CONTENTS

Host Chapter, 0	Officers, and Conferences and Expositions Committee	xvii
	ciety Address, Farooq Mehboob, 2022–2023 ASHRAE President	
•	ess, Ginger Scoggins, 2023–2024 ASHRAE President	
Technical Prog	ram	. xxvi
	EXTENDED ABSTRACTS	
TA-23-A001	Potentials of Direct Air Capture (DAC) of CO ₂ in a Dedicated Outside Air System (DOAS) Youngsik Choi, Student Member ASHRAE; Zheng O'Neill, PhD, PE, Fellow ASHRAE; Shu Yang, PhD	3
TA-23-A002	The Feasibility of Wi-Fi Based Demand-Controlled Ventilation and Impact on Indoor Air Quality Troye Sas-Wright, Student Member ASHRAE; Jordan Clark, PhD, Full Member ASHRAE	6
T4 00 4000	•	^
TA-23-A003	Energy Modeling of Housing in Rural Alaska Using BEopt and AkWarm Patricia Guillante, ASHRAE Student Member; Kristen Cetin, PhD, PE, Full Member ASHRAE	9
TA-23-A004	WITHDRAWN	
TA-23-A005	Mathematical Modeling and Analysis of a Hybrid Heat Pump Dryer (MemDry) Coupled with a Passive Membrane Dehumidifier B. Anand, PhD, Associate Member ASHRAE; Jinwoo Oh, PhD, Affiliate Member; Andrew J. Fix, Student Member ASHRAE; Junyan Ren, Student Member ASHRAE; Songhao Wu, Student Member ASHRAE; Davide Ziviane, PhD, Full Member ASHRAE; James E. Braun, PhD, Fellow ASHRAE; David Warsinger, Full Member ASHRAE	13
TA-23-A006	Are We Back Yet?: A Statistical Analysis of the Return of University Buildings to Pre-pandemic Energy Consumption Patterns Philip A. Ramsey, PE, Student Member ASHRAE; Daniel B. Gingerich, PhD; Jordan D. Clark, PhD, Full Member ASHRAE	16
TA-23-A007	Demonstrations of Geo-fencing Occupancy-Based Control in Smart and Connected Homes Blake Smith-Cortez; Zhiyao Yang, PhD, Associate Member ASHRAE; Zheng O'Neill, PhD, PE Fellow ASHRAE	20
TA-23-A008	Leveraging IoT Retrofits to Integrate Existing Buildings into the Realm of Smart Homes Thomas Firsich, Student Member ASHRAE; Zheng O'Neill, PhD, PE, Fellow ASHRAE	23
TA-23-A009	Greenhouse Gas Emission Factors for Building Stock Modeling Constantinos A. Balaras, PhD, Peng, Fellow ASHRAE; Elena G. Dascalaki, PhD; Matina Patsioti	26
TA-23-A010	Review of Baselining Methods to Quantify Load Shed in Academic Buildings by Testing on 100 Buildings Located in Ohio Yashvi Malhotra, Student Member ASHRAE; Jordan D. Clark, PhD, Full Member ASHRAE	29
TA-23-A011	Building and City Scale Public Sustainability Assessment System for Mediterranean Cities Constantinos A. Balaras, PhD, Fellow ASHRAE; Kalliopi Droutsa; Elena G. Dascalaki, PhI Simon Kontoyiannidis; Andrea Moro; Elena Bazzan	33 D;
TA-23-A012	Study on Airtightness and Pressurization in a BSL-3 Laboratory Using Measurement and Simulation Indra Permana, Student Member ASHRAE; Fujen Wang, PhD, PE, Fellow ASHRAE; Yung-Chieh Cheng, Student Member ASHRAE	36
TA-23-A013	Model Free Control for Non-Uniform Indoor Environment Using Reinforcement Learning Mingzhe Liu, PhD, Full Member ASHRAE; Yangyang Fu, PhD, Full Member ASHRAE; Zheng O'Neill, PhD, PE, Fellow ASHRAE	39

TA-23-A014	Cold Start Methods for Building's Energy Consumption Forecasting Delgado F. Carlos A.; Abdali Aymane; Bartosz Boguslawski, PhD; Florent Pesando; Lucas Drumetz, PhD; Vincent Gripon, PhD	43
TA-23-A015	Development of a Partial Pressure-Driven Discretization Model of Hollow Fiber Membranes for Air Dehumidification Jinwoo Oh, PhD, Affiliate Member ASHRAE; Anand Balarman, PhD, Associate Member ASHRAE; Andrew J. Fix, Student Member ASHRAE; Songhao Wu, Student Member ASHRAE; Davide Ziviani, PhD, Full Member ASHRAE; James E. Braun, PhD, Fellow ASHRAE; David M. Warsinger, PhD, Full Member ASHRAE	46
