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Mario A. Medina, Ph.D., P.E.

Associate Department Chair and Associate Professor
Civil, Environmental & Architectural Engineering Department
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Education

Ph.D. Mechanical Engineering - Texas A&M University, 1992
Area of Study Energy Systems
Specialization Thermal Analysis of Buildings
Transient Heat and Mass Transfer Modeling
M.S., B.S. Mechanical Engineering (M.S. Minor: Mathematics), Texas A&I University, 1988, 1987

Professional Registration

State of Kansas - Mechanical Engineer

Work Experience

August 2014 - Present

Associate Department Chair of Civil, Environmental, and Architectural Engineering. The University of Kansas.

August 2014 – July 2015

Director of Laboratories, Environmental, and Architectural Engineering. The University of Kansas.

August 2005 - Present

Associate Professor of Civil, Environmental, and Architectural Engineering. The University of Kansas. Tenured.

May 2013 - June 2013

Invited Professor of Civil Engineering. College of Civil Engineering. Hunan University, Changsha, China.

May 2013

Invited Professor of Building Energy. School of Energy and Environment. Southeast University, Nanjing, China.

May 2012 - June 2012

Invited Professor of Building Energy. School of Energy and Environment. Southeast University, Nanjing, China.

May 2009 - June 2009

Invited Professor of Building Physics. School of Human and Environmental Sciences. University of La Réunion, La Réunion, France.

August 2001 - August 2005

Assistant Professor of Civil, Environmental, and Architectural Engineering. The University of Kansas.

August 1998 - August 2001

Assistant Professor of Architectural Engineering. The University of Kansas.

August 1996 - August 1998

Assistant Professor of Mechanical Engineering. Texas A&M University-Kingsville.

January 1993 - August 1996

Visiting Assistant Professor of Mechanical Engineering. Texas A&M University-Kingsville.

January 1992 - January 1993

Research Associate. Energy Systems Laboratory. Texas Engineering Experiment Station.

January 1989 - January 1992

Research Assistant. Mechanical Engineering Department. Texas A&M University.

Related Experience

August 2014 – Present

Academic Council Member: Architectural Engineering Institute (AEI).

August 2005 - Present

Advisor: Tau Beta Pi Engineering Honor Society.

October 2002 - December 2007

Executive Board Member: West-Central Wind Research Consortium (W2RC).

July 2000 - August 2005

Chief Advisor: Tau Beta Pi Engineering Honor Society.

September 1998 - July 2000

Advisor: Tau Beta Pi Engineering Honor Society.

September 1998 - 2005

Co-Advisor: American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE).

November 1993 - October 1997

Assistant Director: Industrial Assessment Center (IAC), (formerly EADC).

February 1995 - February 1997

Executive Committee Member: Building Energy Institute, Texas Energy Coordinating Council.

December 1994

Instructor: Institute for International Education. U.S. Agency for International Development.

November 1994

Instructor: Texas Energy Extension Service. The University of Texas at Arlington.

May 1993 - December 1994

Chairman: Center for Innovation and Teaching Excellence (a focus group sponsored by the National Science Foundation).

Journal Editorships

July 2013 - Present

Associate Editor: *Solar Energy*. Elsevier, Inc.

December 2012 – December 2015

Member of the Editorial Board: *Journal of Building Physics*. Sage Publications.

Proceeding Editorships

Co-Editor of the *Proceedings of the APEC Conference on Low Carbon Towns and Physical Energy Storage*, Changsha, China, May 25-26, 2013.

Peer Reviewed Journal Publications

Published

1. Sun, X., Chu, Y., **Medina, M.A.**, Mo, Y., Fan, S., Shuguang, L., “Experimental Investigation on the Thermal Behavior of Phase Change Material (PCM) in Ventilated Slabs. *Applied Thermal Engineering* 148 (2019) 1359-1369.
2. Sun, X., **Medina, M.A.**, Lee, K.O., Jin, X., “Laboratory Assessment of Residential Building Walls Containing Pipe-encapsulated Phase Change Materials for Thermal Management” *Energy* 163 (2018) 383-391.
3. Sun, X., Lee, K.O., **Medina, M.A.**, Chu, Y., and Li, C., “Melting Temperature and Enthalpy Variations of Phase Change Materials (PCMs): A Differential Scanning Calorimetry (DSC) Analysis.” *Phase Transitions* 91(6) (2018) 667-680.
4. Lee, K.O., **Medina, M.A.**, Sun, X., and Jin, X., “Thermal Performance of Phase Change Materials (PCM)-Enhanced Cellulose Insulation in Passive Solar Residential Building Walls.” *Solar Energy* 163 (2018) 113-121.
5. Jin, X., Shi, D., **Medina, M.A.**, Shi, X., Zhou, X., and Zhang, X., “Optimal Location of PCM Layer in Building Walls Under Nanjing (China) Weather Conditions.” *Thermal Analysis and Calorimetry* 129 (2017) 1767-1778.

