

Stephen Bourne, Ph.D.

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EDUCATION

Ph.D. Civil Engineering **2010 - 2016**

University of Texas, Austin, TX

Program: Building Energy and Environments

*Dissertation: High Density Thermal Energy Stores Utilizing Phase
Change Materials for Shifting of Peak Cooling Loads*

M.S. Civil and Environmental Engineering **2008 - 2009**

University of California, Berkeley, CA

*Program: Engineering and Project Management,
Engineering and Business for Sustainability*

B.S. Civil Engineering **2005 - 2007**

University of California, Berkeley, CA

ACADEMIC POSITIONS

Postdoctoral Fellow **2016 - 2018**

Department of Civil, Architectural and Environmental Engineering
University of Texas, Austin TX

Graduate Research Assistant **2011 - 2016**

Department of Civil, Architectural and Environmental Engineering/SOA
University of Texas, Austin TX

Graduate Teaching Assistant **2015**

Department of Civil, Architectural and Environmental Engineering
University of Texas, Austin TX

AWARDS

THRUST 2000 Fellowship **2010 - 2013**

4-year merit-based fellowship for University of Texas engineering graduate students

American Society of Heating, Refrigeration and Air Conditioning Engineers **2011 - 2012**

Merit-based Grant-in-Aid award to support ASHRAE-related research

University of Texas Graduate School Recruitment Fellowship in Engineering **2010 - 2011**

Merit-based recruitment award for qualified graduate school applicants

HILP Scholarship, University of California, Berkeley **2008**

Merit-based award for graduate students in Engineering and Project Management

RESEARCH EXPERIENCE

Impact of Hidden Spaces on the Microbiome in Portable Classrooms 2016 - 2018

Funding Agency: Sloan Foundation

(PI: Dr. Kerry Kinney) The goal of this study is to systematically assess the transport of particles and microorganisms from hidden, unmaintained spaces such as ceiling plenums and crawl spaces into the occupied space of buildings. To this end, we are applying a newly developed method to track the movement of particles from hidden spaces in buildings (and from outside buildings) into the interior space. This novel approach utilizes unique, DNA-labeled particles that allow us to readily seed one space in a building and then trace where the particles move as a function of ventilation conditions and other factors (resuspension by occupants, vibrations due to doors opening, shutdown and restart conditions, etc.). This 1.5 year research proposal is valued at ~ \$250K. (Awarded 2016)

Extend Load Calculation Methods for Radiant Cooling Model 2016 – 2017

Funding Agency: American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE)

Prepare proposal (PI: Dr. Atila Novoselac) in response to ASHRAE 1729-TRP for the purpose of updating the Heat Balance Method (HBM) and the Radiant Time Series Method (RTSM) to include the capability to properly calculate cooling loads for systems incorporating radiant cooling elements. Radiant cooling elements are to be combined with forced air cooling or a dedicated outdoor air system to determine the radiant cooling parameters necessary to maintain the desired indoor operative temperature range. The research makes extensive use of the Thermal Façade Labs at the University of Texas at Austin School of Architecture. This two-year proposal combines numeric modeling with experimental verification, and is valued at over \$180K. (Awarded 7/2016)

Effect of Ventilation on the Microbiome & Air Quality Inside Portable Classrooms 2014 - 2017

Funding Agency: Sloan Foundation

(PI: Dr. Kerry Kinney) This research focuses on the use of portable classrooms in schools. These structures are based on standard building units designed for uses that may not anticipate the number of occupants found in classroom-specific applications. An investigation is conducted with respect to the performance of the building envelope and HVAC system in portable classrooms, and how they can be easily altered to improve indoor air quality. This 3 year research proposal is valued at ~ \$200K. (Awarded 2014)

PCM-based, High-Density Thermal Stores for Retrofit Applications 2012 - 2016

Funding Agency: University of Texas

This research investigates the development of a simple, high-density thermal storage system suitable for residential or small commercial retrofit applications utilizing tube-encapsulation paraffin-based PCM (phase change material). A scale experimental model is designed and tested, and a finite volume numerical model is developed for design and real-time control applications. Design guidelines are established to optimize encapsulation tube parameters for specific applications, with parametric modeling used to optimize other design parameters. This design is the subject of UT patent application number PCT/US17/35681.