TA-23-A016	Selective Membrane Humidity Management in Electronics Songhao Wu, Student Member ASHRAE; Andrew J. Fix, Student Member ASHRAE; Jinwoo Oh, Affiliate Member ASHRAE; James E. Braun, PhD, ASHRAE Fellow/Life Member ASHRAE; Anand Balaraman, Associate Member ASHRAE; David M. Warsinger, PhD, Full Member ASHRAE	
TA-23-A017	Leveraging Unique Properties of Metal Organic Frameworks for Leaps Forward in Air Conditioning Performance Saba Zakeri Shahvari, Student Member ASHRAE; Jordan Clark, PhD, Full Member ASHRAE	52
TA-23-A018	Numerical Modeling of a Rotary Desiccant Wheel Using Super Absorbent Polymer for Air Dehumidification Xiaoli Liu, PhD, Full Member ASHRAE; Kai Li, PhD, Full Member ASHRAE; Kashif Nawaz, PhD, Full Member ASHRAE	55
TA-23-A019	Life Cycle Climate Performance Analysis for Drop-in Replacement R134 Alternatives in Chillers Michael O. Akinseloyin, Student Member ASHRAE; Carter Hall; Jordan A. Morrow, Full Member ASHRAE; Melanie M. Derby, PhD, Full Member ASHRAE	58
	CONFERENCE PAPERS	
TA-23-C001	Field Testing of the Energy-Saving Potential of an Occupancy Presence Sensing System in an Apartment Unit Zhihong Pang, PhD, Associate Member ASHRAE; Blake Smith-Cortez; Zhiyao Yang, PhD, Associate Member ASHRAE; Zheng O'Neill, PhD, PE, Fellow ASHRAE	63 E
TA-23-C002	Field Study of Thermal Infrared Sensing for Office Temperature Control Akihisa Nomoto, PhD, Associate Member ASHRAE; Donghun Kim, PhD, Full Member ASHRAE; Hui Zhang, PhD; Yingdong He, PhD; Charlie Huizenga; Edward Arens, PhD, Fellow ASHRAE; Robert Prickett; Sri Swaminathan; Ronnen Levinson, PhD	72
TA-23-C003	Investigation into the Pertinence of Using Child-Specific Radiation Data for Thermal Comfort Calculations Nour Youssef, Student Member ASHRAE; Katherine D'Avignon, PhD, Eng, Full Member ASHRAE	81
TA-23-C004	A Simulation Framework for Analyzing the Impact of Stochastic Occupant Behaviors on Demand Flexibility in Typical Commercial Buildings Zhelun Chen, PhD, Associate Member ASHRAE; Yicheng Li, Student Member ASHRAE; Jin Wen, PhD, Full Member ASHRAE; Amanda Pertzborn, PhD, Associate Member ASHRAE; W. Vance Payne, PhD, Full Member ASHRAE; L. James Lo, PhD, Full Member ASHRAE; Gabriel Grajewski, Student Member ASHRAE; Zheng O'Neill, PhD, PE, Fellow ASHRAE; Steven T. Bushby, Fellow ASHRAE	92 AE;
TA-23-C005	An EEM by Any Other Name: Best Practices for Naming Energy Efficiency Measures Apoorv Khanuja, Student Member ASHRAE; Amanda Webb, PhD, Full Member ASHRAE	100

TA-23-C006	Decarbonization: The Product of Integrated Design Robert Bean, Fellow ASHRAE	109
TA-23-C007	Interactive Effects of Interior Ambient Light and Temperature on Thermal Comfort and Driving Performance Chao Wang Student Member ASHRAE; John Elson, PhD, Full Member ASHRAE;	117
	Shichao Liu, PhD, Full Member ASHRAE	
TA-23-C008	The Limits of 'Net Zero' for Specifying Building Performance Jim Edelson, Full Member ASHRAE; Kim Cheslak, Full Member ASHRAE; Charles Eley, Full Member ASHRAE; David Goldstein, Full Member ASHRAE	124
TA-23-C009	Energy Savings with Destratification Fans in National Guard Facilities during Heating Season Rich Swierczyna, Full Member ASHRAE; Jason LaFleur, Associate Member ASHRAE; Jason Stein, Associate Member ASHRAE	133