6. Sun, X., Zhang, Q., **Medina, M.A.**, Lee, K.O., and Liao, S., "Parameter Design for a Phase Change Material Board Installed in the Inner Surface of Building Exterior Envelopes for Cooling in China." *Energy Conservation and Management* 120 (2016) 100-108.
7. Jin, X., **Medina, M.A.**, and Zhang, X., "Numerical Analysis for the Optimal Location of a Thin PCM Layer in Frame Walls." *Applied Thermal Engineering* 103 (2016) 1057-1063.
8. Lee, K.O., **Medina, M.A.** "Using Phase Change Materials for Residential Air Conditioning Peak Demand Reduction and Energy Conservation in Coastal and Transitional Climates in the State of California." *Energy and Buildings* 116 (2016) 69-77.
9. Sun, X., Zhang, Q., **Medina, M.A.**, and Lee, K.O. "Experimental Observations on the Heat Transfer Enhancement Caused by Natural Convection During Melting of Solid-Liquid Phase Change Materials (PCMs)." *Applied Energy* 162 (2016) 1453-1461.
10. Lee, K.O., **Medina, M.A.**, and Sun, X. "Development and Verification of an EnergyPlus-Based Algorithm to Predict Heat Transfer Through Building Walls Integrated with Phase Change Materials (PCM)." *Journal of Building Physics* 40(1) (2016).
11. Sun, X., Quan, Z., **Medina, M. A.**, and Shuguang, L. "Performance of a free-air cooling system for telecommunications base stations using phase change materials (PCMs): In-situ tests." *Applied Energy* 147 (2015) 325-334.
12. Lee, K.O., **Medina, M.A.**, Raith, E., and Sun, X. "Assessing the Integration of a Thin Phase Change Material (PCM) Layer in a Residential Building Wall for Heat Transfer Reduction and Management." *Applied Energy* 137 (2015) 699-706.
13. Lee, K.O., **Medina, M.A.**, and Sun, X. "On the Use of Plug-and-Play Walls (PPW) for Evaluating Thermal Enhancement Technologies for Building Enclosures: Evaluation of a Thin Phase Change Material (PCM) Layer." *Energy and Buildings* 86 (2015) 86-92.
14. Jean, A., Adams, C., **Medina, M.A.**, Miranville, F. "Natural Materials for Thermal Insulation: Mulch and Lava Rock Characterizations." *Applied Mechanics and Materials (Special Issue)*, 705 (2015) 8-13.
15. Jean, A. P., Libelle, T., Miranville, F., and **Medina, M.A.** Vegetalized Complex Partition (VCP): Impact of a Green Roof under a Humid Tropical Climate, Comparison between Hong Kong and Reunion Island. *Applied Mechanics and Materials (Special Issue)*, 705 (2015) 273-277.
16. Sun, X., Zhang, Q., **Medina, M.A.**, Liu, Y., and Liao, S., "A Study on the Use of Phase Change Materials (PCMs) in Combination with a Natural Cold Source for Space Cooling in Telecommunications Base Stations (TBSs) in China." *Applied Energy* 117 (2014) 95-103.
17. Jin, X., **Medina, M.A.**, and Zhang, X., "On the Placement of a Phase Change Material Thermal Shield Within the Cavity of Building Walls for Heat Flux Reduction." *Energy* 73 (2014) 780-786.
18. Jin, X., Zhang, S., **Medina, M.A.** and Zhang, X., "Experimental Study of the Cooling Process of Partially-Melted Sodium Acetate Trihydrate." *Energy and Buildings* 76 (2014) 654-660.
19. Sun, X., Zhang, Q., **Medina, M.A.**, and Lee, K.O. "Energy and Economic Analysis of a Building Enclosure Outfitted with a Phase Change Material Board (PCMB)." *Energy Conversion and Management* 83 (2014) 73-78.
20. Zhang, Y., Du, K., **Medina, M.A.**, and He, J., "An Experimental Method for Validating Transient Heat Transfer Mathematical Models Used for Phase Change Materials (PCMs) Calculations." *Phase Transitions* 87(6) (2014) 541-558.
21. Jin, X., **Medina, M.A.**, Zhang, X., Zhang, S. "Phase Change Characteristic Analysis of Partially-Melted Sodium Acetate Trihydrate Using DSC." *International Journal of Thermophysics* 35 (1) (2014) 45-52.
22. Sun, X., Zhang, Q., **Medina, M.A.**, Lee, K.O. "On the Natural Convection Enhancement of Heat Transfer During Phase Transition Processes of Solid-Liquid Phase Change Materials (PCMs)." *Energy Procedia*, 61 (2014) 2062-2065. *Energy Procedia*.
23. Jin, X., **Medina, M.A.**, Zhang, X., "On the Importance of the Location of PCMs in Building Walls for Enhanced Thermal Performance." *Applied Energy* 106 (2013) 72-78.
24. **Medina, M.A.**, "A Comprehensive Review of Radiant Barrier Research Including Laboratory and Field Experiments." *ASHRAE Transactions*, Vol. 118, Part 1, 2012.
25. Miranville, F., Lauret, P., **Medina, M.A.**, and Bigot, D., "A Simplified Model for Radiative Transfer in Building Enclosures with Low Emissivity Walls: Development and Application to Radiant Barrier Insulation." *ASME Journal of Solar Energy Engineering*. Vol. 133, No. 2, May 2011.
26. Evers, A.C., **Medina, M.A.** and Fang, Y., "Evaluation of the Thermal Performance of Frame Walls Enhanced with Paraffin and Hydrated Salt Phase Change Materials Using a Dynamic Wall Simulator." *Building and Environment* 45 (2010) 1762-1768.
27. Ahmed, M., Meade, O., and **Medina, M.A.**, "Reducing Heat Transfer Across the Insulated Walls of Refrigerated Truck Trailers by the Application of Phase Change Materials." *Energy Conversion and Management* 51 (2010) 383-392.
28. Fang, Y. and **Medina, M.A.**, "Proposed Modifications for Models of Heat Transfer Problems Involving Partially Melted Phase Change Processes." *Journal of ASTM International*. Vol. 6, Issue 9 (2009).
29. **Medina, M.A.**, and Young, B., "Evaluating the Sensitivity of Attic Radiant Barrier Performance to Climate Parameters." *ASCE Journal of Energy Engineering*. Vol. 134, No. 1, pp. 2-5 (2008).
30. **Medina, M.A.**, King, J.B., and Zhang, M., "On the Heat Transfer Rate Reduction of Structural Insulated Panels (SIPs) Outfitted with Phase-change Materials (PCMs)." *Energy* 33 (2008) 667-678.

