



# Pennsylvania Housing Research/Resource Center

Phone: (814) 865-2341  
 Fax: (814) 863-7304  
 PHRC@psu.edu  
 www.engr.psu.edu/phrc

The Pennsylvania State University  
 219 Sackett Building  
 University Park, PA 16802

## 2009 Annual Report

For the period January 1, 2009 through December 31, 2009

### Staff Changes:

Brian Wolfgang has been appointed as the PHRC Fellow for FY 2009-10. In addition to his scholarly activities, he will assist in the development of Basement Insulation Guidelines, as well as the development of the Wall Bracing Training Program.

### Training, Education and Outreach Activities

**Workshops and Training** – The PHRC delivered 69 technical workshops and webinars to 3,428 builders, remodelers, educators, design professionals and code officials during this reporting period (please see the table below for detail). This is on par with the programs during the previous reporting period. The PHRC anticipates the demand for training on building code issues to continue to decline to a maintenance level of between 20 to 30 programs a year.

<b>PHRC Training Programs Delivered</b>			
<b>PROGRAM</b>		<b>Activities for</b>	
		<b>1/01/2009 – 12/31/2009</b>	
		<b># of Programs</b>	<b># of Attendees *</b>
Comprehensive IRC Program	CO1	3	65
International Residential Code Inspection Essentials	CO2	3	86
IRC's Plumbing Requirements	CO3	2	50
IRC's Mechanical Requirements	CO4	1	14
Commercial Building Provisions of the IECC	CO5C	2	45
Residential Energy Essentials	CO5R	2	45
2009 IRC Update Program	CO6	27	941
Storm water programs	SW	0	
Residential Decks: <i>Design Construction and Inspection</i>	D1	4	108
Webinars	W1	12	1482
Residential Mechanical Compliance Program	MC2	1	10
NDS Wood Frame Design	ND1	1	6
Two Family Dwellings and Townhouses Program	MF1	2	54
Custom Programs	CP1		
Residential Sprinkler Program		2	240

West Penn Power Sustainable Energy Fund		6	247
PSATS Convention		1	35
Pennsylvania Standards for Residential Site Development			
<b>Total Programs Held</b>		<b>69</b>	<b>3,428</b>

\* Note: Estimated—not all programs have submitted attendance reports

## A. Program Development

**Description:** The PHRC will develop or update the following new training programs. These programs address issues challenging the residential construction industry (builders, remodelers, building code officials, materials suppliers, etc.)

1. **Residential Mechanical Code Compliance Program** – The need for this program is two-fold. The first is the need of new building code officials to have more in-depth knowledge of mechanical systems since many of them come into code enforcement from other areas of the construction industry and are not familiar with mechanical requirements and proper installation issues. Additionally, a recent DOE funded study conducted by the PHRC found generally poor performing HVAC systems across the Commonwealth. This was generally attributed to poorly constructed ducts. This program provides new and experienced building code officials, mechanical installers, and job supervisors the background they need to effectively administer and enforce the mechanical requirements in the IRC.
2. **Two-Family Dwellings and Townhouses Program** – There are specific requirements for multi-family structures built under the IRC that require special attention by the building code official. The program highlights such issues as fire separation requirements and accessibility. This program focuses on effective plan review and inspection practices and provides an understanding of fire rated assemblies.
3. **2009 IRC Update Program** - Every three years the UCC updates its building code to the most recent version of the ICC's International Residential Code (IRC). This program highlights the most significant changes between the 2006 and 2009 IRC, and identifies potential impacts to builders, designers and building code officials. The result of this is a new training program to be offered to builders and code official organizations.
4. **Blueprint Reading Program** - This one-day workshop is designed to familiarize people with little or no construction experience with the technical components of blueprint reading. This program is intended to provide people who want to become residential inspectors or inspectors with this essential skill.
5. **Wall Bracing: Prescriptive Design and Plan Reviews** - This one-day workshop is designed to provide an overview of the 2009 IRC wall bracing requirements. The program provides a general understanding of structural principals of wood frame buildings as well as wind and seismic loading. The program also provides an emphasis on prescriptive design using the IRC, when a building is exceeding the limits of this approach and a design professional is required, and how to conduct wall bracing plan reviews.
6. **Updating Existing Programs to the 2009 IRC** – The PHRC will update eight of its existing residential training programs to the 2009 IRC. This will require a re-drafting of many of the programs. Additionally programs a, b, c and d will be expanded and changed to reflect greater need for more basic information and to present the material at a slower pace and in a more detailed fashion.

