

**JAYA MUKHOPADHYAY Ph.D., LEED AP**  
Assistant Professor, School of Architecture  
Co-Director, Integrated Design Laboratory  
Montana State University, Bozeman MT

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## EDUCATION

**Texas A&M University**, College Station, Texas, USA

Ph.D. in Architecture, 2013

Master of Science in Architecture, 2005

**Tulsi Vidya Bharati School of Architecture**, New Delhi, India

Diploma in Architecture (Equivalent to B Arch), 1999

**LEED Accredited Professional** (LEED 2.1), 2006

## PROFESSIONAL EXPERIENCE

**Montana State University**

**Department of Art & Architecture**

**Bozeman, MT**

*Assistant Professor (Aug 15 – Present)*

**Energy Systems Laboratory**

**Texas A&M University, College Station, TX**

*Research Engineering Associate III (Sep 13 – Aug 15)*

*Research Engineering Associate II (Mar 07 – Aug 13)*

*Graduate Research Assistant (Sep 03 – Aug 05)*

Working on a project to calculate NO<sub>x</sub> emission reductions from implementation of the IECC/ IRC and ASHRAE energy conservation codes in Texas for residential and commercial buildings. This project is motivated by the Senate Bill 5 passed by the State of Texas legislature aiming to reduce NO<sub>x</sub> emissions in Texas. Clients include:

- Austin Energy
- City of Houston, Texas
- North Central Texas Council of Governments (NCTCOG)
- City of Arlington, Texas
- Home Builders Association of Michigan
- Texas Home Energy Rating Organization (Texas HERO)

**Kirksey**

**Houston, TX**

*Junior Associate (Sep 05 – Feb 07)*

Contributed as part of the Green Team that provided in-house energy modeling, daylighting and LEED certification services to various design projects at Kirksey.

Projects include:

- Satterfield & Pontikes Building Houston TX (LEED gold certification)
- Amegy Bank Building prototype (energy analysis)
- Kirksey expansion (daylighting analysis)
- Tallowood Baptist Church (daylighting analysis)
- Houston Community College Houston TX (daylighting analysis)
- Beltway-8 Building Houston TX (LEED certification)

**Texas Center for Applied Technology**

**Texas A&M University, College Station, TX**

*Graduate Assistant (Mar 02 – Aug 03)*

As part of a design team to provide supportive graphic design work for CDROM and web based presentations for the Central Technical Support Facility CTSF a branch of the US Army.

**Educational Media Services****Texas A&M University, College Station, TX**

*Student Worker (Aug 01 – Feb 02)*

As part of a team providing graphic design templates for educational aid material.

**S. Ghosh and Associates****New Delhi, India**

*Assistant Architect (May 00 – May 01)*

Assisted in the design development, preparation and management of working drawings and supervision of construction of Bharat Petroleum Corporation Research and Development laboratories, NOIDA, UP, India. Time frame for construction: 1999 - 2001.

**S.K. Das Consultants****New Delhi, India**

*Junior Architect (May 99 – April 00)*

**ACADEMIC WORK****Ph.D. Dissertation**

*An analysis of energy consumption in grocery stores in a hot and humid climate*

**Master of Science Thesis**

*Development of fenestration for improved residential buildings for code compliance in hot and humid climates*

**Graduate Coursework Completed for the Master of Science and Ph.D.****Degree in Architecture**

- Principles of Heating, Ventilation and Air Conditioning
- Environmental Systems in Buildings
- Energy Optimization in Building Design – An Introduction to DOE-2 Simulation Software.
- Daylighting Design
- Cogeneration Systems
- Renewable Energy Systems
- Principles of Building Energy Analysis
- Software Development for Building Design
- Applied Solar Energy
- Statistics in Research
- Heat Transfer
- Thermodynamics
- Energy Management in Commercial Buildings

**Graduate Program Projects**

- Proposal for a cogeneration plant for a mid-size community college.
- Energy consumption of an office building in College Station Texas using EnergyPlus.
- Energy consumption analysis of Blocker building (TAMU Campus) using DOE2.1e.
- Assessing different glazing and frame types for windows in various climates and conditions using DOE2.1e simulations.
- Comparative study assessing different methods for modeling windows in DOE2.1e.
- Assessing the daylighting qualities of a space at the Cushing library using Radiance.
- A calculation program to optimize the lighting fixtures requirements for a specified space, using Visual Basic programming language.