31. **Medina, M.A.** and Young, B., "A Perspective on the Effect of Climate and Local Environmental Variables on the Performance of Attic Radiant Barriers in the United States." *Building and Environment* 41 (2006) 1767-1778.
32. Zhang, M., **Medina, M.A.**, and King, J., "Development of a thermally enhanced frame wall with phase-change materials for on-peak air conditioning demand reduction and energy savings in residential buildings." *International Journal of Energy Research*. Vol. 29, No. 9, (2005) pp. 795-809.
33. Hernandez, M. and **Medina, M. A.**, and Schruben, D. L., "Verification of an Energy Balance Approach to Estimate Indoor Wall Heat Fluxes Using Transfer Functions and Simplified Solar Heat Gain Calculations." *Mathematical and Computer Modeling* 37 (2003) 235-243.
34. Kirsch, F. W. and **Medina, M.A.**, "Cost of Implementation of Energy-Efficiency Measures in Specific Industries," *The Journal of Energy and Development*. Vol. 27, No. 2 (2002) pp. 285-298.
35. **Medina, M.A.**, "On the Performance of Radiant Barriers in Combination with Different Attic Insulation Levels," *Energy and Buildings* 33 (2000) 31-40.
36. **Medina, M.A.**, "Effects of Shingle Absorptivity, Radiant Barrier Emissivity, Attic Ventilation Flowrate, and Roof Slope on the Performance of Radiant Barriers," *International Journal of Energy Research*. Vol. 24, No. 8, (2000) pp. 665-678.
37. Kirsch, F. W. and **Medina, M.A.**, "Cost of Industrial Energy-Efficiency Measures: Its Effect Upon Their Implementation," *The Journal of Energy and Development*. Vol. 24, No. 1, (1998) pp. 83-108.
38. **Medina, M.A.**, "A Quasi-Steady-State Heat Balance Model of Residential Walls," *Mathematical and Computer Modeling* 30 (1999) 103-112.
39. **Medina, M.A.**, "Validation and Simulations of a Quasi-Steady State Heat Balance Model of Residential Walls," *Mathematical and Computer Modeling* 30 (1999) 93-102.
40. **Medina, M.A.**, O'Neal, D.L. and Turner, W.D., "A Transient Heat and Mass Transfer Model of Residential Attics Used to Simulate Radiant Barrier Retrofits, Part I: Development," *ASME Journal of Solar Energy Engineering*, Vol. 120, No. 1, pp. 32-38. February 1998.
41. **Medina, M.A.**, O'Neal, D.L. and Turner, W.D., "A Transient Heat and Mass Transfer Model of Residential Attics Used to Simulate Radiant Barrier Retrofits, Part II: Validation and Simulations," *ASME Journal of Solar Energy Engineering*, Vol. 120, No. 1, pp. 39-44. February, 1998.
42. **Medina, M.A.**, O'Neal, D.L. and Turner, W.D., "Effect of Attic Ventilation on the Performance of Radiant Barriers," *ASME Journal of Solar Energy Engineering*, Vol. 114, No. 4, pp. 234-239. November 1992.

Peer Reviewed Conference Proceedings Published

1. Sun, X., **Medina, M.A.**, Lee, K.O., Jin, X., "Thermal Performance of Building Frame Walls Outfitted with Encapsulated PCM Under Full Weather Conditions." *Proceedings of the 1st International Conference on New Horizons in Green Civil Engineering (NHICE-01)*. Victoria, BC, Canada, April 25-27, 2018.
2. Jin, X., Ph.D., Shi, D., Hu, H., **Medina, M. A.**, Ph.D., Shi, X., Zhou, X., & Zhang, X., Ph.D. (2016). Optimal location of PCM layer in building walls under Nanjing (China) weather conditions. In *The 8th International Conference on Applied Energy*. Beijing, China.
3. Jin, X., Ph.D., **Medina, M. A.**, Ph.D., & Zhang, X., Ph.D. (2015). Numerical research on the optimal location of phase change material layer in frame walls for peak heat flux reduction. The 6th International Conference for Building Physics for a Sustainable Building Environment, June 15-17, 2015, Turin, Italy and in *Energy Procedia*, Elsevier. ISSN: 1876-6102.
4. Jean, A., Adams, C., **Medina, M.A.**, Miranville, F. "Natural Materials for Thermal Insulation: Mulch and Lava Rock Characterizations." *Proceedings of the ICRET 2014 Congress*, November 6-8, 2014, Hong Kong. ICRET: International Conference on Renewable Energy Technologies.
5. Jean, A. P., Libelle, T., Miranville, F., and **Medina, M.A.** "Vegetalized Complex Partition (VCP): Impact of a Green Roof under a Humid Tropical Climate, Comparison between Hong Kong and Reunion Island." *Proceedings of the ICRET 2014 Congress*, November 6-8, 2014, Hong Kong. ICRET: International Conference on Renewable Energy Technologies.
6. Jean, A., Boyer, H., Adams, C., Fakra, A., **Medina, M.A.**, Miranville, F., "De la Simulation du Comportement Thermique d'une Paroi à l'observation d'état: L'assimilation de Données dans CODYRUN en Vue de la Validation des Propriétés Thermiques d'un Matériau." *Proceedings of the CIFEM2014 Conference*, pp. 135-140, May 6, 2014, Comoro Island (In French). CIFEM: Colloque International Francophone d'Energétique et Mécanique.
7. **Medina, M.A.**, Lee, K., Xing, J., and Sun, X., "On the Use of Phase Change Materials (PCMs) in Building Walls for Heat Transfer Control and Enhanced Thermal Performance." *Proceedings of the APEC Conference on Low Carbon Towns and Physical Energy Storage*, Changsha, China, May 25-26, 2013.
8. Sun, X., Zhang, Q., **Medina, M.A.**, Lee, K., "Energy and Economic Analysis on Building Envelope with Phase Change Materials in Summer." *Proceedings of the APEC Conference on Low Carbon Towns and Physical Energy Storage*, Changsha, China, May 25-26, 2013.
9. Varadarajan, K. and **Medina, M.A.**, "Estimation of Hourly Solar Loads on the Surfaces of Moving Refrigerated Tractor Trailers Outfitted with Phase Change Materials (PCMs) for Several Routes Across the Continental U.S." ASME Paper