a. <b>Comprehensive International Residential Code (IRC) Program</b>	<b>2 day</b>
b. <b>Pennsylvania's Residential Energy Code Requirements</b>	<b>2 day</b>
c. <b>Overview of the IRC's Plumbing Requirements</b>	<b>2 day</b>
d. <b>Overview of the IRC's Mechanical Requirements</b>	<b>2 day</b>
e. <b>Residential Mechanical Plan Reviews and Inspections</b>	<b>1 day</b>
f. <b>Commercial Building Provisions of the IECC</b>	<b>2 day</b>
g. <b>Performing Residential Building Inspections</b>	<b>2 day</b>
h. <b>Residential Deck Design Construction and Inspection</b>	<b>1 day</b>

Updating our existing training programs to the 2009 IRC has been a major focus of our efforts. This included new presentations, manuals, examples, slides, examinations and presenter's manuals.

## **B. PHRC Workshops**

**Description:** Every year the PHRC provides workshops for builders, remodelers, design professionals, educators, trade contractors and building code officials. These programs will be administered directly by the PHRC. Some of the topics for this year's programs include the following:

### **1. Residential Deck Design Construction and Inspection**

This one-day program provides an overview of IRC code requirements for residential decks and a detailed review of the proper installation of commonly used connectors, fasteners and some commonly used proprietary products. The afternoon focuses on hands-on examples including designing a simple residential deck, performing a detailed deck plan review to check for code compliance, and a virtual inspection of a residential deck.

This course is designed for builders, remodelers, deck contractors, building code officials (plan reviewers and inspectors), design professionals, home inspectors, and manufacturers and suppliers of deck-related construction materials.

### **2. Residential Mechanical Code Compliance Program**

This program focuses on mechanical installers and job supervisors, as well as new building code officials, to provide a more in-depth knowledge of mechanical systems since many of them come into code enforcement from other areas of the construction industry and are not familiar with mechanical requirements and proper installation issues. This program provides new and experienced building code officials and mechanical installers and job supervisors the background they need to effectively administer and enforce the mechanical requirements in the IRC.

### **3. Wall Bracing: Prescriptive Design and Plan Reviews**

This one-day workshop is designed to provide an overview of the 2009 IRC wall bracing requirements. The program provides a general understanding of structural principals of wood frame buildings and wind and seismic loading. The program also provides an emphasis on prescriptive design using the IRC, when a building is exceeding the limits of this approach and a design professional is required and how to conduct wall bracing plan reviews.

## **PA Residential Sprinkler Forum:**

At the direction of the PHRC's IAC, the PHRC developed a training plan to address training needs for residential sprinkler systems that will be required when the 2009 IRC is adopted. As part of this plan the PHRC, in partnership with the PCCA, held the Pennsylvania Residential Sprinkler Forum. The forum was held to provide builders and building code officials with a technical overview of the sprinkler requirements in the 2009 IRC. The presentations in this program focused on the technical issues of designing, installing, inspecting and commissioning of sprinkler systems.

### C. PHRC Training Provided Through Industry Partnerships

**Description:** The PHRC has developed and maintains a wide array of training for all sectors of the construction industry with a focus on residential construction. These programs are intended to address technical issues facing the industry. Additionally the PHRC will customize programs to better meet a need of an industry partner. Each program is developed with a particular audience which may include builders, remodelers, trade contractors, design professionals, teachers, building code officials, etc.

These programs are intended to be offered through our industry partners who may include trade associations such as the Pennsylvania Builders Association or their 42 local associations, professional associations, building code associations as well as the Pennsylvania Construction Code Academy (PCCA).

