



## CBE Publications & Report List

### April 2022

*Papers that summarize research by CBE and affiliated institutions have appeared in the following journals, trade magazines, and conference proceedings. Many of these publications are also available from the eScholarship Repository, on-line at [http://escholarship.org/uc/cedr\\_cbe](http://escholarship.org/uc/cedr_cbe).*

#### 2022

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Sun, R.J., C. Duarte Roa, P. Raftery, and G. Fierro. 2022. Enabling portable and reproducible long-term thermal comfort evaluation with brick schema and mortar testbed. *ASHRAE 2022 Annual Conference*. <https://escholarship.org/uc/item/5640w8m0> **NEW**

Lamon, E., P. Raftery, and S. Schiavon. 2022. Boiler retrofits and decarbonization in existing buildings: HVAC designer interviews. Prepared for *California Energy Commission*. Accepted for publication in *ACEEE Summer Study on Energy Efficiency in Buildings*, Panel 5. August. <https://escholarship.org/uc/item/6k4369zv> **NEW**

Cheung, T., L. Graham, and S. Schiavon. 2022. Impacts of life satisfaction, job satisfaction, and the big five personality traits on satisfaction with the indoor environment. *Building and Environment*, Volume 212. March. <https://doi.org/10.1016/j.buildenv.2022.108783>  
<https://escholarship.org/uc/item/84r525hj> **NEW**

#### 2021

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He, Y., T. Parkinson, E. Arens, H. Zhang, N. Li, J. Peng, J. Elson, and C. Maranville. 2021. Creating alliesthesia in cool environments using personal comfort systems. *Building and Environment*, Volume 209. December. <https://doi.org/10.1016/j.buildenv.2021.108642>  
<https://escholarship.org/uc/item/35k2c351> **NEW**

Kent, M., and J. Jakubiec. 2021. An examination of range effects when evaluating discomfort due to glare in Singaporean buildings. *Lighting Research and Technology*. December. <https://escholarship.org/uc/item/50t169w4> <https://doi.org/10.1177/14771535211047220> **NEW**

Parkinson, T., S. Schiavon, R. de Dear, and G. Brager. 2021. Overcooling of offices reveals gender inequity in thermal comfort. *Nature Scientific Reports*, Volume 11, Issue 1. December. <https://doi.org/10.1038/s41598-021-03121-1> <https://escholarship.org/uc/item/5rk4b607> **NEW**

Kent, M., T. Parkinson, J. Kim, and S. Schiavon. 2021. A data-driven analysis of occupant workspace dissatisfaction. *Building and Environment*, Volume 205. November.

<https://doi.org/10.1016/j.buildenv.2021.108270> <https://escholarship.org/uc/item/9r901701>

He, Y., Y. Zhou, J. Yuan, Z. Liu, Z. Wang, and G. Zhang. 2021. Transformation towards a carbon-neutral residential community with hydrogen economy and advanced energy management strategies. *Energy Conversion and Management*, Volume 249. October.

<https://doi.org/10.1016/j.enconman.2021.114834> <https://escholarship.org/uc/item/61g3g267>

**NEW**

Dawe, M., C. Karmann, S. Schiavon, and F. Bauman. 2021. Field evaluation of thermal and acoustical comfort in eight North-American buildings using embedded radiant systems. *PLOS ONE*, Volume 16, Issue 10. October.

<https://doi.org/10.1371/journal.pone.0258888>

<https://escholarship.org/uc/item/24k6q5zg> **NEW**

Tartarini, F., S. Schiavon, O. Jay, E. Arens, and C. Huizenga. 2021. Application of Gagge's energy balance model to determine humidity-dependent temperature thresholds for healthy adults using electric fans during heatwaves. *Building and Environment*. October.

<https://doi.org/10.1016/j.buildenv.2021.108437> <https://escholarship.org/uc/item/5th5s8qb>

**NEW**

Xiong, J., S. Carter, O. Jay, E. Arens, H. Zhang, M. Deuble, and R. de Dear. 2021. A sex/age anomaly in thermal comfort observed in an office worker field study: A menopausal effect?