- IMECE2012-85476. *Proceedings of the ASME 2012 International Mechanical Engineering Congress & Exposition (IMECE2012)*. November 9-15, 2012, Houston, TX.
10. Rendall, J., Adams, C., **Medina, M.A.**, Eberhart, S., Adams, M., "Design of Human Composting Latrines for Robust Solar Disinfection Including Inactivation of *Ascaris Lumbricoides*." *Proceedings of the International Water Association World Water Congress and Exhibition*, Busan, South Korea, September 19, 2012.
 11. Jin, X., **Medina, M.A.**, Reshmeen, S., and Zhang, X., "Experimental Study on the Thermal Performance of a Phase Change Material Thermal Shield for Wall and Ceiling Applications." *Proceedings of the World Renewable Energy Asia Regional Congress and Exhibition (WREC-Asia) in cooperation with the 5th International Conference on Sustainable Development in Building and Environment (SuDBE 2011)*. October 28-31, 2011, Chongqing, China.
 12. Jean, A.P., Adams, C., **Medina, M.A.**, and Miranville, F., "Experimental Method Calibration (MECr): A New Relative Method for Heat Flux Sensor Calibration." *Proceedings of the 24th International Conference on Efficiency, Cost, Optimization, Simulation and Environmental Impact of Energy Systems*, July 4-7, 2011, Novi Sad, Serbia.
 13. **Medina, M.A.** and Zhu, D., "A Comparative Heat Transfer Examination of Structural Insulated Panels (SIPs) With and Without Phase Change Materials (PCMs) Using a Dynamic Wall Simulator." *Proceedings of the Sixteenth Symposium on Improving Building Systems in Hot and Humid Climates*, December 16-17, 2008, Plano, TX.
 14. **Medina, M.A.** and Stewart, R., "Phase-Change Frame Walls (PCFWs) for Peak Demand Reduction, Load Shifting, Energy Conservation and Comfort." *Proceedings of the Sixteenth Symposium on Improving Building Systems in Hot and Humid Climates*, December 16-17, 2008, Plano, TX.
 15. Fang, Y., **Medina, M.A.**, and Evers, A., "An Experimental Study of the Performance of PCM-Enhanced Cellulose Insulation used in Residential Building Walls Exposed to Full Weather Conditions." *Proceedings of the Sixteenth Symposium on Improving Building Systems in Hot and Humid Climates*, December 16-17, 2008, Plano, TX.
 16. Taghavi, R.R., Jin, W., and **Medina, M.A.**, "Experimental and Computational Analyses of Pressure Differentials in Flexible Ducts with Different Bent Angles," ASME Paper No. FEDSM2007-37652. *Proceedings of the 5th Joint ASME/JSME Fluids Engineering Conference*, July 30-August 2, 2007, San Diego, CA.
 17. Zhang, M., **Medina, M.A.**, and King, J., "Phase-Change Frame Walls for On-Peak Demand Reduction and Energy Conservation in Residential Buildings: Development, Construction and Evaluation." *Proceedings of the Fourteenth Symposium on Improving Building Systems in Hot and Humid Climates*, May 17-19, 2004, Richardson, TX.
 18. **Medina, M.A.**, and Frempong, M., "Evaluation of Ceiling Heat Fluxes in Residential Buildings with Attic Radiant Barriers in Prevalent Climates Across the United States." *Proceeding of the Architectural Engineering 2003 Conference: Building Integration Solutions*, September 17 - 20, 2003, Austin, TX.
 19. **Medina, M. A.**, "On the Use of Equation Solvers, Interactive Software, and Hands-on Projects in Integrated Sophomore Engineering Courses." *2003 Proceedings of the American Society for Engineering Education Annual Conference*, June 22-25, 2003. Nashville, TN.
 20. **Medina, M.A.** and Nutter, D.W., "A Semi-empirical Modeling Technique for Predicting Improved Performance of Water-cooled Chillers Used in Building Space Cooling Applications," ASME Paper No. RAES99-7621. *Proceedings of the ASME Conference on Renewable and Advanced Energy Systems for the 21st Century*, April 11-15, 1999, Maui, HI.
 21. Gonzales, M.A., **Medina, M.A.**, and Schruben, D.L., "Effects of Installing Economizers in Boilers Used in Space Heating Applications." ASME Paper No. RAES99-7608. *Proceedings of the ASME Conference on Renewable and Advanced Energy Systems for the 21st Century*, April 11-15, 1999, Maui, HI.
 22. Figueroa, I.E, **Medina, M.A.**, Cathey, M., and Nutter, D.W., "Modification and Validation of a Universal Thermodynamic Chiller Model Used to Evaluate the Performance of Water-cooled Centrifugal Chillers," *Proceedings of the Eleventh Symposium on Improving Building Systems in Hot and Humid Climates*, pp. 57-65, Fort Worth, Texas, May 1998.
 23. **Medina, M.A.**, O'Neal, D.L., and Turner, W.D., "Development of a Transient Heat and Mass Transfer Model of Residential Attics Used to Simulate Radiant Barrier Retrofits," *Solar Engineering 1995: Proceedings of the ASME/JSME/JSES International Solar Energy Conference*, March 19-24, 1995, Maui, Hawaii. New York: American Society of Mechanical Engineers Vol. 1, pp. 253-264.
 24. **Medina, M.A.**, Turner, W.D., and O'Neal, D.L., "Economic Evaluation of Insulation/Radiant Barrier Systems for the State of Texas," *Proceedings of the Ninth Symposium on Improving Building Systems in Hot and Humid Climates*, Dallas, Texas, May 1994.
 25. Ashley, R., Garcia, O., **Medina, M.A.**, and Turner, W.D., "Effect of Radiant Barrier Technology on Summer Attic Heat Load in South Texas," *Proceedings of the Ninth Symposium on Improving Building Systems in Hot and Humid Climates*, Texas, May 1994.
 26. **Medina, M.A.**, O'Neal, D.L., and Turner, W.D., "Effects of Radiant Barrier Systems on Ventilated Attics in a Hot and Humid Climate," *Proceedings of the Eighth Symposium on Improving Building Systems in Hot and Humid Climates*, pp. 47-52, Dallas, Texas, May 1992.
 27. **Medina, M.A.**, O'Neal, D.L., and Turner, W.D., "Radiant Barrier Performance During the Heating Season," *Proceedings of the Eighth Symposium on Improving Building Systems in Hot and Humid Climates*, pp. 53-58, Dallas, Texas, May 1992.