## **Undergraduate Program Projects**

### **Thesis**

*International Center for Genetic Engineering and Biotechnology investigating the possibility of improving the existing design using innovative building systems, service infrastructure and construction details of a laboratory building type - A design project*

### **Dissertation**

*Critique of contemporary Indian institutional architecture within the framework of prevailing social ethos*

## **GRANTS**

### **Integrated Design Lab Services, Northwest Energy Efficiency Alliance, 2015-2017**

(Co-PI)

**ASHRAE RP-1650: Training Requirements for Sustainable High Performance Building Operations. American Society of Heating Refrigerating & Air-conditioning Engineers 2017 – 2018** (PI)

## **TEACHING EXPERIENCE**

### **Montana State University, Department of Architecture**

ARCH 331: Environmental Control Systems – I

ARCH 331: Environmental Control Systems – II

ARCH 525: Energy Optimization in Building Design

ARCH 535: Advanced Building Systems

### **Graduate Teaching Academy Certificate**

Texas A&M University, College Station, Texas, USA

## **PUBLICATIONS & PRESENTATIONS**

### **Presentations**

1. **Mukhopadhyay, J.**, J.C. Baltazar, J. Haberl. 2016. "Comparing the Performance of RESNET Certified Software Programs for Energy Code Compliance in Texas." Presentation at 2016 IBPSA Conference, Salt Lake City.

### **Peer Reviewed Publications in Review / Preparation**

1. Wilder, R., **J. Mukhopadhyay**, K.L. Amende. 2016. "Evaluating Glare in LEED Certified Green Buildings to Inform Criteria for Daylighting Credits". Journal paper in preparation. To be submitted to Energy and Buildings Journal.
2. **Mukhopadhyay, J.**, J. Ore and K.L. Amende. 2016. "Assessing Retrofits in the Historic District of Havre Montana". Journal paper in preparation. Plan to submit to the APT Bulletin.
3. Hays, J., **J. Mukhopadhyay**, K.L. Amende. 2016. "A Comparison of Energy Savings for Two Simulation Programs of an Above-Code Small Office Building for LEED Compliance." Submitted to ASHRAE Summer Conference, Long Beach CA.

### **Peer Reviewed Publications**

1. **Mukhopadhyay, J.**, J. Haberl. 2014. "Reducing Energy Consumption in Grocery Stores: Assessing CHP Systems". Technical Paper. Accepted by the ASHRAE Transactions, American Society of Heating, Refrigerating and Air-conditioning Engineers.
2. **Mukhopadhyay, J.**, J. Haberl. 2014. "Reducing Energy Consumption in Grocery Stores: Evaluation of Energy Efficiency Measures". Technical Paper, ASHRAE

Transactions, Volume 120. American Society of Heating, Refrigerating and Air-conditioning Engineers.