*Indoor Air*. August. <https://doi.org/10.1111/ina.12926>

<https://escholarship.org/uc/item/1dk4z7th>

He, Y., Y. Zhou, Z. Wang, J. Liu, Z. Liu, and G. Zhang. 2021. Quantification on fuel cell degradation and techno-economic analysis of a hydrogen-based grid-interactive residential energy sharing network with fuel-cell-powered vehicles. *Applied Energy*, Volume 303. August.

<https://doi.org/10.1016/j.apenergy.2021.117444> <https://escholarship.org/uc/item/8ms2x24r>

Miller, D., P. Raftery, M. Nakajima, S. Salo, L. Graham, T. Peffer, M. Delgado, H. Zhang, G. Brager, D. Douglass-Jaimes, G. Paliaga, S. Cohn, M. Greene, and A. Brooks. 2021. Cooling energy savings and occupant feedback in a two year retrofit evaluation of 99 automated ceiling fans staged with air conditioning. *Energy and Buildings*, Volume 251. August.

<https://doi.org/10.1016/j.enbuild.2021.111319> <https://escholarship.org/uc/item/7752j100>

Porrás-Salazar, JA., S. Schiavon, P. Wargocki, T. Cheung, and KW. Tham. 2021. Meta-analysis of 35 studies examining the effect of indoor temperature on office work performance. *Building and Environment*, Volume 203. June. Open Access. <https://doi.org/10.1016/j.buildenv.2021.108037>

Tran, P., M. Adam, KW. Tham, S. Schiavon, J. Pantelic, P. Linden, E. Sofianopoulou, C. Sekhar, D. Cheong, and R. Balasubramanian. 2021. Assessment and mitigation of personal exposure to particulate air pollution in cities: An exploratory study. *Sustainable Cities and Society*, Volume 72. May.

<https://doi.org/10.1016/j.scs.2021.103052> <https://escholarship.org/uc/item/3tm9n180>

Mishra, A.K., S. Schiavon, P. Wargocki, and K. Wai Tham. 2021. Respiratory performance of humans exposed to moderate levels of carbon dioxide. *Indoor Air*. May. <https://doi.org/10.1111/ina.12823> <https://escholarship.org/uc/item/8qj5v8d1>

Luo, M., H. Zhang, P. Raftery, L. Zhou, T. Parkinson, E. Arens, Y. He, and E. Present. 2021. Detailed measured air speed distribution in four commercial buildings with ceiling fans. *Building and Environment*, Volume 200, ISSN 0360-1323. May. <https://doi.org/10.1016/j.buildenv.2021.107979> <https://escholarship.org/uc/item/3ts5528s>

Parkinson, T., H. Zhang, E. Arens, Y. He, R. de Dear, J. Elson, A. Parkinson, C. Maranville, and A. Wang. 2021. Predicting thermal pleasure experienced in dynamic environments from simulated cutaneous thermoreceptor activity. *Indoor Air*. May. <https://doi.org/10.1111/ina.12859> <https://escholarship.org/uc/item/1xd8n2t0>

Xu, Y., P. Raftery, and S. Schiavon. 2021. Capturing energy savings from correcting VAV box minimums on campus. Masters of Science Thesis. Department of Architecture, University of California, Berkeley. May. <https://escholarship.org/uc/item/6zt4k0hd>

Liang, R., M. Kent, R. Wilson, and Y. Wu. 2021. The effect of thermochromic windows on visual performance and sustained attention. *Energy and Buildings*, Volume 236. April. <https://doi.org/10.1016/j.enbuild.2021.110778> <https://escholarship.org/uc/item/9kt889fn>

Graham, L., T. Parkinson, and S. Schiavon. 2021. Lessons learned from 20 years of CBE's occupant surveys. *Building and Cities*, Volume 2, Issue 1, pages 166-184. February. <https://doi.org/10.5334/bc.76>