TA-23-C010	Assessing the Performance of Mechanical Filters in Restoring the Performance of Closed Looped Hydronic Heating and Cooling System Amr Suliman, Associate Member ASHRAE; Darren Wilkinson, Full Member ASHRAE; Vanda Dimitriou, PhD, Associate Member ASHRAE; Mahroo Eftekhari, DPhil, Full Member ASHRAE; Enea Dimitris Tseno, Associate Member ASHRAE	142
TA-23-C011	Fan Power Modeling of Commercial HVAC Systems: A Comparative Study Samy Faddel, PhD; Huangjie Gong, PhD; Franck Jung	151
TA-23-C012	Energy and Cost Assessment of The Proposed Dual VAV System Iffat Ridwana, Student Member ASHRAE; Nabil Nassif, PhD, PE, Full Member ASHRAE	160
TA-23-C013	Impact of Crossflow Microsand Filtration on Particle Removal in Cooling Tower Circuit Vaishali Ashok, PhD, PE; Dominique Claveau-Mallet, PhD, Ing.; Etienne Robert, PhD, Ing. Alain Silverwood; Emilie Bédard, PhD, Ing.	169 g.;
TA-23-C014	Development and Investigation of Advanced HVAC Demand Control Gang Wang, PhD, PE, Full Member ASHRAE; Junke Wang, Full Member ASHRAE; Nurayn Tiamiyu, Student Member ASHRAE; Zufen Wang, Full Member ASHRAE; Li Song, PhD, PE, Full Member ASHRAE	176
TA-23-C015	The Considerations and Limits of Single-Phase Immersion Cooling Deployments in Data Center Cooling Nan Chen, PhD, Full Member ASHRAE; Yunshui Chen; Nick Xu, Full Member ASHRAE	184
TA-23-C016	Cooling Energy Saving in Data Centers in Hot and Humid Climates Using a Dehumidification Assisted Evaporated Cooling System Hyo-Lim Park, PhD, Student Member ASHRAE; Soo-jin Lee, Student Member ASHRAE; Jae-Weon Jeong, Full Member ASHRAE	193
TA-23-C017	Investigations on the Cost-Effective Design and Operation of Water-Based Thermal Energy Storage Systems for Data Centers Amir Abdolhosseinzadeh; Hamza Salih Erden, PhD, Full Member ASHRAE	202
TA-23-C018	Application of CFD and Flow Network Modeling for the Design and Operation of Hybrid-Cooled Data Centers Ali Heydari, PhD, Full Member ASHRAE; Bahareh Eslami, PhD, Full Member ASHRAE; Vahideh Radmard, PhD; Pardeep Shahi, PhD; Peter Chen; Mohammad Tradat, PhD; Jeremy Rodriguez	211
TA-23-C019	Rationalizing Data Center Whitespace Airflow and Energy-Flow Metrics James W. VanGilder, PE, Full Member ASHRAE; Michael Condor; Wei Tian, PhD, Associate Member ASHRAE	220

TA-23-C020	Demonstrating Load-Shaping Capabilities of Cost Minimizing Heat Pump Water Heater Controls with Varying Price Profiles Marius Stübs, PhD; Peter Grant; Bruce Nordman	228
TA-23-C021	Stabilizing the Grid and Reducing Utility Bills Through Price-Responsive Controls for Heat Pump Water Heaters Peter Grant; Marius Stübs, PhD; Bruce Nordman; Christoph Gehbauer	237
TA-23-C022	Evaluation of Energy Efficiency and Thermal Comfort Delivery for a Novel Wall-Integrated Micro Heat Pump in Heating Mode Feng Wu, Student Member ASHRAE; Sarah Alkandar, Student Member ASHRAE;	246
	Jie Ma, Full Member ASHRAE; Parveen Dhillon, Student Member ASHRAE; Haotian Liu, Full Member ASHRAE; Panagiota Karava, Full Member ASHRAE; James Braun, Fellow ASHRAE; W. Travis Horton, Full Member ASHRAE; Davide Ziviani, Full Member ASHRAE	
TA-23-C023	Decarbonization through Residential Air-Source Heat Pumps Aniruddh Roy, Full Member ASHRAE; Dylan Sarkisian	255
TA-23-C024	Calculating Breakout from HVAC Ductwork Jerry G. Lilly, PE, Life Member ASHRAE	264