There have been several programs offered through this initiative:

**PCCA:** PCCA has held 25 programs during this reporting period.

**Builders Associations and other groups:** The PHRC has held 17, 2009 IRC Transition programs with local associations across the Commonwealth.

#### PA Home Energy:

**Home Performance 101: The House as a System** – This one-day training program was developed primarily by the PHRC as a subcontractor of the West Penn Power Sustainable Energy Fund with funding from the Pennsylvania Department of Environmental Protection.

Programs delivered:

Turns, M., *Home Performance 101: The House as a System*, full-day training program, PA Home Energy Conference, State College, PA, March 18, 2009.

Turns, M., *Home Performance 101: The House as a System*, full-day training program, Chambersburg, PA, April 2, 2009.

Turns, M., *Home Performance 101: The House as a System*, full-day training program, Altoona, PA, April 14, 2009.

Turns, M., *Home Performance 101: The House as a System*, Allentown, PA, April 28, 2009

Fortney, M., *Home Performance 101: The House as a System*, Harrisburg, PA, May 8, 2009

Additional programs have been requested and are in the process of being scheduled.

### D. Web-Based Training

**Description:** The PHRC's Industry Advisory Council has requested the development and deployment of web-based training. There is a need for technical programs with a lower-cost delivery mechanism than a formal classroom setting. This initiative will seek to develop interactive web-based training that can be available both live and archived for future viewing.

The following are some of the topics that are being considered for web-based training:

- ❖ Factory Built Structures Series; A Primer for Code Officials
  - Part 1 – Manufactured Housing (HUD Code Homes)
  - Part 2 – Modular of Industrialized Housing
  - Part 3 – Commercial Structures (Depending on Pending Legislation)
- ❖ Tall Wall Framing Based on the 2009 IRC
- ❖ Zero Energy Homes in PA
- ❖ Introduction to Wall Bracing in the 2009 IRC
- ❖ Overview of Mold for Remodelers
- ❖ Building Code Basics for Energy Improvements
- ❖ Building No-Step Entrances for Single Family Homes
- ❖ Basement Insulation Strategies
- ❖ Introduction to Green Building
- ❖ Residential Duct Testing
- ❖ Air Sealing Techniques
- ❖ Conducting a Blower Door Test
- ❖ Radiant Floor Heat - Insulation Requirements and Installation Challenges
- ❖ Habitable Attics
- ❖ Live - Work Units
- ❖ Wood - Plastic Composites (Standard Plus Installation Issues)
- ❖ Vinyl Siding and Soffit - Common Installation Errors
- ❖ Combustion Air Requirements
- ❖ Entrapment Protection - Residential Pools

The following programs were held during this reporting period:

Lau, A., Turns, M., *Intro to Residential Solar Technologies: Resources and Solutions*, January 13, 2009 (~ 156 attendees)

Fortney, M., Turns, M., *Alternatives to Traditional Foundations: Shallow Frost-Protected Foundations*, March 10, 2009. (~73 attendees)

Fortney, M., Neale, R., *Residential Sprinkler Systems: An Introduction to NFPA 13-D*, March 31, 2009 (~261 attendees)

Fortney, M., Turns, M., Buddenbohn, R., *Sneak Peek: Critical Changes in the 2009 IRC*, April 14, 2009 (~220 attendees)

Fortney, M., Turns, M., *Tax Credits, Rebates and grants for the Residential Construction Industry: Are You Leaving Money on the Table?* May 12, 2009 (~82 attendees)

Buddenbohn, B., Meshaw, D., *Municipal Rights & Responsibilities Under the Home Improvement Consumer Protection Act* – June 4, 2009 (~258 attendees) \*

Conte, M., *Factory Built Structures, Part 1, Manufactured Housing* – July 14, 2009 (~83 attendees)

Conte, M., *Factory Built Structures, Part 2, Industrialized/Modular Housing* – August 11, 2009 (~70 attendees)