Other Publications in the Open Literature (First author unless indicated otherwise)

1. "Reflecting on Heat Transfer Reduction – Exploring Radiant Barriers and Interior Radiation Control Coatings." *The Construction Specifier Magazine*, 67(12), 66-76. December 2014.
2. "The Trend of Phase Change Materials (PCMs) Research in the U.S." *Building Environment and Systems*, Vol. 8, No. 2, ISSN 1976-6475. Korean Institute of Architectural Sustainable Environment and Building Systems (In Korean).
3. "Phase Change Materials in Combination with Existing Insulation for a Superior Thermal Performance of Building Walls." *Global Gypsum Magazine*. March 2013.
4. "Solar-Disinfection Composting Latrines for Developing Countries." Engineers Without Borders Midwest Regional Conference, Rolla, MO, USA. November 5, 2011. (4th of 7 authors).
5. "Development and Adoption of Solar-Disinfection Composting Latrines in Developing Nations." Water Technologies for Emerging Regions Conference, Norman, OK, USA. October 24, 2011. (3rd of 8 authors).
6. "Study of Radiant Barriers in North America." *Proceedings of the 6th Global Conference and Exhibition*. September 26-27, 2011. Toronto, Canada.
7. "Guide Specifications: Metal Ducts - Section 23 31 13." Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) - (2009).
8. "Guide Specifications: Dampers - Section 23 33 13." Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) - (2009).
9. "Guide Specifications: Duct Silencers - Section 23 33 19." Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) - (2009).
10. "Guide Specifications: Turning Vanes - Section 23 33 23." Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) - (2009).
11. "Guide Specifications: Duct Mounting Access Doors - Section 23 33 33." Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) - (2009).
12. "Accreditation Manual: Central American Agency for the Accreditation of Postgraduate Programs" (Agencia Centroamericana para la Acreditacion de Postgrados - ACAP). In Spanish. Version 4.08. - (2008). (One of 8 authors).
13. "Development of Design Specifications, Details and Design Criteria for Traffic Light Poles." Bureau of Materials and Research, Kansas Department of Transportation Report No. KTRAN:KU-98-6. September 2006.
14. "Radiant Barrier Effectiveness Depends on Where You Live." *Home Energy Magazine*. May/June 2003 Issue.
15. "Adequate Attic Venting." In Diagnostics O&A Section of *Home Energy Magazine*. September/October 2001 Issue.
16. "Radiant Barriers, Performance Revealed." *Home Energy Magazine*. September/October 2000 Issue.
17. "Assessing the Viability of Composite Retrofitting in Severe Environments." *Proceedings of the Texas Section of ASCE Spring 1999 Meeting*. Longview, Texas. April, 1999. (One of 4 authors)
18. "Predicting Improved Chiller Performance Through Thermodynamic Modeling." *Proceedings of the 20th Industrial Energy Technology Conference*. Houston, Texas. April, 1998.
19. "Overview of LoanSTAR Chiller Monitoring and Analysis of In-Situ Chiller Diagnostics Using ASHRAE RP-827 Test Method." *Proceedings of the Cool Sense National Forum on Integrated Chiller Retrofits*, Lawrence Berkeley National Laboratory. University of California, Berkeley, California. September, 1997. (One of 4 authors)
20. "Impact of the Texas A&M University-Kingsville's Industrial Assessment Center." *Proceedings of the 19th Industrial Energy Technology Conference*. Houston, Texas. April, 1997.
21. "First Year Analysis of Industrial Energy Conservation/Management of the Texas A&M University-Kingsville Energy Analysis and Diagnostic Center." *Proceedings of the 17th Industrial Energy Technology Conference*. Houston, Texas. April, 1995.

Scholarly Presentations in the Past Seven Years (2011 – 2018)

1. "Thermal Performance of Building Frame Walls Outfitted with Encapsulated PCM Under Full Weather Conditions." 1st International Conference on New Horizons in Green Civil Engineering (NHICE-01). Victoria, BC, Canada, April 25-27, 2018.
2. (Invited) "A Survey of Radiant Barrier and Internal Radiation Control Coatings Modeling and Simulations." 2016 I-RIM Conference. June 3, 2016. Hollywood Beach, FL.
3. (Invited) "A Collaborative Effort Between Chinese and American Universities for the Study of Phase Change Materials for Heat Transfer Control and Energy Conservation in Buildings." Invited international presentation, Changsha University of Science and Technology. September 21, 2015.
4. (Invited) "Radiant Barriers – Why Contractors & Homeowners Need to Understand this Option for Heat Load Reduction." Southeast Louisiana Coalition of the Air Conditioning Industry. New Orleans. October 2, 2014.
5. (Invited) "Sustainable Construction in Architecture" Presented to graduate students in Biol420/Chem680/CPE715/PHSX600/EPX601: Introduction to Nanotechnology for Renewable Energy. University of Kansas. April 15, 2014 and November 18, 2013.
6. (Invited) "State of the Problem in Relation to Software Used to Predict Space Cooling and Heating Energy Use Reductions Produced by Radiant Barriers." International Reflective Insulation Manufacturers Conference. London, United Kingdom.

March 6-7, 2014.