TA-23-C025	Investigating the Emission Reduction Co-benefits of using Heat Pumps vs. Natural Gas Furnaces C.Victoria McCrary, Student Member ASHRAE; Jonathan Buonocore, ScD;	272
TA-23-C026	Joseph G. Allen, ScD; Parichehr Salimifard, PhD, Associate Member ASHRAE Simulation of Duct Breakout Transmission Loss and Applications Caoyang Li, Student Member ASHRAE; D.W. Herrin, Full Member ASHRAE	281
TA-23-C027	Ramifications of Adding a Thin Protective Layer to Fiber Lining on Duct Insertion Loss Caoyang Li, Student Member ASHRAE; D.W. Herrin, PE, Full Member ASHRAE	290
TA-23-C028	Field Implementation of MPC for Heat Pump-Based Dual Fuel Systems in Small Commercial Buildings for Decarbonization	298
	Lazlo Paul, Full Member ASHRAE; Sang woo Ham, PhD, Full Member ASHRAE; Marco Pritoni, PhD, Full Member ASHRAE; Donghun Kim, PhD, Full Member ASHRAE; Rich Brown; Jingjuan Dove Feng, PhD, PE, Associate Member ASHRAE	
TA-23-C029	Empirical Analysis of Cascade Heat Pump System for Heating with Different Types of Refrigerant Flows Based on Field Test Beom-Jun Kim, Student Member ASHRAE; Hye-Jin Cho, PhD, Full Member ASHRAE; Hyo-Lim Park, Student Member ASHRAE; Jae-Weon Jeong, PhD, Full Member ASHRAE	307
TA-23-C030	Evaluating Occupants' Willingness-to-Pay to Avoid Consequences of Extreme Climate Change Weather Events: Lessons Learned from the Ottawa 2022 Derecho	315
	Santinah Green-Mignacca, Student Member ASHRAE; Milad Rostami, Student Member ASHRAE; Scott Bucking, Associate Member ASHRAE	
TA-23-C031	Data-Driven Model to Capture Building Dynamics during Different Patterns of Power Outages	323
	Mingjun Wei, Student Member ASHRAE; Mingzhe Liu, PhD, Full Member ASHRAE; Yangyang Fu, PhD, Full Member ASHRAE; Zhiyao Yang, PhD, Full Member ASHRAE; Zheng O'Neill, PhD, PE, Fellow ASHRAE	
TA-23-C032	Embodied Carbon and Thermal Performance of Building Envelope Assembly Insulation: Implications for Codes and Decarbonization Lyla Fadali, PhD; Michael Waite, PhD, PE, Full Member ASHRAE	331
TA-23-C033	Model Energy Codes End-Use Opportunity Analysis Chitra Nambiar, Associate Member ASHRAE; Xuechen Lei, Associate Member ASHRAE; Michael Rosenberg, Fellow ASHRAE	339 ;

TA-23-C034	WITHDRAWN	
TA-23-C035	Advancing Thermal Envelope Measures to Create a Foundation for Decarbonized New Construction Kevin Carbonnier, PhD; Kim Cheslak, Full Member ASHRAE; Mark Lyles, Full Member ASHRAE	348
TA-23-C036	Data-Driven Investigation of How Performance-Based Code is Pushing Washington Commercial Buildings to Net Zero Energy and Decarbonization Targets Xuechen Lei, PhD, Associate Member ASHRAE; Supriya Goel, Full Member ASHRAE; Juan Gonzalez; Jeremy Lerond, Associate Member ASHRAE; Michael Rosenberg, Fellow ASHRAE; Yan Zhao	356
TA-23-C037	Modeling and Simulation of Dedicated Outdoor Air System (DOAS) with a Passive Desiccant Wheel: A Case Study using EnergyPlus Youngsik Choi, Student Member ASHRAE; Xing Lu, PhD, Associate Member ASHRAE; Zheng O'Neill, PhD, PE, Fellow ASHRAE; Zhihong Pang, PhD, Associate Member ASHR	365 AE
TA-23-C038	Optimization of the Liquid Desiccant Cooling Systems in Hot and Humid Areas Yanling Zhang; Hao Zhang, PhD; Hongxing Yang, PhD; Yi Chen, PhD; Chun-Wah Leung, PhD	374
TA-23-C039	Evaluation of Suitability of CO ₂ Measuring Devices in Practice with a Focus on Measuring Accuracy Benoît Sicre, PhD; Stephan Zuber	383