(Ph.D. dissertation)

UT Thermal Façade Lab Construction and Development 2013 - 2015

Funding Agency: NSF (facility developed as a part of IGERT Smart Grid Demonstration Project)

Provide engineering and design support for the construction of the Thermal Façade Labs, a research lab developed as a collaborative effort between the Cockrell School of Engineering and the School of Architecture. Design and install a hydronic-based HVAC system, including facilities to support both air and radiant cooling systems as well as PCM-based (phase change material) thermal storage systems. Design, program, and deploy specialized control systems for these systems to support engineering research at the Thermal Façade Lab. Provide ongoing engineering support for the use and advancement of the labs. This multi-year project is valued at \$200K. (Completed)

PUBLICATIONS, PROCEEDINGS, PRESENTATIONS AND REPORTS

Publications:

- Ardeshir Moftakhari, Stephen Bourne & Atila Novoselac (2023) All-air vs. Radiant Cooling Systems: Analysis of Design and Operation Factors that Impact Building Cooling Loads (ASHRAE RP 1729), Science and Technology for the Built Environment, DOI: 10.1080/23744731.2023.2183016.
- Ardeshir Moftakhari, Stephen Bourne & Atila Novoselac (2023) Cooling load comparison of rooms conditioned with radiant cooling panels and all-air HVAC systems (ASHRAE RP 1729), Science and Technology for the Built Environment, 29:3, 280-296, DOI: 10.1080/23744731.2022.2139581.
- Ampollini, Laura, Erin F. Katz, Stephen Bourne, Yilin Tian, Atila Novoselac, Allen H. Goldstein, Gregor Lucic, Michael S. Waring, and Peter F. DeCarlo. "Observations and Contributions of Real-Time Indoor Ammonia Concentrations during HOMEChem." *Environmental Science & Technology* 53, no. 15 (August 6, 2019): 8591–98. <https://doi.org/10.1021/acs.est.9b02157>.
- Farmer, D. K., M. E. Vance, J. P. D. Abbatt, A. Abeleira, M. R. Alves, C. Arata, E. Boedicker, S. Bourne, et al. "Overview of HOMEChem: House Observations of Microbial and Environmental Chemistry." *Environ. Sci.: Processes Impacts* 21, no. 8 (2019): 1280–1300. <https://doi.org/10.1039/C9EM00228F>.
- Bourne, Stephen, and Atila Novoselac. "Improved Performance in Tube-Encapsulated Phase Change Thermal Energy Stores for HVAC Applications." *Building and Environment* 98 (March 2016): 133–44. <https://doi.org/10.1016/j.buildenv.2015.12.023>.
- Bourne, Stephen, and Atila Novoselac. "Compact PCM-Based Thermal Stores for Shifting Peak Cooling Loads." *Building Simulation* 8, no. 6 (December 1, 2015): 673–88. <https://doi.org/10.1007/s12273-015-0243-6>.

Conference Proceedings:

- Cai, Y., Bourne, S., and Novoselac, A. 2020. The Impact of Mass Transfer Coefficients on Ozone Deposition Velocity in Typical Residential Units. *Proceeding of Indoor Air 2020 Conference, The First Virtual Conference of ISIAQ*, November 1-5, 2020.
- Maestre, J., Bourne, S., Ren, J., Clotilde, I., Zografos, A., Novoselac, A., and Kinney, K. 2018. Ventilation and Communication between Hidden and Occupied Spaces in Portable Classrooms: Air Flow and Labeled Particle Movement. *Proceedings of Indoor Air 2018 Conference*, Philadelphia, Pennsylvania, July 22 – 27, 2018.
- Bourne, S., Kinney, K., Novoselac, A. Maestre, J.P. and Jennings, W. 2016. Improving ventilation in portable classrooms: simple, low cost solutions. *Proceedings of Indoor Air 2016 Conference* (Paper: 919), Ghent, Belgium, July 4 – 8, 2016.
- Maestre, J.P., Kinney, K., Novoselac, A., King, M., Bourne, S., Jennings, W. and Corsi, R. 2016. Effect of Ventilation on the Microbiome inside Portable Classrooms. *Proceedings of Indoor Air 2016 Conference* (Paper: 969), Ghent, Belgium, July 4 – 8, 2016.
- Bourne, S. and Novoselac, A., 2015. PCM-based high-density thermal storage systems for residential and small commercial retrofit applications. *Procedia Engineering*, 121, pp.536-543.
- Bourne, S. and Novoselac, A. 2014. Compact phase change based thermal stores: Experimental apparatus, methodology, and results. *ASHRAE Transactions*, 120, NY-14-C078.