Turns, M., *Verification Required! New Duct Leakage Testing Requirements in the 2009 IRC* – September 8, 2009 (~105 attendees)

Conte, M., *Emerging regulation of commercial modular construction conflict*—October 20, 2009 (~28 attendees)

Fortney, M., *Building a durable zero step entrance*—November 5, 2009 (~70 attendees)

Fortney, M., Buddenbohn, B., *Building habitable attics and five floor buildings under the IRC*—December 15, 2009 (~76 attendees)

## E. Builder Briefs

**Description:** Continuation of the series of short technical documents - two to four pages in length - that address specific issues that have been identified by builders or remodelers. These documents are intended to be quick to read with much information presented graphically or pictorially.

Potential topics include:

1. Energy Code Enforcement – Lessons from the Field
2. Design Pressures for Windows and Doors
3. In-floor Radiant Heat
4. Basement Wall Insulation Strategies

The following Builder Brief was completed during this reporting period:

- Kasal, B., Repka, N., *Insulated Concrete Masonry Below-grade Walls*, RB0109

## F. Technology Transfer & Outreach

**Description:** Continuation or expansion of activities to get information and publications to builders, remodelers, design professionals, building code officials and others involved in the residential construction industry.

1. **Annual Pennsylvania Housing and Land Development Conference:** For over 17 years this conference has been the premier technical conference for housing and land development issues in Pennsylvania. This two-day conference provides the latest information on emerging technologies and how to resolve problems facing the housing industry. The conference is intended for all sections of the housing industry including builders, remodelers, code officials, educators, design professionals and modular and HUD-code builders. The second day of the conference serves as an annual forum that addresses emerging planning, design, and regulatory issues affecting the land development industry in Pennsylvania. This day is intended for anyone involved in land development activities including builders, developers, design professionals, planners and regulatory officials.

The following are the key activities that have been accomplished for the 2010 PA Housing and Land Development Conference:

- a) The dates for the conference are February 10 & 11, 2010.
- b) Secured the venue for the conference – Four Points Sheraton in Cranberry Township – Just North of Pittsburgh.
- c) Two electronic surveys were conducted of past attendees to help identify and prioritize potential topics for the conference.
- d) Save the date postcards have been developed and are being printed.
- e) The Housing Steering Committee met and prioritized sessions and identified some possible presenters for the first day of the conference. The following are some of the subjects to be addressed.

Early Morning	Late Morning	Early Afternoon	Late Afternoon
Construction Defects (Chinese drywall moisture etc.)	Improving Energy Performance of Existing Homes	Green Building Case Studies – What’s Worked and What Hasn’t	On-site Energy Generation
Subject TBD	Window Technology – Separating Reality from Sales Myths	Spray Foam Insulation	Residential Lighting
	Changes in IRC 2009 Wall Bracing	Residential Sprinklers	Air Leakage Testing

- f) The Land Development Steering Committee met and all members expressed concern for being able to draw an audience for the topics being considered. Additional concern was stated about the timing of the event will be before DEP finalizes numerous regulations and formal policy documents. The concern is that the program may only be able to highlight what DEP and others may do, with no clear guidance.
- g) **The PHRC Leadership Reception will be held on the evening of February 10<sup>th</sup>** at the Four Points Sheraton in Cranberry Township, PA. This event is intended to gather the PHRC leadership in an informal setting.
2. **Speaker Service:** The PHRC will hold and/or participate in talks and seminars directed at the housing industry. This may include trade and professional association functions and regional meetings, local association meetings, or state or national conferences.