TA-23-C040	Study of the Impacts of COVID-19 Pandemic on Energy Consumption and CO ₂ Emissions in University Campus Buildings Xiaoli Li; Juan-Carlos Baltazar, PhD, PE, BEMP, Full Member ASHRAE	າ 391
TA-23-C041	Pitfalls of Using CO ₂ Measurements as the Sole Indicator of IAQ and Airborne Transmission Risk Michael J. Risbeck, PhD; Jonathan D. Douglas, Full Member ASHRAE; Brennan Fentzlaf Full Member ASHRAE; Zhanhong Jiang, PhD; Alexander E. Cohen; Young M. Lee, PhD, Full Member ASHRAE; Martin Z. Bazant, PhD	400 f,
TA-23-C042	Development of Three Inverse Modeling Approaches for Zone-Level Virtual Metering of Heat Supplied by Perimeter Heaters Tanmay Agrawal; Hamidreza Karimian, Full Member ASHRAE; Mohamed Ouf, PhD, PE, Full Member ASHRAE; Burak Gunay, PhD, PE, Full Member ASHRAE	410
TA-23-C043	A Building Performance Simulation-Based Investigation on Fault Tolerance of Sequences of Operation for VAV AHU Systems Narges Torabi, Student Member ASHRAE; H. Burak Gunay, Associate Member ASHRAE William O'Brien, Associate Member ASHRAE; Shane Ferreira, Student Member ASHRAE	419 ;
TA-23-C044	Reimagining Energy-Efficient Cooling Through Comfort-Based Occupant-Centric Micro-Zonal Control Jeslu Celine Jacob, Student Member ASHRAE; Debapratim Pandit, PhD; Joy Sen, PhD	428
TA-23-C045	Sensors, Storage, and Algorithms for Practical Optimal Controls in Residential Buildings Elias N. Pergantis, Student Member ASHRAE; Anokhi S. Sangamnerkar, Student Member ASHRAE; Priyadarshan, Student Member ASHRAE; Jonathan Ore, PhD, Full Member ASHRAE; Parveen Dhillon, PhD, Full Member ASHRAE; Davide Ziviani, Fellow ASHRAE Eckhard A. Groll, Fellow ASHRAE; Kevin J. Kircher, Full Member ASHRAE	
TA-23-C046	WITHDRAWN	
TA-23-C047	Analysis of Thermal Distribution Patterns in Multi-Occupancy Environments Fatih Topak; Gregory S. Pavlak, PhD, Full Member ASHRAE; M. Koray Pekeriçli, PhD; Julian Wang, PhD	445

TA-23-C048	Field Demonstration of the Brick Ontology to Scale up the Deployment of ASHRAE Guideline 36 Control Sequences Carlos Duarte Roa, PhD, Full Member ASHRAE; Paul Raftery, PhD, Full Member ASHRAE Anand Prakash; Therese Peffer, PhD	453 E;
TA-23-C049	Intelligent Integration of Desk Fans in Energy-Efficient Ventilation— Including Occupant Perspectives and Predictions into Decision Making Arup Bhattacharya, PhD, Associate Member ASHRAE; Amirhosein Jafari, PhD; Seddigheh Norouziasl	463
TA-23-C050	Development of an Application Programming Interface for a Building Systems Control Performance Verification Framework Xuechen Lei, PhD, Associate Member ASHRAE; Jeremy Lerond, Associate Member ASHRAE; Yun Joon Jung, PhD; Yan Chen, PhD, Full Member ASHRAE	472
TA-23-C051	The Indoor Air Quality of Classrooms With and Without Portable Air Purifiers: A Pilot Study Daud Nosham, Student Member ASHRAE; Josephine Lau, PhD, Full Member ASHRAE; James A. Bovaird, PhD	481
TA-23-C052	Design and Application of an in Situ IoT-Based Energy Monitoring System for Use in Real Time Building Modeling Aaron Farha, Student Member ASHRAE; Jonathan Ore, PhD, Full Member ASHRAE; Elias N. Pergantis, Student Member ASHRAE; Lokesh Sriram, Student Member ASHRAE Davide Ziviani, PhD, Full Member ASHRAE; Eckhard A. Groll, Dr. Eng., Fellow ASHRAE	490 :;
TA-23-C053	WITHDRAWN	
TA-23-C054	WITHDRAWN	
TA-23-C055	A Cybersecurity Testbed for Smart Buildings Sivasathya Balamurugan; Steve Granda; Selam Haile; Anya Petersen; Jing Wang, Full Member ASHRAE; Jiazhen Ling, Full Member ASHRAE	498