Bourne, S. and Novoselac, A., 2012. The effects of emissivity and insulation levels on radiant barrier performance. *Proceedings of COBEE 2012 Conference*, Boulder, CO, August 1-4, 2012.

Presentations (* denotes speaker):

Maestre, J., Bourne, S., Ren, J., Trump, M., Clotilde, I., Zografos, A., Novoselac, A., and *Kinney, K. 2018. Ventilation and Communication between Hidden and Occupied Spaces in Portable Classrooms: Air Flow and Labelled Particle Movement. *Proceedings of Indoor Air 2018 Conference*, Philadelphia, Pennsylvania, July 22 – 27, 2018.

Bourne, S., Kinney, K., *Novoselac, A. Maestre, J.P. and Jennings, W. 2016. Improving ventilation in portable classrooms: simple, low cost solutions. Presented at the Indoor Air 2016 Conference, Ghent, Belgium, July 4 – 8, 2016.

Maestre, J.P., *Kinney, K., Novoselac, A., King, M., Bourne, S., Jennings, W. and Corsi, R. 2016. Effect of Ventilation on the Microbiome inside Portable Classrooms. Presented at the Indoor Air 2016 Conference, Ghent, Belgium, July 4 – 8, 2016.

*Kinney, K. and Stephen Bourne. 2016. “Ventilation in Portable Classrooms: Impacts on Indoor Air Quality and Microbiome.” presented at the 5th Annual MoBE Conference, Boulder, CO, June 3, 2016.

*Bourne, S. and Novoselac, A. "Compact Phase Change Based Thermal Stores: Experimental Apparatus, Methodology, and Results." Presented at the ASHRAE Winter Conference, New York, NY, January 18-22, 2014.

*Bourne, S., Thermal Storage and the Building Side of Smart Grid. *University of Texas at Austin Energy Symposium*, Sept. 6, 2012. Austin, TX.

*Bourne, S. and Novoselac, A. “The Effects of Emissivity and Insulation Levels on Radiant Barrier Performance.” Presented at the COBEE 2012 Conference, Boulder, CO, August 1-4, 2012.

*Bourne, S. and Novoselac, A. "Attic Radiant Barriers in Residential Applications." Presented at the University of Texas at Austin Inaugural Energy Forum, February 3 - 4, 2011.

Technical Reports

Moftakhari, A., Bourne S., and Atila Novoselac 2019. Experimental Verification of Cooling Load Calculations for Spaces with Non-Uniform. Temperature Radiant Surfaces, ASHRAE 1729_RP. *American Society of Heating Refrigeration and Air Conditioning Engineers*, July 2019.

PROFESSIONAL EXPERIENCE

Self-employed, Reno NV **2021 – present**
Building Scientist

Lucent Technologies, Alameda CA **1998 – 2002**
Senior Courseware Developer/Technical Trainer

PATENTS

Novoselac, Atila, and Stephen Bourne. Issued Jun 22 2021. HIGH-DENSITY LATENT HEAT STORAGE DEVICE. U.S. Patent no. 11,041,680.

CERTIFICATIONS

Engineer-in-Training, certificate # EIT32187 (California), 61639 (Texas), & 0T8063 (Nevada)