3. **Mukhopadhyay, J.**, J. Haberl and J. Baltazar. 2013. "Reducing Energy Consumption in Grocery Stores: Calibration of a Grocery Store Simulation Model". Conference Paper accepted by the American Society of Heating, Refrigerating and Air-conditioning Engineers. Proceedings of the ASHRAE Conference, Denver, CO.
4. **Mukhopadhyay, J.**, J. Baltazar, J. Haberl, and C. Loyd. 2013. "Comparing the Performance of a 2009 IECC Code-Compliant House Using Code-Compliant Residential Simulation Programs for Texas". 12<sup>th</sup> International Conference for Enhanced Building Operations, Montreal, Canada.
5. **Mukhopadhyay, J.**, J. Baltazar, H. Kim, J. Haberl, C. Lewis and B. Yazdani. 2011. "Comparison of ASHRAE Standard 90.1, 189.1 and IECC Codes for Large Office Buildings in Texas". Proceedings of the 11<sup>th</sup> International Conference for Enhanced Building Operations, New York, New York.
6. **Mukhopadhyay, J.**, J. Baltazar, Z. Liu, J. Haberl, C. Culp and B. Yazdani. 2010. "A Comparative Analysis of Residential Energy Use for 2009 IECC Code Compliance with 2006 NAECA Appliance Standards for Selected Climate Zones in Texas". Proceedings from 17<sup>th</sup> Annual Symposium on Improving Building Energy Efficiency in Hot and Humid Climates in Austin Texas.
7. **Mukhopadhyay, J.**, Z. Liu, M. Malhotra, S. Kota, S. Blake, J. Haberl, C. Culp, and B. Yazdani. 2009. "Recommendations for 15% Above-Code Energy Efficiency Measures on Implementing Houston Amendments to Single-Family Residential Buildings in Houston Texas". Proceedings of the 9<sup>th</sup> International Conference for Enhanced Building Operations, Austin, Texas.
8. **Mukhopadhyay, J.**, Z. Liu, M. Malhotra, S. Kota, S. Blake, J. Haberl, C. Culp and B. Yazdani. 2009. "Recommendations for 15% Above-Code Energy Efficiency Measures on Implementing Houston Amendments to Multi-Family Residential Buildings in Houston Texas". Proceedings of the 9<sup>th</sup> International Conference for Enhanced Building Operations, Austin, Texas.
9. **Mukhopadhyay, J.**, Z. Liu, M. Malhotra, J. Haberl, D. Gilman, C. Montgomery, C. Culp and B. Yazdani. 2008. "An Analysis of the Residential Energy Savings from the Implementation of the 2001 IECC and 2006 NAECA Appliance Standards in the State of Texas". Proceedings of the 16<sup>th</sup> Symposium on Improving Building Systems in Hot and Humid Climates, Dallas, Texas.
10. **Mukhopadhyay, J.**, and J. Haberl. 2006. "Comparison of Simulation Methods for Evaluating Improved Fenestration Using the DOE-2.1E Building Energy Simulation Program". Proceedings of the 15<sup>th</sup> Symposium on Improving Building Systems in Hot and Humid Climates, Orlando, Florida.
11. **Mukhopadhyay, J.** and J. Haberl. 2006. "Performance of High-performance Glazing in IECC Compliant Building Simulation Model". Proceedings of the IBPSA SimBuild Conference, MIT Cambridge, Massachusetts.
12. Kim, H., **J. Mukhopadhyay**, J. Baltazar, J. Haberl and B. Yazdani. 2013. "Analysis of Code-Compliant Construction in Texas Based on Texas Building Energy Performance Standards (TBEPS)". Published in the 12<sup>th</sup> International Conference for Enhanced Building Operations, Montreal, Canada.

