CURRICULUM VITAE

Stephen Bourne, Ph.D.
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Department of Civil, Architectural and Environmental Engineering
University of Texas at Austin
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ACADEMIC POSITIONS

Postdoctoral Fellow **2016 -**
Department of Civil, Environmental and Architectural Engineering
University of Texas, Austin TX

Graduate Research Assistant **2011 - 2016**
Department of Civil, Environmental and Architectural Engineering,
and the School of Architecture
University of Texas, Austin TX

Graduate Teaching Assistant **2015**
Department of Civil, Environmental and Architectural Engineering
University of Texas, Austin TX

Graduate Research Assistant **2011 - 2012**
Pecan Street Inc., Austin TX

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*

B.S. Civil and Environmental Engineering **2005 - 2007**
University of California, Berkeley, CA

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

Improving Indoor Air Quality in Portable Classrooms **2015 - 2016**
Funding Agency: *Sloan Foundation*
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 into the performance of HVAC systems in portable classrooms, and how their function can be easily altered to improve indoor air quality.

UT Thermal Façade Lab Construction and Development **2013 - 2015**
Funding Agency: *NSF*
Provide engineering 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 UT School of Architecture. Design and install a hydronic-based HVAC system and associated environmental control systems, including facilities to support both air and radiant cooling systems, as well as PCM-based (phase change material) thermal storage systems. Provide ongoing engineering support for the use and advancement of the labs.

PCM-based, High-Density Thermal Stores for Retrofit Applications **2012 - 2016**
Funding Agency: *University of Texas*
This research investigates the development of a simple, compact, high-density paraffin-based PCM (phase change material) thermal storage unit suitable for residential or small commercial retrofit applications. A scale experimental model is designed and tested, and a simplified numeric model for design and real-time control applications is developed. Design guidelines for encapsulation parameters are developed, and parametric modeling is used to optimize other design parameters.

Domestic Hot Water **2011 - 2012**
Funding Agency: *Pecan Street Inc.*
The goal of this research is to investigate the primary energy use of different options for domestic hot water systems. The systems include conventional gas fired, condensing gas-fired, tankless gas fired, resistive electric, and electric condenser (heat pump) systems. Performance is weighed relative to primary energy use to allow for a fair comparison between gas fired and electric options. Local solar electric generation capabilities are also considered when evaluating electric powered options.

Dust Fouling of Horizontal and Rafter-Installed Radiant Barriers
Funding Agency: American Society of Heating, Refrigeration and Air Conditioning Engineers
This study investigated the effects of dust fouling on radiant barriers used in residential attics. The study was performed using a numerical analysis that gauged the impact of radiant barrier emissivity changes on overall attic temperatures, which alters the net energy exchange through the floor of the attic into the occupied space. The results showed that even small changes in emissivity resulted in large reductions in radiant barrier effectiveness. Results presented at the COBEE conference in Denver, CO in 2012. Proposal valued at $10K. (Awarded 2011).

Proposal Development: Extend Load Calculation Methods for Radiant Cooling Modes **2016**
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. This two-year proposal combines numeric modeling with experimental verification, and is valued at over $180K. (Awarded 7/2016)

Proposal Development: Impact of Hidden Spaces on the Microbiome in Portable Classrooms 2016
Prepare proposal (PI: Dr. Kerry Kinney) to the Sloan Foundation for the investigation of the impact that hidden spaces – attics, wall cavities, and crawl spaces – can have on the indoor environment of portable classrooms. Investigations into these hidden spaces as a source of microbiome, as well as into the drivers of communication between these spaces and the indoor environment, are proposed using both biogenic markers of the existing microbiome and artificially DNA-encoded particles. In addition, the impact of extended shutdown periods - for instance over the summer school break - and their impact on classroom microbiome are investigated. This 1.5 year research proposal is valued at over $250K. (Awarded 10/2016)

Proposal Development: Multi-Pollutant Model Predictive Ventilation Control 2017
Prepare proposal (PI: Dr. Atila Novoselac) for the development of a ventilation control system using model predictive control, multi-variable constrained optimization and real-time monitoring of several pollutants including (but not limited to) particulate matter, VOCs, CO, CO_2, and O_3. The goal is to provide a novel approach for the control of residential ventilation systems that is based on proactive monitoring of the indoor and outdoor environments so that energy consumption is minimized while reducing occupant exposure. This would be accomplished through the use of centralized sensor data, local sensor data using emerging low-cost sensor technologies, and new algorithms optimized for low-cost computing. (Under review)

PUBLICATIONS, PROCEEDINGS & PRESENTATIONS

Publications:

Bourne, Stephen, and Atila Novoselac. 2016. "Improved Performance in Tube-Encapsulated Phase Change Thermal Energy Stores for HVAC Applications." *Building and Environment* 98 (March): 133–44. doi:10.1016/j.buildenv.2015.12.023.