7. (Invited) "Evidence of Energy Savings Produced by Radiant Barriers and Interior Radiation Control Coatings: Experiments and Modeling." RESNET Conference 2014, Jacksonville, FL. February 24-26, 2014. RESNET: Residential Energy Services Network.
8. (Invited) "Next Generation Building Walls Using Nanotechnologies and Phase Change Materials for Energy Management and Conservation." Keynote speech, 57th Midwest Solid State Conference. September 28, 2013.
9. (Invited) "HVAC Basics." Evansville, Indiana, USA SMACNA Chapter. August 20, 2013.
10. (Invited) "A Collaborative Effort Between Chinese and American Universities for the Study of Phase Change Materials for Heat Transfer Control and Energy Conservation in Buildings." To faculty and students of Hunan University. May 29, 2013.
11. (Invited) "On the Use of Phase Change Materials (PCMs) in Building Walls for Heat Transfer Control and Enhanced Thermal Performance." Keynote speech, APEC Conference on Low Carbon Towns and Physical Energy Storage, Changsha, China. May 25-26, 2013.
12. (Invited) "RESNET, Home Raters, and Reflective Insulation Manufacturers: How All Can Work Together." RESNET Conference 2013, Orlando, FL. February 27-March 1, 2013. RESNET: Residential Energy Services Network.
13. (Invited) "Climate-change driven building design in China: My experience in China. Tea and Talk Series. KU Center for East Asian Studies. October 4, 2012.
14. (Invited) "Phase change materials in combination with existing insulation for a superior thermal performance of building walls." 7th Global Insulation Conference and Exhibition, Riga, Latvia. September 18-19, 2012. Presentation won "Best Presentation Award."
15. (Invited) "Thermal performance evaluation of building walls outfitted with phase change materials (PCMs). Presented to the students and faculty of the School of Energy and Environment of Southeast University in Nanjing, China. May 30, 2012.
16. (Invited) "Radiant Barrier Technology." Presented to the students and faculty of the School of Energy and Environment of Southeast University in Nanjing, China. May 29, 2012.
17. (Invited) "Phase Change Materials Research at the University of Kansas. Presented to the students and faculty of the School of Energy and Environment of Southeast University in Nanjing, China. May 28, 2012
18. (Invited) "Fundamentals of Thermal Simulation for the Understanding and Evaluation of Radiant Barriers and IRCCs Performance." International Reflective Insulation Manufacturers Conference. Fort Lauderdale, FL. May 1-2, 2012.
19. (Invited) "A Summary of Fifty Years of Radiant Barrier Research." RESNET Conference 2012, Austin, Texas. February 27-29, 2012. RESNET: Residential Energy Services Network.
20. (Invited) "A Comprehensive Study of Radiant Barrier Research Including Laboratory, Field Experiments, and Simulations." Building Enclosure Council, Kansas City. January 25, 2012.
21. (Invited) "Study of Radiant Barriers in North America." Sixth Global Conference and Exhibition. September 26, 2011. Toronto, Canada.
22. (Invited) "Performance of Attic Radiant Barriers (RBs): A Summary of Published Research." Building Enclosure Council, Held at ASHRAE headquarters, Atlanta, GA. May 11, 2011.
23. (Invited – Keynote Speaker) "Performance of Attic Radiant Barriers (RBs) and Interior Radiation Control Coatings (IRCCs): A Summary of Published Research." Reflective Insulation Manufacturers' Association – International (RIMA-I) Bi-Annual Meeting. Anaheim, CA. April 10, 2011.

Funded Research/Projects (Principal Investigator Unless Stated Otherwise)

-Assessment of Moisture-Tolerant Coatings for Decreasing Open Top Construction Time

Source: Electric Power Research Institute (EPRI)

Period: August 2015 - December 2016

Funding: \$203,546 (Co-Principal Investigator; with Dave Darwin, PI, and Matt O'Reilly, Co-PI)

-High Performance Design for Health & Wellness: Seeding a Center of Design Excellence for Promoting Efficient Rural Healthcare Settings

Source: Research Investment Council & Strategic Initiative Grant Program, Level II. University of Kansas.

Period: August 2015 - July 2016

Funding: \$30,000 (Co-Principal Investigator; with Hui Cai, PI, Kent Spreckelmeyer, Co-PI, Hugo Sheward, Co-PI)

-Research on the Application of Physical Energy Storage Technology with Renewable Energy in a Low Carbon Town

Source: Asia Pacific Economic Cooperation/Changsha Maxxon High Tech Co. Ltd. (Changsha, Hunan, China)

Period: December 2012 - December 2013

Funding: \$2,000

-Funding for University of Kansas Research and Educational Support for U.S. Army Programs and Initiatives at Fort Leavenworth, Kansas

Source: Army Research Laboratory and Army Research Office

Period: March 2011 - March 2014

Total Funding: \$1,940,000 (Thrust 1 Co-Investigator; with Craig Adams, PI)

ARO – Sanitation Project portion: \$250,688 (Co-Investigator)

- Increasing the Overall Efficiency of Commercial and Industrial Refrigerated Vehicles by the Application of a Phase Change Technology Developed at the University of Kansas

Source: Kansas Transportation Research Institute

Period: August 2006 – September 2008

Funding: \$100,000

-Enhancing the Experimental Capabilities of the CEAE and AERO Engineering Departments

Source: GRF/SOE

Period: August 2006 – July 2007

Funding: \$9,600

-Improving Life Cycle Performance and Energy Consumption Prediction Using Aged Samples and Electron Microscopy to Examine Thermal and Moisture Performance Due to Natural Deterioration of Roofing Materials

Source: Energy Research Center/ Kansas Geological Survey

Period: August 2006 – July 2007

Funding: \$8,800 (Co-Principal Investigator)

-Reducing the Fuel Consumption of Refrigerated Vehicles Via a Phase Change Technology Developed at the University of Kansas

Source: Energy Research Center/ Kansas Geological Survey

Period: August 2006 – July 2007

Funding: \$8,670

- Solar Decathlon 2007

Source: DOE/National Renewable Energy Laboratory

Period: January 2006 - September 2007

Funding: \$12,500

- Evaluation of Radiant Barrier Technologies for Attic Applications Using a Dynamic Heat Transfer Simulator

Source: Radiant Barrier Technologies, Inc.