13. Liu, Z., **J. Mukhopadhyay**, M. Malhotra, J. Haberl, D. Gilman, C. Montgomery, C. Culp and B. Yazdani. 2008. "Methodology for Residential Building Energy Simulations Implemented in the international Code Compliance Calculator". Proceedings of the 16th Symposium on Improving Building Systems in Hot and Humid Climates, Dallas, Texas.
14. Gilman, D., K. Marshall, Z. Liu, **J. Mukhopadhyay**, R. Stackhouse, J. Cordes, et al.. 2008. "Development of a Residential Code-compliant Web-based Energy Efficiency Calculator for Texas". Proceedings of the 16th Symposium on Improving Building Systems in Hot and Humid Climates, Dallas, Texas.
15. Cho, S., **J. Mukhopadhyay**, J. Haberl, C. Culp and B. Yazdani. 2007. "Recommendations for 15% Above-Code Energy Efficiency Measures for Commercial Office Buildings". Proceedings of the 15.5th Symposium on Improving Building Systems in Hot and Humid Climates, San Antonio, Texas.
16. Malhotra, M., **J. Mukhopadhyay**, Z. Liu, J. Haberl, C. Culp and B. Yazdani. 2007. "Recommendations for 15% Above-Code Energy Efficiency Measures for Commercial Office Buildings". Proceedings of the 15.5th Symposium on Improving Building Systems in Hot and Humid Climates, San Antonio, Texas.
17. Baltazar, J., P. Im, J. Haberl, Z. Liu, **J. Mukhopadhyay**, C. Culp, S. Kim, D. Gilman and B. Yazdani. 2007. "A Methodology for Calculating Integrated NO<sub>x</sub> Emissions Reduction from Energy Efficiency and Renewable Energy (EE/RE) Programs across State Agencies in Texas". Proceedings of the 15.5th Symposium on Improving Building Systems in Hot and Humid Climates, San Antonio, Texas.
18. Morgan, R., D. Gilman, **J. Mukhopadhyay**, K. Marshall, R. Stackhouse, J. Cordes, et al. 2007. "Development of a Residential Code-compliant Calculator for the Texas Climate Vision Project". Proceedings of the 15.5th Symposium on Improving Building Systems in Hot and Humid Climates, San Antonio, Texas.
19. Ahmad, M., P. Im, **J. Mukhopadhyay**, M. Malhotra, J. Haberl, C. Culp and B. Yazdani. 2006. "Impact of the Implementation of the 2000/2001 IECC on Residential Energy Use in Texas: Analysis of Residential Energy Savings". Proceedings of the 15th Symposium on Improving Building Systems in Hot and Humid Climates, Orlando, Florida.
20. Ahmad, M., D. Gilman, **J. Mukhopadhyay**, J. Haberl and C. Culp. 2005. "Development of a Web-based Emissions Reduction Calculator for Code compliant Single-family and Multi-family Construction". Proceedings of the 5th International Conference for Enhanced Building Operation. Pittsburgh, PA.

#### Technical Reports

1. **Mukhopadhyay, J.**, J. Baltazar, and J. Haberl. 2014. "Validation of the International Code Compliant Calculator (IC3) Using the RESNET Verification Procedures for HERS Software Tools (No. 13-002)". Energy Systems Laboratory Technical Report, Texas A&M University System. Report in Review.
2. **Mukhopadhyay, J.**, J. Baltazar, and J. Haberl. 2014. "Update of the International Code Compliance Calculator (IC3) to Specifications Provided by Austin Energy for the City of Austin". Energy Systems Laboratory Internal Technical Report, Texas A&M University System. Report in Review ESL-ITR-14-11-01.
3. **Mukhopadhyay, J.**, J. Baltazar, J. Haberl, B. Yazdani, B. and S. Ellis. 2014. "Comparing the Residential Provisions of the 2015 IECC with the Corresponding Provisions of the 2012 IECC for Single-Family Residential Construction in Texas".

Energy Systems Laboratory, Texas A&M University System. Report No. ESL-TR-14-08-02.