TA-23-C056	Comparing HVAC Fan Operation with a Ceiling Fan and Room Air Cleaner Combination for Indoor Air Quality, Thermal Comfort, and Energy Use in a Multizone Residence Daniel Rush, Student Member ASHRAE; Mengjia Tang, PhD, Associate Member ASHRA Sangeetha Kumar, PhD; Student Member ASHRAE; Atilla Novoselac, PhD, Full Member ASHRAE	507 E;
TA-23-C057	The Impact of Thermally Adaptive Light Louvers Attached to Clerestories on Indoor Natural-Light Performance During the Winter Season Omar Humaidan; Khaled Almazam; Jae Chang, PhD	515
TA-23-C058	Improving the Performance of Thin-Film BIPV Using Thermally-Adaptive Composite Materials Khaled Almazam; Omar Humaidan; Jae Chang, PhD	523
TA-23-C059	Assessing Emission Reduction Potential of Small-Scale (<100 kWe) Combined Heat and Power Systems for Multi-Family Residential Buildings in the United States Christopher R. Curl, Student Member ASHRAE; Brian M. Fronk, PhD, Associate Member ASHRAE	532
TA-23-C060	Pathways to Achieve Thermal and Energy Performance of Residential Windows to Meet 2030 NZE Target Anil Parekh, PEng, Full Member ASHRAE	541
TA-23-C061	Explosion Hazard Considerations for HVAC Equipment Serving Lithium-Ion Battery Energy Storage Systems Arny Leroy, PhD, Full Member ASHRAE; Khaled Hashad, PhD; Michael Barry, PhD, PE, Full Member ASHRAE; Alfonso Ibarreta, PhD, PE	549

TA-23-C062	WITHDRAWN	
TA-23-C063	Considerations in Intelligently Sizing and Controlling TES-Integrated HVAC Systems Armando Casillas, Affiliate Member ASHRAE; Sang woo Ham, PhD, Full Member ASHRAE Dre Helmns, PhD, Full Member ASHRAE; Lazlo Paul, Affiliate Member ASHRAE	558 AE;
TA-23-C064	Energy Storage Potential of Electrical Appliances for Office Buildings Based on User Surveys	566
	Mengrong Gao; Lanhao Liao; Xuanying Lin; Yi Zhang, PhD	
TA-23-C065	User Survey Based Investigation on Energy Storage Potential of Electric Appliances for Residential Buildings	580
	Weizheng Lin; Hongjun Li; Yi Zhang, PhD	
TA-23-C066	Evaluating the Influence of Program Type Building Parameters on UBEM: A Case Study for the Residential Stock in Nottingham, UK	591
	Athanasia Apostolopoulou, Student Member ASHRAE; Doreen Boyd; Carlos Calderon; Stefano Cavazzi; Carlos Jimenez-Bescos; Robin Wilson	
TA-23-C067	An Energy Consumption Intensity Ranking System for Rapid Energy Efficiency Evaluation of a Cluster of Commercial Buildings	601
	Aditya Ramnarayan, Student Member ASHRAE; Andres Sarmiento, PhD; Armin Gerami; Michael Ohadi, PhD, Fellow ASHRAE	
TA-23-C068	WITHDRAWN	
TA-23-C069	CFD Analysis of Demand Control Ventilation (DCV) for Laboratory Facilities Kishor Khankari, PhD, Fellow ASHRAE	611
TA-23-C070	Effect of Surgical Light Placement and Orientation in Operating Rooms on Aerosol Exposure to Healthcare Workers and Patients Ryan A. Darragh, PhD, Affiliate Member ASHRAE; Andrew S. Gearhart, PhD; Alexander S. New, PhD; Michael S. Robinette; Jeffrey Freeman, PhD; Lucy Carruth, PhD Brian Damit, PhD; Christopher D. Stiles, PhD	619 ;
TA-23-C071	Exploring an Effective and Efficient Approach to Smoke Control in Underground Parking Garages Xiaolei Chen, PhD; Frank Wang, PE; Anthony Perez; Christopher Chen	629
TA-23-C072	Effect and Estimation of Louver Porosity on Wind Load Digambar Killedar; Mike Astourian; Jeffrey Smith, PE; Nikhil Desai; Parmeshwar Patil; Aaron Gunzner, PE; Scott Arnold	638