The following presentations have been provided during this reporting period:

- Fortney, M., *Basement Insulation Strategies*, HBA of Huntingdon County, February 5, 2009, (~15 attendees)
  - Turns, M., *Green Building Programs and Land Development*, co-presenter, PA Land Development Conference February 12, 2009 (~100 attendees)
  - Fortney, M., *Overview of the Changes in the 2009 IRC*, Wayne Co. BA, March 17, 2009, (~30 attendees)
  - Fortney, M., *Overview of the Changes in the 2009 IRC*, PA Manufactured Housing Association, Harrisburg, PA, March 18, 2009, (~25 attendees)
  - Fortney, M., *Mold for Building Operators*, PA County Commissioners Association - Loss Prevention Group, Harrisburg, PA, April 7, 2009, (~40 attendees)
  - Turns, M., *Understanding Pennsylvania’s Alternative Energy Provisions*, Endless Mountains Builders Association, New Milford, PA, May 20, 2009 (~12 attendees)
  - Turns, M., *Whole-House Ventilation: How Tight is Too Tight?*, Huntingdon County Builders Association, Huntingdon, PA, June 4, 2009 (~30 attendees)
  - Turns, M., *Stimulus for the Rest of Us – Over view of Energy Tax Incentives*, Gettysburg, PA, July 24, 2009 (~ 45 attendees)
  - Turns, M., *IRC Update: Sneak Peek*, York County Builders Association, York, PA, September 21, 2009 (~ 40 attendees)
3. **Outreach Activities:** This includes activities to let builders know about the PHRC and the services and publications it provides. These activities may include the PHRC newsletters, mailings, promotional pamphlets, advertisements in trade journals, phone calls, and the PHRC’s Web site.

### **Conferences Attended:**

- Fortney, M., Turns, M., PA Home Energy Conference, State College, PA, March 18-19, 2009
- Fortney, M., PSATS Annual Convention, Hershey, PA, April 2009
- Turns, M., Pennsylvania Solar Energy Conference, State College, PA, May 6-7, 2009
- Fortney, M., U.S. DOE State Energy Code Conference, Portland OR, July 27-29, 2009
- Fortney, M., Building Science Symposium, Westford, MA, August 3-5, 2009
- Kasal, B., Modeling and Advanced Simulations, June 30 – July 3, 2009 Bratislava, Slovak Republic

### **Conference Presentations:**

- Kasal, B., *Residential Structures Under Natural Disasters*. Invited speaker. Inner Mongolia Technical College, Hohhot, China, June 18, 2009
- Kasal, B., *Residential structures under natural disasters*. Invited speaker. Inner Mongolia University of Science & Technology, Hohhot, China, June 19, 2009
- Kasal, B., *Modeling of composite layered laminated arches*. International Conference Computational Modeling and Advanced Simulations, Bratislava, Slovak Republic, June 30 – July 3, 2009
- Kasal, B., *Composite Materials in Reinforcement of Timber*, University of New Brunswick, Fredericton, New Brunswick, Canada, December 17, 2009

### **Pennsylvania Focus Committees:**

- Pennsylvania Builders Association (PBA)—(Training and Education Committee, Land Development Task Force, Housing Finance Committee, and PHRC Committee)
- Advisory Council for the Modular Housing Training Institute (MHTI)
- Advisory Council for the Manufactured Housing Resource Center (MHRC)
- Builder's Association of Central Pennsylvania
- Pennsylvania Concrete Masonry Association, Codes Committee

### **National and International Focus Committees:**

- National Consortium of Housing Research Centers
- Forest Products Society, Wood Engineering Award Committee
- RILEM, Technical Committee TC 215 AST Chair
- National Institute for Building Sciences (NIBS)
- International Council for Research and Innovation in Building and Construction – Working Commission W-18 – Timber Structures
- Affordable Comfort Incorporated, 2010 Conference Planning Committee & Track Leader

## Publications

---

### PHRC Research Reports:

Myers, T., and B. Kasal. May 2009. Analysis of the International Residential Code 2006 Bracing Requirements for Pennsylvania. PHRC Report No.108. Pennsylvania Housing Research Center. 123 p.

### Builder Briefs:

Repka, N., and B. Kasal. 2009. Insulated Concrete Masonry Below-Grade Walls. Builder Brief, RB 0109. Pennsylvania Housing Research Center. 6 p.

### Research Papers:

The research publications not only disseminate the technical information to the public but increase the state, national, and international reputation of the PHRC. As such, they are an important component of our mission.