4. **Mukhopadhyay, J.**, J. Baltazar, J. Haberl, and B. Yazdani. 2014. "Comparison of the Performance Predictions of a 2009 IECC Code-Compliant House Using IC3, REM/Rate, EnergyGauge and REScheck". Energy Systems Laboratory Technical Report, Texas A&M University System. Report No. ESL-TR-13-09-02.
5. **Mukhopadhyay, J.**, J. Baltazar, J. Haberl, S. Ellis and G. Zilbershtien. 2014. "Comparing the Implementation of the 2012 International Residential Code (IRC) to the 2009 Michigan Uniform Energy Code (MUEC) for Residential Construction". Energy Systems Laboratory Internal Report, Texas A&M University System. Report No. ESL-TR-13-12-01.
6. **Mukhopadhyay, J.**, J. Baltazar and J. Choi. 2013. "Documentation of the UA Calculation Procedure for the IC3". Energy Systems Laboratory Internal Report, Texas A&M University System. Report No. ESL-TR-13-08-04.
7. **Mukhopadhyay, J.**, J. Baltazar and J. Choi. 2013. "Documentation of the HERS Index Rating Plug-In Tool for the IC3". Energy Systems Laboratory Internal Report, Texas A&M University System. Report No. ESL-TR-13-07-03.
8. **Mukhopadhyay, J.**, J. Baltazar and J. Choi. 2013. "Documentation of the Manual-J Plug-In Tool for the IC3". Energy Systems Laboratory Internal Report, Texas A&M University System. Report No. ESL-TR-13-08-01.
9. **Mukhopadhyay, J.**, J. Baltazar and J. Haberl. 2012. "Assessing Savings from Group Measures Proposed by the Houston Amendments for the 2009 IECC (Residential Provisions) – A Report for the City of Houston". Energy Systems Laboratory, Report No. ESL-TR-11-12-06.
10. **Mukhopadhyay, J.**, G. Zilbershtien, S. Ellis, J. Baltazar, J. Haberl, and B. Yazdani. 2012. "Detailed Stringency Analysis of Suggested Amendments to Chapter 11 of the 2012 IRC and the 2012 IECC that were Submitted to the Texas State Energy Conservation Office (SECO) During March 30-April 30, 2012 Comment Period". Energy Systems Laboratory Report No. ESL-TR-12-08-01, Texas A&M University System.
11. **Mukhopadhyay, J.**, J. Baltazar, G. Zilbershtien, S. Ellis, J. Haberl and B. Yazdani. 2012. "Assessment of the Proposed Amendments to the 2012 IECC Provided by the North Central Texas Council of Governments (NCTCOG)". Energy Systems Laboratory Report No. ESL-TR-12-10-01, Texas A&M University System.
12. **Mukhopadhyay, J.**, J. Baltazar, J. Haberl, B. Yazdani, B. and S. Ellis. 2011. "A Comparison of Building Energy Code Stringency : 2009 IECC Versus 2012 IECC for Commercial Construction in Texas". Energy Systems Laboratory Report No. ESL-TR-11-12-07, Texas A&M University System.
13. **Mukhopadhyay, J.**, J. Baltazar, H. Kim, J. Haberl, et al. 2011. "Comparison of ASHRAE Standard 90.1, 189.1 and IECC Codes for Large Office Buildings in Texas". Energy Systems Laboratory Report No. ESL-TR-11-08-02, Texas A&M University System.
14. **Mukhopadhyay, J.**, H. Kim, S. Do, K. Kim, J. Baltazar, J. Haberl and C. Lewis. 2011. "Cost-Effective Energy Efficiency Measures for Above Code (ASHRAE-90.1-2001 and 2007): For Restaurant Buildings in the City of Arlington". Energy Systems Laboratory Report No. ESL-TR-11-10-08, Texas A&M University System.