## 2020

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Tartarini, F., S. Schiavon, T. Cheung, and T. Hoyt. 2020. CBE thermal comfort tool: Online tool for thermal comfort calculations and visualizations. *SoftwareX*, 12:100563. <https://doi.org/10.1016/j.softx.2020.100563>

Tartarini, F. and S. Schiavon. 2020. Pythermalcomfort: A python package for thermal comfort research. *SoftwareX*, 12:100578. <https://doi.org/10.1016/j.softx.2020.100578>

Gall, E., A. Mishra, J. Li, S. Schiavon, and A. Lauguerre. 2020. Impact of cognitive tasks on CO<sub>2</sub> and isoprene emissions from humans. *Environmental Science & Technology*, Volume 55, Pages 139-148. December. <https://doi.org/10.1021/acs.est.0c03850> [https://pdxscholar.library.pdx.edu/mengin\\_fac/324/](https://pdxscholar.library.pdx.edu/mengin_fac/324/)

Lassen, N., F. Goia, S. Schiavon, and J. Pantelic. 2020. Field investigations of a smiley-face polling station for recording occupant satisfaction with indoor climate. *Building and Environment*. Volume 185. November. <https://doi.org/10.1016/j.buildenv.2020.107266>

- He, Y., E. Arens, N. Li, Z. Wang, H. Zhang, Y. A, and C. Yuan. 2020. Modeling solar radiation on a human body indoors by a novel mathematical model. *Building and Environment*, Volume 187. November. <https://doi.org/10.1016/j.buildenv.2020.107421>  
<https://escholarship.org/uc/item/78f0b543>
- Tartarini, F. and S. Schiavon. 2020. Skin temperature sampling period for longitudinal thermal comfort studies. *Proceedings of the Indoor Air 2020*. November.  
<https://escholarship.org/uc/item/9jn57924>
- Cheung, T., S. Schiavon, L. Graham, and K. Tham. 2020. Occupant satisfaction with the indoor environment in seven commercial buildings in Singapore. *Building and Environment*. November.  
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- Duarte Roa, C., S. Schiavon, and T. Parkinson. 2020. Targeted occupant surveys: A novel method to effectively relate occupant feedback with environmental conditions. *Building and Environment*, Volume 184. October. <https://doi.org/10.1016/j.buildenv.2020.107129>  
<https://escholarship.org/uc/item/9sj1c34p>
- He, Y., N. Li, H. Zhang, Y. Han, J. Lu, and L. Zhou. 2020. Air-conditioning use behaviors when elevated air movement is available. *Energy and Buildings*, Volume 225. October.  
<https://doi.org/10.1016/j.enbuild.2020.110370> <http://escholarship.org/uc/item/9np5x6cv>
- Li, P., T. Parkinson, S. Schiavon, T. Froese, R. de Dear, A. Rysanek, and S. Staub-French. 2020. Improved long-term thermal comfort indices for continuous monitoring. *Energy and Buildings*, Volume 224. October. <https://doi.org/10.1016/j.enbuild.2020.110270>  
<https://escholarship.org/uc/item/9h55w20w>
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<https://doi.org/10.1016/j.buildenv.2020.107160> <https://escholarship.org/uc/item/6gd9t8pj>
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- Altomonte, S., J. Allen, P. Bluysen, G. Brager, L. Heschong, A. Loder, S. Schiavon, J. Veitch, L. Wang, and P. Wargocki. 2020. Ten questions concerning well-being in the built environment. *Building and Environment*, 180: 106949. August. <https://doi.org/10.1016/j.buildenv.2020.106949>