Period: March 2006 - December 2006

Funding: \$11,186

-Optimal Integration of Renewable and Phase Change Materials in Insulation Systems for the Reduction of Thermal Loads Across Building Walls and Ceilings

Source: National Science Foundation

Period: September 2006 - November 2010

Funding: \$279,997

- Evaluation of Coating Technologies for Attic Applications Using a Dynamic Heat Transfer Simulator

Source: STS Coatings, Inc.

Period: December 2005 - June 2006

Funding: \$5,494

- Phase-change Frame Walls to Reduce Peak Demand, Shift Load, and Reduce Energy Use in the Coastal Areas of California

Source: California Energy Commission

Period: January 2005 - December 2005

Funding: \$74,863

- Evaluation of PCM-SIP Concept on the Better Building Panels (BBP)

Source: Better Building Products, LLC.

Period: June 1, 2004 - August 2005

Funding: \$5,000

- Design Pressure Losses for As-Installed Flexible Ducts (Grant in Aid for Amy L. Stadler)

Source: American Society for Heating, Ventilating, and Air-conditioning Engineers, Inc. (ASHRAE)

Period: July 2004 - June 2005

Funding: \$10,000

- Paraffin-Based Phase-Change Wall Panels (PCWP) for Building Applications: Mathematical and Computer Model Development (Grant in Aid for Jennifer B. King)

Sponsor: American Society of Heating, Refrigerating, and Air conditioning Engineers, Inc. (ASHRAE)

Period: July 2003 - June 2004

Funding: \$7,500

- Development of Design Specifications, Details, and Design Criteria for Traffic Light Poles

Source: Kansas Department of Transportation

Period: July 1, 2002 – June 30, 2003

Funding: \$49,945 (Reassignment of the PI position from Dr. Steve McCabe)

- Development of a Biofluid Warming and Infusion Device for In-field and Emergency Room Use to Prevent and Reverse

Hypothermia in Trauma Patients

Source: GRF/SAUD

Period: July 1, 2001 – June 30, 2002

Funding: \$5,226

- Characterization and Performance Evaluation of Phase-Change Building Materials -- Phase I: Experimental and Phase II: Modeling

Source: GRF/SAUD.

Period: July 1, 2000 – December 31, 2001

Funding: \$11,186

- Development of a Research Program in Phase-Change Building Materials (PCBM) for Energy Conservation and Management

Source: Energy Research Center. Kansas Geological Survey.

Period: June 1, 2000 – December 31, 2001

Funding: \$4,868

- Development of a Methodology that Utilizes the Second Law of Thermodynamics to Analyze Heating, Ventilating, and Air-Conditioning (HVAC) Systems

Source: Research and Public Service. The University of Kansas.

Period: July 1, 1999 – August 31, 2000

Funding: \$5,400

- Development of a National Database of Energy Savings in Space Cooling and Heating Loads Produced by Radiant Barrier Technology

Source: Energy Research Center, Kansas Geological Survey.

Period: June 1, 1999 – August 31, 2000

Funding: \$7,579

- Establishment of the Center for the Enhancement of Building Energy Performance

Source: Custom Energy, LLC

Period: September 1, 1998 - August 31, 1999.

Funding: \$49,000

(Reassignment of the PI position from Dr. Clay Belcher)

- Industrial Energy Technical Assistance to Two Mexican Universities

Source: University City Science Center/U.S. Department of Energy.

Period: September 1, 1996 - August 31, 1998

Funding: \$28,000

- Technical Assistance to Develop the State Agencies Natural Resources End-Use Data Base (SANRED) (Y 1- 2)

Source: University of Texas' Center for Energy Study/Texas Energy Conservation Office

Period: September 1, 1994 - August 31, 1996

Funding: \$49,940

- LoanSTAR Energy Program (Loan to Save Taxes And Resources) (Years 1- 3)

Source: Energy Systems Laboratory/Texas State Energy Conservation Office.

Period: June 1, 1994 - August 31, 1997

Funding: \$537,057^(*)^(**)

- Industrial Assessment Center (IAC) (Years 1- 4) formerly known as Energy Analysis and Diagnostic Center

Source: University City Science Center/U.S. Department of Energy.

Period: October 1, 1993 - September 30, 1997

Funding: \$500,273^(*)

(One of two Co-Investigators with no Principal Investigator)

- Experimental and Economic Evaluation of Radiant Barrier Technology in South Texas

Source: Texas Center for Energy and Mineral Resources.

Period: September 1, 1993 - December 31, 1994

Funding: \$23,747^(*)^(**)

- Model Institutions for Excellence

Source: National Science Foundation.

Period: September 1, 1993 - June 30, 1994

Funding: \$74,945^(*)

(Co-Principal Investigator)

^(*) As non-tenure track visiting assistant professor.

^(**) Sole proposal writer and responsible for the project; officially listed as Co-PI because of non-tenure track status.