1. Kasal, B. (Editor). 2009. State-of-the-art in in-situ assessment of timber. RILEM TC AST 215 Special Publication. (book) Springer Verlag/RILEM Paris (in print)
2. Memari, A. M., Kasal, B., Manbeck, H. B., and Adams, A. R., 2009. Lateral Load Resistance Evaluation of Wood and Steel Stud Partition Shear Walls. ASCE Journal of Architectural Engineering, Vol. 15, No. 4, December 2009, pp. 122-130.
3. Heiduschke, A., B. Kasal, and P. Haller. 2009. Shake table tests of small- and full-scale laminated timber frames with moment connections. Bulletin of Earthquake Engineering. Springer Verlag. Vol 7. No 1.: 323-339
4. B. Kasal, R.W. Anthony. 2009. Semi-destructive techniques for in-situ evaluation of historic wood structures. In B. Kasal, R. Anthony, and M. Drdacky (editors). 2009. RILEM/NSF International Engineering Research and Education Workshop "In-situ Evaluation of Masonry and Wood Historic Structures: Challenges and Opportunities". RILEM Publications SARL, Paris. Pro062. e-ISBN: 978-2-35158-068-4.: 57-65.
5. B. Kasal, R.W. Anthony. 2009. Education in engineering evaluation and rehabilitation of historic structures. B. Kasal, R. Anthony, and M. Drdacky (editors). 2009. RILEM/NSF International Engineering Research and Education Workshop "In-situ Evaluation of Masonry and Wood Historic Structures: Challenges and Opportunities". RILEM Publications SARL, Paris. Pro062. e-ISBN: 978-2-35158-068-4.: 3 - 7
6. B. Kasal, R. Anthony, and M. Drdacky (editors). 2009. RILEM/NSF International Engineering Research and Education Workshop "In-situ Evaluation of Masonry and Wood Historic Structures: Challenges and Opportunities". RILEM Publications SARL, Paris. Pro062. e-ISBN: 978-2-35158-068-4. 130 p.
7. Blass, R., and B. Kasal. 2009. Modeling of composite layered laminated arches. In Proceedings from Computational Modeling and Advanced Simulations, June 30 – July 3, 2009 Bratislava, Slovak Republic. (CD Publication)
8. Kasal, B. 2009. Local reinforcement of wood with composite materials. Czech Technical University, Prague. 30p. ISBN 978-80-01-04275-5
9. Fischer, C., and B. Kasal. 2009. Analysis of light-frame, low-rise buildings under simulated lateral wind loads. Wind and Structures, Vol. 12, No. 2.

## **Applied Research**

---

A very important function of the PHRC is to undertake or stimulate research and development on materials, products, procedures, etc. These efforts may have a longer-term and/or a more fundamental focus than other projects. The projects that are listed below foster partnerships and draw on the expertise and strengths of the persons, groups and facilities available at both the Pennsylvania State University and the Pennsylvania College of Technology.

### **A. Guidelines for Efficient Basement Insulation**

**Description:** This project will build on two previous projects conducted by the PHRC involving sophisticated testing of the performance of basement wall systems. This project will synthesize the results of previous work to develop simplified guidelines for energy-efficient and healthy basement insulation based on the latest knowledge. Typical basement insulation details will be developed and their positive and negative attributes will be assessed. The target audience for this document will be builders, design professionals as well as building code officials.

We have finished testing several interior insulation strategies comparing permeable and non-permeable insulations under basement-like conditions. Available materials and publications about basement insulation strategies were collected and studied. We are now in the process of evaluating the available information. It appears that the information is scattered, sometimes complex with no clear directions. We plan on having the 1<sup>st</sup> draft of the basement insulation guidelines ready by the end of this year.

