

# **HOUSING RESEARCH CENTER**

PURDUE UNIVERSITY

Department of Building Construction Management

401 North Grant Street

West Lafayette, In 47907-2021

## **ANNUAL REPORT – 2009**

### **ORGANIZATION**

The Purdue Housing Research Center is located in the Building Construction Management Program in the School of Technology. The Center activities are directed by Prof. Robert Cox as the Executive Director. This center works in conjunction with the Division of Construction Engineering & Management, School of Civil Engineering with Professor Makarand (Mark) Hastak serving as the Research Director for Manufactured Housing. Professor Joseph Orczyk and Mr. Mark Schaubert, both from the Department of Building Construction Management, serve as Co-Research Directors for Re-Construction. Professor Panagiota Karava, who has recently joined Purdue University (School of Civil Engineering /Division of Construction Engineering and Management), has initiated a research program focusing on high performance buildings and net-zero houses.

### **2009 ACTIVITIES**

1. Patel, Saumyang and M. Hastak. (2010). Post Disaster Housing for 200 families (working title), MS Thesis Purdue University.
2. Hastak, M. (2009). “Post Disaster Housing – A U.S. Perspective.” Invited Speaker at the International Symposium on Wenchuan Earthquake Reconstruction Efforts (ISWERE), Duijiangyan City, Sichuan Province, China, September 11-13, 2009
3. A team from Purdue and Shanghai Jiao-Tong University, China, won the bronze medal at the Mondialogo Engineering competition initiated by UNESCO and Daimler. The proposed project “Building Rural Houses After Disaster in Duijiangyan Earthquake Areas of Sichuan province, China”, targeted reconstruction of affected region after the 2008 Earthquake. This contest is held every two years, as a worldwide competition among engineers to address challenges of 21st century. The Purdue team comprised of Nader Naderpajouh and Saumyang Patel and was advised by Prof. M. Hastak.
4. Dr. Karava (in collaboration with three faculty members in the Architectural Engineering Group at Purdue) has designed a two storey outdoor fully-reconfigurable test-building (floor area 500 ft<sup>2</sup>) that will be located at Bowen Laboratory and will facilitate research on innovative building-integrated technologies within the context of net-zero houses. Construction of the facility will start in March 2010.

## Reports and Publications

1. Sabharwal, A., Syal, M. and Hastak, M. (2009). "Impact of Manufactured Housing Component Assembly Redesign on Facility Layout and Production Process." Special Issue "Offsite Manufacturing," Construction Innovation Journal, Emerald Publishing, Bingley, UK, Vol. 9 (1) 2009, pp. 58-71. (1<sup>st</sup> tier category)
2. Jeong, Jae G., Hastak, Makarand and Syal, Matt. (2009). "Manufacturer-Retailer Relationship Modeling and Optimization for the Manufactured Housing Industry." Special Issue "Offsite Manufacturing," Construction Innovation Journal, Emerald Publishing, Bingley, UK, Vol. 9 (1) 2009, pp. 22-41.(1<sup>st</sup> tier category)
3. Alhaj Ali, Souma, Ayman Abu Hammad, M. Hastak, and M. Syal. (2009). "Analysis of a Modular Housing Production System Using Simulation" Accepted for publication in the Jordan Journal of Mechanical and Industrial Engineering, Published by the Jordanian Ministry of Higher Education and Scientific Research in corporation with the Hashemite University. (expected to appear in June 2010 Issue) (1<sup>st</sup> tier category)
4. Shah, S, Oh, E. H., and Hastak, M. (2009). "Use of Cold Formed Steel as a Structural Material in a Manufactured House Construction," Paper submitted to the ASCE Journal of Architectural Engineering.
5. Jeong, Jae G, Hastak, Makarand, Syal, Matt, and Hong, TaeHoon. (2009). "Framework of Manufacturer-Supplier Relationship in the Manufactured Housing Industry" Submitted to the ASCE *Journal of Automation in Construction*. (1<sup>st</sup> tier category)
6. Jeong, Jae G, Hastak, Makarand, Syal, Matt, and Hong, TaeHoon. (2009). "Internal Supply Chain Modeling and Optimization for the Manufactured Housing Industry" Submitted to the ASCE *Journal of Construction Engineering and Management*. (1<sup>st</sup> tier category)
7. Patel, S., and Naderpajouh, N., and Hastak, M., (2009). "Post Disaster Housing – A U.S. Perspective." International Symposium on Wenchuan Earthquake Reconstruction Efforts (ISWERE), Dujiangyan City, Sichuan Province, China, September 11-13, 2009
8. Stenabaugh, S., Karava, P. (2009). "Design wind-loads on residential Photovoltaic Systems", Proceedings of Annual General Meeting & Conference, Canadian Society of Civil Engineers, St. John's, Canada, May 27-29 (Awarded the First place in the Canadian Society of Civil Engineers Student Competition).
9. Jubayer C., Karava, P., Savory, E. (2009). "Evaluation of forced convective heat transfer coefficients on Photovoltaic/Thermal systems", Poster Presentation, Canadian Solar Buildings Conference, Toronto, Canada, June.
10. Jubayer C., Karava, P., Savory, E. (2010). "CFD simulations for evaluation of forced convective heat transfer coefficients on Photovoltaic/Thermal systems integrated on roof surfaces of houses", Proceedings of Computational Wind Engineering Conference, Chapel Hill, US, May.
11. Jubayer C., Karava, P., Savory, E. (2010). Modelling and simulation of Photovoltaic/Thermal systems in houses. Proceedings of 1<sup>st</sup> High Performance Buildings Conference, Purdue University, July.

## Planned or Anticipated Journal Publications

1. Garcia, Juan Pablo, Jae G Jeong, Makarand Hastak, and Matt G. Syal. (2010). “Alternative Housing Systems: Hybrid Home Concept” Planned submission to the *ASCE Journal of Architectural Engineering*. (1<sup>st</sup> tier category)
2. Jeong, Jae G, Hastak, Makarand and Syal, Matt G. (2010). “Integrated DSS for Manufactured Housing Supply Chain Management” Planned submission to the *ASCE Journal of Construction Engineering and Management*. (1<sup>st</sup> tier category)
3. Swarup, L., Syal, M. and Hastak, M. (2010). “Whole House Performance Criteria Framework and its Application,” Planned submission to the *ASCE Journal of Architectural Engineering*. (1<sup>st</sup> tier category)
4. Fernandez, Marcela, Hastak, M., and Nader Naderpajouh (2010). Risk Assessment for the Housing Market in Mexico.” Planned submission to the *ASCE Journal of Construction Engineering and Management*. (1<sup>st</sup> tier category).
5. Hastak, M. and Alex Duran. (2010). “Decision Model to Evaluate Decentralized and Centralized Wastewater Treatment Options for Residential Land Development.” *Planned submission to the Journal of Urban Planning and Development, ASCE* (1<sup>st</sup> tier category).
6. Jubayer C., Karava, P., Savory, E. (2010). Modelling and simulation of Photovoltaic/Thermal systems in houses, Planned submission to the *Journal of Energy and Buildings, Elsevier* (1<sup>st</sup> tier category)

## Center of Re-Construction

- A Center of Re-Construction is in the process of being established.
- On a broad basis the Center will work in the areas building rehabilitation as the result of disaster or natural deterioration.

## NAHB Student Chapter

- 37 members
- Meetings are held each month with speakers, participation in the local chapter of NAHB, and fund raising activities to off set costs to travel to the national convention.
- Professor Dale Koehler is the faculty advisor