TA-23-C073	Going Beyond Business as Usual: Finding Deeper Cost and Carbon Savings in Multifamily Energy Efficiency Programs Hashani De Silva, Student Member ASHRAE; Amanda Webb, PhD, Full Member ASHRA	646 E
TA-23-C074	Study on the Incentive Mechanism of EV Charging Service by Buildings Based on Conjoint Analysis Hongjun Li; Weizheng Lin; Yi Zhang, PhD	656
TA-23-C075	A Framework for Evaluating Pathways to Building Decarbonization: Case Study in Seattle City Light	665
	Maggie Sheng, Associate Member ASHRAE; Siva Sankaranarayanan, Full Member ASHRAE; Madeline Kostic, Full Member ASHRAE	
TA-23-C076	The Application of Statistical and Machine Learning Techniques in Building Performance Assessment and Prediction: A Review	673
TA 00 0077	Jie Li, Student Member ASHRAE; Ute Poerschke	
TA-23-C077	Limitations of Conventional Artificial Neural Network-Based Surrogate Models for Building Energy Retrofit Chul-Hong Park; Tae Yong Song; Young-Sub Kim; Seon-Jung Ra; Cheol-Soo Park, PhD,	683
	Full Member ASHRAE	

TA-23-C078	Machine Learning-Enhanced Operation of a Solar-Driven HVAC System: A Case Study Michael Berger; Shruthi Balaji; Richard McElhinney, Full Member ASHRAE	691
TA-23-C079	An Evaluation of Ensemble Machine Learning Algorithms for Predicting Thermal Sensation Using the ASHRAE Comfort Database II Atiye Soleimanijavid, Student Member ASHRAE; Iason Konstantzos, PhD, Associate Member ASHRAE	699
TA-23-C080	Scaling Decarbonization with Early-Stage Energy Modeling Patrick Pease, PE, Full Member ASHRAE; Akshay Padwal, Associate Member ASHRAE; Mostafa Tahmasebi, PhD, Associate Member ASHRAE	708
TA-23-C081	An Innovative Building Energy Use Analysis by Unsupervised Classification and Supervised Regression Models Tian Li, Student Member ASHRAE; Jiarong Xie, Student Member ASHRAE; Tianqi Liu, Student Member ASHRAE; Yi Lu; Azadeh Omidfar Sawyer, PhD, Full Member ASHRAE	715
TA-23-C082	IEQ Project at a Children's Library Dhanurja De Silva, Student Member ASHRAE; Yalin Lu, Student Member ASHRAE; William Hutzel, PE, Full Member ASHRAE	725
TA-23-C083	Experimental Investigation on a Liquid Desiccant System with a Solution Atomization by the Ultrasound Soo-Jin Lee, Student Member ASHRAE; Beom-Jun Kim, Student Member ASHRAE; Su-Young Jo, Student Member ASHRAE; Jae-Weon Jeong, PhD, Full Member ASHRAE	733
TA-23-C084	Modeling Indoor Botanical Fresh Air Generation Will Pepi, Student Member ASHRAE	741
TA-23-C085	Local vs. Integrated Control of a Cooling System in a Factory Building Young-Sub Kim, Jin-Hong Kim; Hyeong-Gon Jo; Cheol-Soo Park, PhD, Full Member ASHRAE; Eiji Urabe, PE; JeongHun Gwak, PE; YongSung Park, PE	752
TA-23-C086	Condensation-Evaporation Modeling of Drift from a Mechanical Cooling Tower K. Han, PhD, PE, Full Member ASHRAE; A. Mistreanu, PhD; C. Sobecki, PhD, Full Member ASHRAE; B. d'Entremont, PhD, Full Member ASHRAE	760
TA-23-C087	A Systematic Approach to Evaluate Efficiency and Economic Viability of Using Heat Transfer Nano-Fluid in HVAC Systems Ayman Youssef, PE, Full Member ASHRAE; Abdulmajeed Almohnna, Full Member ASHRAE	767
TA-23-C088	Oil Retention in Suction and Discharge Pipes of Vapor Compression Cycles with Various Refrigerants and Oil Types Haotian Liu, PhD, Full Member ASHRAE; Vatsal M. Shah, PhD, Full Member ASHRAE; Eckhard A. Groll, PhD, Fellow ASHRAE; James E. Braun, PhD, Fellow ASHRAE	775