## **Land Development**

---

The land development process is a key component of providing affordable homes; however, there is no single group looking at land development practices in Pennsylvania. These initiatives are part of the PHRC's long-term effort to provide technical input and guidance and leadership to these issues. The following program and tasks have been identified by builders and the PHRC Operations Committee as a high priority project for Pennsylvania's home building industry. It should be noted that the Land Development Specialist position at the PHRC is currently vacant. Once this position is filled additional activities will be included as contingency projects. The following tasks will be undertaken:

### **A. Pennsylvania Standards for Residential Site Development**

**Description:** The residential development standards project was finalized in April 2007. These are a set of consensus standards that allow for the most up-to-date design innovations and provide flexibility needed for sustainable land development. The initiatives that will be undertaken will increase the awareness of the standards and encourage the adoption by municipalities within the Commonwealth. The PHRC has been distributing the standards electronically and via CD.

## **Applied Projects**

---

These groups of projects are application oriented and have a direct need by the residential construction industry. This includes the development and support of standards, and longer term initiatives.

### **A. Enforcement Practices and Impact of the UCC on Municipalities**

**Description:** This project, partially funded by the Center for Rural Pennsylvania, will seek to provide a clearer picture of the UCC's impact on rural municipalities. This will include a determination of which

municipalities are enforcing the UCC, and more importantly, how they are enforcing it. Analyses of building permit fees will be performed to determine whether there is a correlation between fee amounts and enforcement approach, as well as differences in fees between rural and urban municipalities.

The PHRC implemented a survey to assess many of the above goals, and garnered over 1,400 responses representing 60% of opt-in municipalities. A significant effort was made to secure this response rate, including multiple contacts to potential survey respondents via email, mail and telephone. The data from this survey have been cleaned and organized, and integrated with several pre-existing data sets: one maintained by the Department of Labor and Industry (DLI), one maintained by the Department of Community and Economic Development (DCED), and another from the Center for Rural Pennsylvania. Analysis of these data is ongoing with a substantial amount completed. In addition, the PHRC interviewed several people close to the insurance industry to help determine potential impacts of the UCC on insurance premiums. The final report will be issued in the first quarter of 2010. For more information contact Mike Turns at 814-863-0623 or [miketurns@psu.edu](mailto:miketurns@psu.edu).

## **B. MHTI & MHRC Support**

**Description:** Two programs focusing on training for the factory-built housing industries have been developed. The first is the Modular Housing Training Institute (MHTI) and the second is the Manufactured Housing Resource Center (MHRC). The MHTI program currently provides a two-day training program that focuses on the on-site completion of modular houses. The program is intended for builders, installation crews, code officials, as well as industry representatives. The MHRC currently provides training for the on-site completion of manufactured or HUD Code housing. The program is intended for retailers, installers, manufacturers, as well as building code officials. In recognition of the importance of factory-built housing to PA, a Ben Franklin award has been made to enable employment of a full-time Director of MHTI and MHRC.

## **C. Support of Standards**

**Description:** The PHRC has developed three standards to respond to industry demand. These include Pennsylvania's Alternative Residential Energy Provisions, Pennsylvania Standards for Residential Site Development Standards and Foundation Systems for Relocated Manufactured Housing. Each of these standards requires training and timely technical assistance for local governments, builders/developers, design professionals, contractors, etc. All of these standards are available electronically for free and hard copies are available for a fee.

1. Pennsylvania's Alternative Residential Energy Provisions - 2009: Education will be provided through various building code training programs and technical assistance will be provided through telephone and email support by the PHRC.
2. Pennsylvania Standards for Residential Site Development Standards: Please see the Land Development section.
3. Foundation Systems for Relocated Manufactured Housing: The PHRC delivered a one-hour training program for building code officials and contractors. It is posted on the PHRC's Web site for open viewing.

## **D. Analysis of Zero Energy Homes – Technical, Constructability, and Public Policy Challenges**

**Description:** Politicians are paying increasing attention to issues of global warming, rising fuel prices, and our country's dependence on foreign oil, making the possibility of far-reaching energy legislation in the near future very real. If deep cuts in energy consumption were mandated, how would home builders respond? With economic feasibility in mind, this project would look at how far modified designs and off-the-shelf

technologies could take a home in cloudy Pennsylvania toward the goal of producing as much energy as it consumes. Cost mitigating factors and relevant policy issues will also be discussed in this research report.