Professional Affiliations

- Architectural Engineering Institute (AEI)
 - Member of the Academic Council
- American Society for Testing and Materials International (ASTM International)
 - Voting Member of Committee C16 (Thermal Insulation)
- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
 - Corresponding Member of Technical Committee 4.4 (Building Materials and Building Envelope Performance)
- Reflective Insulation Manufacturers' Association International (RIMA-I)
- Residential Energy Services Network (RESNET)
 - Member of the Training and Education Committee
- National Institute of Building Sciences (NIBS)
- Building Enclosure Technology and Environment Council (BETEC)
- Building Enclosure Council (BEC)
- American Association of Civil Engineers (ASCE)
- American Solar Energy Society (ASES)
- International Solar Energy Society (ISES)

Academic Affiliations

- Tau Beta Pi National Engineering Honor Society.
- Pi Tau Sigma International Mechanical Engineering Honor Society
- Phi Alpha Epsilon Honor Society for Architectural Engineers

Honors and Awards

- Xingcheng Friendship Award (2015). Given by Changsha Municipal People's Government. Hunan, China. September 2015.
- Certificate of Honor: *A New Millennium Yuelu Visiting Scholar in 2013*. Given by the Yuelu Academy. Hunan University. May 2013.
- Best Presentation Award for the paper "Phase Change Materials in Combination with Existing Insulation for a Superior Thermal Performance of Building Walls." *Proceedings of the 7th Annual Global Insulation Conference and Exhibition*, Riga, Latvia, September 19, 2012.
- H.O.P.E. Award Finalist - Honor for an Outstanding and Progressive Educator. Top 5 finalist. Only award given for teaching excellence by the entire university student body. November 12, 2011.
- Bellows Scholar Award 2006 for Outstanding Achievement in Research and Service. University of Kansas School of Engineering - 2006.
- Appointed Chief Advisor to Kansas Alpha: Tau Beta Pi Engineering Honor Society Chapter at the University of Kansas. July 2000.
- "Outstanding Service Award" -- Office of Industrial Technologies, U.S. Department of Energy. August 1997.
- Selected to Chair the Center for Innovation and Teaching Excellence focus group - National Science Foundation's Model Institution for Excellence Program - 1993 - 1994.
- Elected to Tau Beta Pi Engineering Honor Society - 1987.
- Elected to Pi Tau Sigma Mechanical Engineering Honor Society - 1987.

M.S. and Ph.D. Committees Chaired

Master of Science

<u>Student's Name</u>	<u>Discipline</u>	<u>In Progress/Graduated</u>
Benke, Russell	Architectural Engineering	In Progress
Horton, Breta	Architectural Engineering	In Progress
McFarlane, Matthew	Architectural Engineering	In Progress
McGinnis, Alan	Architectural Engineering	In Progress
Chen, Yifan	Architectural Engineering	December 2017
Ali, Sarah	Architectural Engineering	August 2017
Kuppusamy, Arun	Architectural Engineering	May 2016 with Honors
Swaback, Matt	Architectural Engineering	December 2015
Clark, Colin	Architectural Engineering	December 2015
Peek, Brent	Architectural Engineering	May 2015
Goebel, Loryn	Architectural Engineering	May 2015 with Honors

Chotangada, Soman	Architectural Engineering	December 2014
M., O.	Architectural Engineering	Did not graduate
Lee, Kyoung Ok	Architectural Engineering	2013 with Honors
Varadarajan, Krupasagar	Mechanical Engineering	2011
Reshmeen, Silvia	Architectural Engineering	2009
Ahmed, Mashud	Mechanical Engineering	2009
Evers, Angela	Architectural Engineering	2008 with Honors
S., A.	Architectural Engineering	Did not graduate
Zhu, Dandan	Architectural Engineering	2005
King, Jennifer	Architectural Engineering	2004
Zhang, Meng	Architectural Engineering	2003
Frempong, Michael	Architectural Engineering	2000

***Prior to Joining
the University of Kansas***

DLC., R.	Mechanical Engineering	Did not graduate
Medrano, Armando	Mechanical Engineering	1998
Figuroa, Irene	Mechanical Engineering	1998
Gonzales, Mario	Mechanical Engineering	1997
Hernandez, Martin	Mechanical Engineering	1997
Mathew, Mathew	Mechanical Engineering	1995

Doctor of Philosophy

Student's Name	Discipline	In Progress/Graduated
Xie, Kun	Civil Engineering	In Progress
Lee, Kyoung Ok	Civil Engineering	2014 with Honors
Fang, Yuan	Civil Engineering	2009 with Honors

Doctor of Philosophy – Jointly Supervised

Student's Name	Discipline	In Progress/Graduated	University/Country
Sun, Xiaoqin	Civil Engineering	2014	Hunan/China
Jin, Xing	Energy and Environment Engineering	2011	Southeast/China

Courses Taught

Course Number	Course Name	Period
ARCE 350	Building Materials Science	Fall 1998 – Fall 2000 Spring 2001 – Spring 2005 Fall 2005 – Fall 2008 Spring 2010 – Spring 2012 – Present
ARCE 351	Building Materials Science, Honors	Spring 2017 – Present
ARCE 561	Principles of Bldg Mech Sys	Spring 1999 – Spring 2001 Spring 2005 – Spring 2007
ARCE 660	Building Thermal Science	Fall 2001 – Present
ARCE 670	Building Thermal Science, Honors	Fall 2017 - Present
ARCE 663	Energy Management	Spring 2000 Spring 2003 – Spring 2004 Spring 2006 – Spring 2009

		Fall 2009 – Fall 2010 Spring 2012 – Present
ARCE 764	Adv. Thermal Analysis of Bldgs	Fall 1999
ARCE 681	ARCE Senior Design Project II	Spring 2007 Spring 2010
ARCE 690	Special Topics: Adv. Bldg. Energy Modeling	Spring 2009
CE 201	Statics	Summer 2008
CE 300	Dynamics	Summer 2008
CE 301	Statics and Dynamics	Summer 2008
CE 310	Strength of Materials	Fall 2000 – Fall 2001 Sum 2000 – Present
	<i>Prior to Joining the University of Kansas</i>	
ME 255	Statics and Dynamics	Spring 1993
MEEN 2303	Integrated Mechanics II	Spring 1997
ME 347/MEEN 3347	Thermodynamics	Spring 1993 – Spring 1998 Fall 1993 – Fall 1997
ME 341/MEEN 4131	Mechanical Engineering Lab	Fall 1994 – Fall 1997
ME 346	Energy Systems	Spring 1995
ME 503	Advanced Energy Systems	Fall 1993 Spring 1995
MEEN 5347	Advanced Thermodynamics	Fall 1995