TA-23-C089	Validation of Energy Savings from a Condenser Water Supply Temperature Reset Strategy Kevin Dai; Jonathan Lerner; Aditi Pattabhiraman; John Rundell, PE; Oliver Zhang; Melody Baglione, PhD	784
TA-23-C090	Real-Time Deployment of Building Automation System-Integrated Inverse Model-Based Fault Detection and Diagnostic Algorithms Andre A. Markus, Student Member ASHRAE; Brodie W. Hobson, Student Member ASHRAE; Jayson Bursill, PhD, PEng, Associate Member ASHRAE; H. Burak Gunay, PhD, PEng, Associate Member ASHRAE	793
TA-23-C091	Dude, Where's My Data? Building Automation Trends and the Case-Driven Value of Converged Systems Jayson Bursill, PhD, PEng, Full Member ASHRAE; Dmitri De Vaz, PEng; Andre A. Markus Student Member ASHRAE; H. Burak Gunay, PhD, PEng, Associate Member ASHRAE; R.Christopher Kwong, PEng; W. Andrew Perrin, Full Member ASHRAE; Gamal Mustapha, PEng	803 s,

TA-23-C092	Data-Driven Cooling Energy Consumption Model for High-Rise Buildings in Hot and Arid Climates	812
	Majd Moujahed, Student Member ASHRAE; Nurettin Sezer, Full Member ASHRAE; Ibrahim Hassan, Fellow ASHRAE; Leon Wang, Full Member ASHRAE	012
TA-23-C093	Advancing Net Zero Showcase in Subtropical High-Rise Commercial Building Wong Yee Ting Melody, Full Member ASHRAE	822
TA-23-C094	Artificial Neural Network-Based Surrogate Models to Predict Building Features from Load Signatures Shane Ferreira, Student Member ASHRAE; Burak Gunay, Associate Member ASHRAE; Adam Wills, Associate Member ASHRAE	831
TA-23-C095	NO PAPER SUBMITTED	
TA-23-C096	Model-Based Characterization of Heat Pump—Thermal Energy Storage Systems for Grid-Interactive Services Wengi Jia, Student Member ASHRAE; Zhiyao Yang, PhD, Full Member ASHRAE;	840
	Mingzhe Liu, PhD, Full Member ASHRAE; Yangyang Fu, PhD, Full Member ASHRAE; Zheng O'Neill, PhD, PE, Fellow ASHRAE	
TA-23-C097	Refrigeration System Design Exploration for a Heavy-Duty Hydrogen Refueling Station K. Han, PhD, PE, Full Member ASHRAE; B. Hardy, PhD; A. Elgowainy, PhD; K. Reddi, P	849 hD
TA-23-C098	Field Demonstration of Low-Cost and Scalable MPC at a K-12 School and Practical Challenges	857
	Sang woo Ham, PhD, Full Member ASHRAE; Donghun Kim, PhD, Full Member ASHRAE	
TA-23-C099	Open Building Operating System: An Open-Source Grid Responsive Control Platform for Buildings	865
	Lazlo Paul, Full Member ASHRAE; Flavia de Andrade Pereira; Sang Woo Ham, PhD, Full Member ASHRAE; Marco Pritoni, PhD, Full Member ASHRAE; Rich Brown; Jingjuan Dove Feng, PhD, PE, Associate Member ASHRAE	
TA-23-C100	Integrating Building-Scale Solar + Storage + Flexible Advanced Technologies to Maximize Value to Commercial Buildings Peng Zhao, PhD, Full Member ASHRAE; Viswanath Ananth, Full Member ASHRAE; Corey Shono, Full Member ASHRAE	875
TA-23-C101	WITHDRAWN	
TA-23-C102	Development of a Dual-Function Solar Thermal Collector for Buildings Rui Miao, PhD, Student Member ASHRAE; Yao Yu, PhD, Associate Member ASHRAE; Xiaoou Hu, Student Member ASHRAE; Xuelei Xiao, Student Member ASHRAE	884
	SOCIETY BUSINESS	
2022-2023 ASI	HRAE Officers, Directors, Staff, and Council and Committee MembersHRAE Chapter Officers	
	HRAE Technical Committees, Task Groups, Technical Resource Groups, and	004
	ultidisciplinary Task Groups	
	Conferences	
	nts	
-	rs and Awards	
	HRAE Intersociety Representatives	

ASHRAE Associate Societies	1037
In Memoriam, July 2022 to June 2023	1041
Index of Extended Abstracts and Papers, Volume 129, Part 2	