This project will result in a presentation of the findings at the PA Housing Conference, as well as a webinar. The work will also be summarized in a technical report for use by builders, design professionals and state and federal policy makers.

## **E. Development of the 2009 Alternative Residential Energy Provisions**

**Description:** In November 1999, the Pennsylvania Legislature passed ACT 45, known as the Uniform Construction Code (UCC), into law mandating a statewide building code across Pennsylvania. Act 45 requires the Pennsylvania Department of Labor and Industry (DLI) to promulgate regulations to implement the requirements of the legislation and, in addition, to consider the development of alternative prescriptive methods for energy conservation that account for the various climatic regions within the Commonwealth. In deriving these energy standards, the DLI was to seek to balance energy savings with initial construction costs.

The PHRC developed the *Pennsylvania Alternative Residential Energy Provisions (PA-Alt)* for consideration by DLI to meet their legislated mandate. The PA-Alt was developed with the intent of being:

- simpler to build to and easier to enforce;
- more rational and flexible;
- focused on Pennsylvania in terms of climatic and other conditions; and,
- equivalent to the provisions of the International Energy Conservation Code (IECC).

The initial version of the PA-Alt was developed in 2000 and was based on the 2000 IECC and IRC. The second version was updated to the 2003 IECC. The third iteration of the PA-Alt is equivalent to the 2006 IECC.

In 2009, the PHRC updated this document to be aligned with the new 2009 International Energy Conservation Code (IECC). This involved detailed computer analysis to document equivalence of the code and evaluate potential tradeoffs.

The final revisions have been made and drawings have been developed. The 2009 PA-Alt was posted on the PHRC web site in mid-September.

## **Proposals & Contracts**

---

### **Pending proposals:**

Center for Rural Pennsylvania – Impact of the Uniform Construction Code in Rural Pennsylvania  
Submitted August 22, 2008, ~\$50,000, Status – Funded

Dow Chemicals, Inc. – Life-Cycle Cost Assessment of Building Enclosure Systems with Respect to  
Hygrothermal and Wind Pressure Loads, ~\$150,000, Status – Funded

West Penn Power Sustainable Energy Fund: *Development of certification Training for Keystone Help  
Contractors*  
Submitted January, 2009 – Labor & Materials – Funded

PA Department of Environmental Protection: *Implementing the 2009 IECC in Pennsylvania,*  
Submitted March, 2009 ~\$300,000 – Pre-proposal.

Integrated Building and Construction Solutions (IBACOS) – *Advanced Residential Energy Training*  
Submitted March, 2009 ~\$348,000 – Rejected  
Submitted March, 2009 ~\$300,000 – Rejected

National Cooperative Highway Research Program (NCHRP) – *High Performance Composite Guardrails Based on Sustainable Materials*  
Submitted March, 2009 ~\$209,095 – Rejected

**Open Contracts:**

**Research:**

*Property Evaluation of Genetically Engineered Wood from Aspen with Down-Regulated Lignin Enzymes-Mechanical Properties*, \$40,000 – through December 2009

*Hygro-Thermal Performance of Imperfectly Protected Below-Grade Walls with Interior Insulation*, \$75,000 – Status – Completed

*Low-Rise Buildings in Areas with Modest Wind Loads*, \$75,000

*Radiographic Investigation of Displacement of Fasteners*, \$30,000

*Modeling of Beam-to-Column Connections*, \$60,000

**Other:**

PA Department of Environmental Protection through the West Penn Power Sustainable Energy Fund:  
*Development of Certification Training for Keystone Help Contractors (Labor and Materials)* - Completed

Center for Rural Pennsylvania: *Impact of the Uniform Construction Code in Rural Pennsylvania*, \$50,000

Pennsylvania Construction Code Academy (PCCA): *Development of Training for Code Officials*

West Penn Power Sustainable Energy Fund: *Development of Certification Training for Keystone Help Contractors (Labor & Materials)* – Completed May 2009