15. **Mukhopadhyay, J.**, J. Baltazar, Z. Liu, J. Haberl, et al. 2010. "Description and Comparison of the Results of the Proposed House : Habitat for Humanity at Frazier Court, Dallas Texas with the 2004 IECC Standard Reference House". Energy Systems Laboratory Report No. ESL-TR-10-09-01, Texas A&M University System.
16. Liu, Z., **J. Mukhopadhyay**, J. Haberl, B. Yazdani, and C. Culp. 2010. "A Comparison of the Stringency of the 2001 IECC versus the 2009 IECC and 2009 IRC". Energy Systems Laboratory Report No. ESL-TR-10-01-01, Texas A&M University (January).
17. Liu, Z., **J. Mukhopadhyay**, J. Haberl, B. Yazdani and C. Culp. 2010. "Recommendations for 15% Above-Code Energy Efficiency Measures on Implementing Houston Amendments to Single-Family Buildings in Houston Texas". Energy Systems Laboratory Report No. ESL-TR-10-01-01, Texas A&M University.
18. Haberl, J., B. Yazdani, J. Baltazar-Cervantes, C. Lewis, P. Parker, S. Ellis, **J. Mukhopadhyay**, H. Kim, et al. 2012. "Energy Efficiency / Renewable Energy Impact in the Texas Emissions Reduction Plan (TERP), Vol. I – Summary Report, Annual Report to the Texas Commission on Environmental Quality". Energy Systems Laboratory Report No. ESL-TR-12-12-04, Texas A&M University (December).
19. Haberl, J., B. Yazdani, J. Baltazar-Cervantes, C. Lewis, P. Parker, S. Ellis, **J. Mukhopadhyay**, H. Kim, et al. 2012. "Energy Efficiency / Renewable Energy Impact in the Texas Emissions Reduction Plan (TERP), Vol. II – Technical Report, Annual Report to the Texas Commission on Environmental Quality". Energy Systems Laboratory Report No. ESL-TR-12-12-05, Texas A&M University (December).
20. Haberl, J., B. Yazdani, J. Baltazar-Cervantes, C. Lewis, P. Parker, S. Ellis, **J. Mukhopadhyay**, H. Kim, et al. 2012. "Energy Efficiency / Renewable Energy Impact in the Texas Emissions Reduction Plan (TERP), Vol. III – Appendix, Annual Report to the Texas Commission on Environmental Quality". Energy Systems Laboratory Report No. ESL-TR-12-12-06, Texas A&M University.
21. Malhotra, M., **J. Mukhopadhyay**, Z. Liu, C. Culp, J. Haberl, B. Yazdani and C. Montgomery. 2007. "Recommendations for 15% Above-Code Energy Efficiency Measures for Residential Buildings". Energy Systems Laboratory Report No. ESL-TR-07-09-01, Texas A&M University.
22. Cho, S., **J. Mukhopadhyay**, Z. Liu, C. Culp, J. Haberl, B. Yazdani, and C. Montgomery. 2007. "Recommendations for 15% Above-Code Energy Efficiency Measures for Commercial Office Buildings". Revised November 2008, Energy Systems Laboratory Report No. ESL-TR-07-09-02, Texas A&M University.

#### Authoritative References

1. **Mukhopadhyay, J.**, Contributing author of "Appendix D: Regression Techniques", ASHRAE Guideline 14: Measurement of Energy and Demand Savings. American Society of Heating, Refrigeration and Air Conditioning Engineers, Atlanta, Georgia,.

**ENERGY SIMULATION PROGRAMS**

- DOE-2 – Version 2.1e (Hourly whole building simulation program)
- eQUEST – Version 3.64 (Hourly whole building simulation program)
- eQUEST-Refrigeration – Version 3.61 (Hourly whole building simulation program for refrigeration systems)
- EnergyPlus – Version 6.0 (Hourly whole building simulation program)
- WINDOW – Version 5.2 (Software for analyzing performance of building envelope components)
- Radiance –Windows Version 2.0 (Daylighting analysis)
- F-Chart –(Photovoltaic systems analysis and design program)
- PV F-Chart – (Solar system analysis and design program)
- EES – Engineering Equation Solver (Equation solving program)

**SOFTWARE SKILLS**

- AutoCAD 2000 / AutoDesk for 2Dimensional and 3Dimensional drawing.
- Adobe: Illustrator, Photoshop for graphical design presentations.
- Macromedia: Flash 5 and Dream weaver for web based graphical presentations.
- Microsoft Office: Word, Excel, FrontPage, PowerPoint, Visio for data management and organization.

**PROFESSIONAL SOCIETIES**

- A member of the United States Green Building Council.
- Life member of the Institute of Architects, India.
- Associate member of the American Society of Heating, Refrigerating and Air-Conditioning Engineers.