Bourne, S., Novoselac, A. 2015. "Compact PCM-Based Thermal Stores for Shifting Peak Cooling Loads." *Building Simulation*, July. doi:10.1007/s12273-015-0243-6.

Publications under review:

Bourne, Stephen and Atila Novoselac**.** "Design guidelines for high-density thermal storage systems utilizing hexagonal packed tube encapsulated PCM." (*Submitted to Energy and Buildings 4/2017).*

Conference Proceedings:

Bourne, S., Novoselac, A. Improving ventilation in portable classrooms: simple, low cost solutions. *Indoor Air 2016: The 14th international conference of Indoor Air Quality and Climate.* July 3-8, 2016. Ghent, Belgium.

Bourne, S., Novoselac, A. PCM-based High-Density Thermal Storage Systems for Residential and Small Commercial Retrofit Applications. *The Third International Conference on Building Energy and Environment (COBEE 2015).* July 12-15, 2015, Tianjin, China.

Bourne, S., Novoselac, A. Compact Phase Change Based Thermal Stores: Experimental Apparatus, Methodology, and Results. *ASHRAE Winter Conference New York,* ASHRAE Papers CD: 2014 ASHRAE Winter Conference, New York, NY

Bourne, S., Novoselac, A. The Effects of Emissivity and Insulation Levels on Radiant Barrier Performance. *The Second International Conference on Building Energy and Environment (COBEE 2012).* August 1-4, 2012, Boulder, CO.

Invited Presentations:

Kerry Kinney, 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.

Bourne, S. Panelist, AIA Austin – Building Enclosure Council (BEC), "Phase Change Materials (PCM) for High Performance Enclosures". AIA Austin Center for Architecture. Dec 3, 2014. Austin, TX.

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., Novoselac, A. Radiant Barriers in Residential Applications. *University of Texas at Austin Energy Forum*, Feb 4, 2011, Austin, TX.

TEACHING EXPERIENCE

University of Texas at Austin, Austin TX

Energy Simulation in Building Design *(Teaching Assistant)*	**2015**
Building Energy Systems *(Lecturer)*	**2014**

Lucent Technologies, Alameda CA

Senior courseware developer and Technical Trainer	**1998 – 2002**

MENTORSHIP EXPERIENCES

University of Texas at Austin, Austin TX

Senior Design Project, Department of Mechanical Engineering (ME 266K) **2016**

Project Description: *Performance testing of a sun shading elements and their impact on thermal and lighting loads.*

Students: Kaitlin Handel, Lindsey Lewallen, Lou Sunderman, Madeline Roemer

TEACHING AREAS – COURSES PREPARED TO TEACH

Applied Thermodynamics
Fluid Mechanics
Computer Methods (MatLab)
Building Environmental Systems
HVAC Design
Energy and Indoor Air Quality/Field Measurements

PROFESSIONAL EXPERIENCE

Lucent Technologies, Alameda CA **1998 - 2002**
Senior Courseware Developer and Technical Trainer

PROFESSIONAL SERVICE AND SELECTED OTHER ACTIVITIES

DeafTEC Summer STEM Camp panelist, Texas School for the Deaf	**2016**
Development of K-12 modules on energy-related topics	**2014 - 2015**
Science Fair judge – Texas School for the Deaf	**2013 - 2016**
Science Club – Texas School for the Deaf	**2013 - 2016**
Science Sundays/NanoDays – Austin Children's Museum	**2012 - 2013**

COMPUTER SKILLS

Software Packages: eQuest, WUFI, RISA 2D
Programming: MATLAB
Networking: Extensive knowledge of networking and network protocols
Computers: Experience with both PC (Windows) and Mac operating systems

PATENTS

Novoselac, Atila, and Stephen Bourne. Provisional. HIGH-DENSITY LATENT HEAT STORAGE DEVICE. 62345564, filed June 3, 2016.

CERTIFICATIONS

Engineer-in-Training, certificate #EIT 132187