASHRAE Technical Committees and Task Groups .....	1043
2008–2009 ASHRAE Standard Project Committees and Guideline Project Committees .....	1074
ASHRAE Past Meetings .....	1085
Society Presidents .....	1087
ASHRAE Honors and Awards .....	1089