- Liu, S., Z. Wang, S. Schiavon, Y. He, M. Luo, H. Zhang, and E. Arens. 2020. Predicted percentage dissatisfied with vertical temperature gradient. *Energy and Buildings*, 220. August. <https://doi.org/10.1016/j.enbuild.2020.110085> <https://escholarship.org/uc/item/0s76t57k>
- Duarte Roa, C. 2020. Design and control of high thermal mass radiant systems. Doctor of Philosophy Dissertation. Dept. of Architecture, University of California, Berkeley <https://escholarship.org/uc/item/82t6n3xr>
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- Rafsanjani, H. N., A. Ghahramani, A. H. Nabizadeh. 2020. iSEA: IoT-based smartphone energy assistant for prompting energy-aware behaviors in commercial buildings. *Applied Energy*, 266. May. <https://escholarship.org/uc/item/34w088fp> <https://doi.org/10.1016/j.apenergy.2020.114892>
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- Li, J., M. Wan, S. Schiavon, K. Tham, S. Zuraimi, J. Xiong, M. Fang, and E. Gall. 2020. Size-resolved dynamics of indoor and outdoor fluorescent biological aerosol particles in a bedroom: A one-month case study in singapore. *Indoor Air*, Volume 30, Issue 5, Pages 942-954. April. <http://doi.org/10.1111/ina.12678> <https://escholarship.org/uc/item/6rh0c245>
- Raftery, P., D. Miller, H. Zhang, T. Pepper, G. Brager, L.T. Graham, E. Present, E. Arens, D. Douglas-Jaimes, G. Paliaga, A. Brooks, S. Cohn, and M. Greene. 2020. Integrating Smart Ceiling Fans and Communicating Thermostats to Provide Energy-Efficient Comfort. Final report to California Energy Commission. April. <https://escholarship.org/uc/item/91z0m3xw>
- Ghahramani, A., P. Galicia, D. Lehrer, Z. Varghese, Z. Wang, and Y. Pandit. 2020. Artificial Intelligence for Efficient Thermal Comfort Systems: Requirements, Current Applications and Future Directions. *Frontiers in Built Environment*. April. <https://doi.org/10.3389/fbuil.2020.00049> <https://escholarship.org/uc/item/75j1m967>
- Arens, E., D. Heinzerling, S. Liu, G. Paliaga, A. Pande, S. Schiavon, Y. Zhai, and H. Zhang. 2020. Advances to ASHRAE Standard 55 to encourage more effective building practice. Proceedings of Windsor Conference 2020: Resilient Comfort, London, April 13-16. <https://escholarship.org/uc/item/5ww2c38p>

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- Raftery, P., and D. Douglass-Jaimes. 2020. Ceiling Fan Design Guide. CBE Report. March. <https://escholarship.org/uc/item/6s44510d>
- Arens, E., A. Ghahramani, R. Przybyla, M. Andersen, S. Min, T. Pepper, P. Raftery, M. Zhu, V. Luu, and H. Zhang. 2020. Measuring 3D indoor air velocity via an inexpensive low-power ultrasonic anemometer. *Energy and Buildings*, 211. March. <https://doi.org/10.1016/j.enbuild.2020.109805> <https://escholarship.org/uc/item/43c525tg>
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- Rafsanjani, H., and A. Ghahramani. 2020. Towards utilizing internet of things (IoT) devices for understanding individual occupants' energy usage of personal and shared appliances in office buildings. *Journal of Building Engineering*, Vol. 27. January. <https://doi.org/10.1016/j.jobbe.2019.100948> <https://escholarship.org/uc/item/07v2s2xm>
- Wang, Z., K. Warren, M. Luo, X. He, H. Zhang, E. Arens, W. Chen, Y. He, Y. Hu, L. Jin, S. Liu, D. Cohen-Tanugi, and M. Smith. 2020. Evaluating the comfort of thermally dynamic wearable devices. *Energy and Buildings*, Vol. 167. January. <https://doi.org/10.1016/j.buildenv.2019.106443> <https://escholarship.org/uc/item/7rf7z7k1>



Luo, M., Z. Wang, H. Zhang, E. Arens, D. Filingeri, L. Jin, A. Ghahramani, W. Chen, Y. He, and B. Si. 2020. High-density thermal sensitivity maps of the human body. *Building and Environment*, Vol 167. January. <https://doi.org/10.1016/j.buildenv.2019.106435>  
<https://escholarship.org/uc/item/3kq5p62q>

Zhai, Y.C., S. Zhao, Y. Gao, W. Song, L. Yang, H. Zhang, and E. Arens. 2020. Preferred temperatures with and without air movement during moderate exercise. *Energy and Buildings*, Volume 207, 109565, ISSN 0378-7788. January. <https://doi.org/10.1016/j.enbuild.2019.109565>

## 2019

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Schweiker, M., et al 95 authors. 2019. The Scales Project, a Cross-National Dataset on the Interpretation of Thermal Perception Scales. *Scientific Data*, 6 (1): 1–10. November. <https://doi.org/10.1038/s41597-019-0272-6>

Zhai, Y., F. Miao, L. Yang, S. Zhao, H. Zhang, and E. Arens. 2019. Using personally controlled air movement to improve comfort after simulated summer commute. *Building and Environment*, Vol. 165. November. <https://doi.org/10.1016/j.buildenv.2019.106329>  
<https://escholarship.org/uc/item/4px750ms>

Yang, B., A. Melikov, A. Kabanshi, C. Zhang, F. Bauman, G. Cao, H. Awbi, H. Wigo, J. Niu, K. Cheong, K. Tham, M. Sandberg, P. Nielsen, R. Kosonen, R. Yao, S. Kato, S. Sekhar, S. Schiavon, T. Karimipannah, X. Li, and Z. Lin. 2019. A review of advanced air distribution methods- theory, practice, limitations, and solutions. *Energy and Buildings*, Vol. 202. November. <https://doi.org/10.1016/j.enbuild.2019.109359> <https://escholarship.org/uc/item/85x6r3wv>

Zhai Y., A. Honnekeri, M. Pigman, M. Fountain, H. Zhang, X. Zhou, and E. Arens. 2019. Use of adaptive control and its effects on human comfort in a naturally ventilated office in Alameda, California. *Energy and Buildings*, Vol. 203, 13 pp. November. <https://doi.org/10.1016/j.enbuild.2019.109435> <https://escholarship.org/uc/item/9nv63029>

Rafsanjani, H., and A. Ghahramani. 2019. Extracting occupants' energy-use patterns from wi-fi networks in office buildings. *Journal of Building Engineering*. November. <https://doi.org/10.1016/j.jobee.2019.100864> <https://escholarship.org/uc/item/4db8s3nr>

Pantelic, J., M. Dawe, and D. Licina. 2019. Use of IoT sensing and occupant surveys for determining the resilience of buildings to forest fire generated pm2.5. *PLOS ONE*. October. <https://doi.org/10.1371/journal.pone.0223136>

Woolley, J., S. Schiavon, F. Bauman, and P. Raftery. 2019. Side-by-side laboratory comparison of radiant and all-air cooling: how natural ventilation cooling and heat gain characteristics impact space heat extraction rates and daily thermal energy use. *Energy and Buildings*, Vol 200. October. <https://doi:10.1016/j.enbuild.2019.07.020> <https://escholarship.org/uc/item/4w94k709>

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<https://doi.org/10.1016/j.buildenv.2019.106231> <https://escholarship.org/uc/item/9wq674bp>

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Dawe, M. 2019. Field evaluation of occupant satisfaction and energy performance in eight LEED-certified buildings using radiant systems. Master of Science Thesis. Dept. of Architecture, University of California, Berkeley. June. <https://escholarship.org/uc/item/6d95z6sw>

Dawe, M., P. Raftery, J. Woolley, S. Schiavon, and F. Bauman. 2019. Comparison of mean radiant and air temperatures in mechanically-conditioned commercial buildings from over 200,000 field and laboratory measurements. Submitted to *Energy and Buildings*. June.

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Raftery, P., J. Fizer, W. Chen, Y. He, H. Zhang, E. Arens, S. Schiavon, and G. Paliaga. 2019. Ceiling fans: Predicting indoor air speeds based on full laboratory measurements. *Building and Environment* 155, 210-223. May. <https://doi.org/10.1016/j.buildenv.2019.03.040>

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