



## Activity Report

For the period April 18, 2008 to October 15, 2008

The following is a brief listing of the PHRC's activities and accomplishments since the last Industry Advisory Council Meeting held on April 17, 2008.

### Staff Changes:

Alex Duran has left the PHRC in May 2008. He is currently with an environmental remediation consulting firm in New Jersey. Applications for the Land Development Specialist position have been reviewed, numerous people have been interviewed, and one individual is being considered for the position.

Tanya Myers has been appointed as the first PHRC Fellow. In addition to her scholarly activities, she is considered a part-time employee of the PHRC. She has assisted in the development of the residential deck program, redesigned the PHRC's web site and is working on the wall bracing standards project.

Tracy Desoto received the prestigious Gold Level in Penn State's Peer Review for Exceptional Performance. She is one of 6 people in the College of Engineering to ever receive this recognition.

### Administrative:

The *PHRC Work Plan for PY 2008-09* was developed based on the prioritization of projects conducted at the April IAC Meeting. This was distributed electronically to all members of the IAC and is posted on the web site for anyone to view.

The Year in Review was completed in August and includes a description of all the activities the PHRC undertook from January through June 2008. This six month report marks a change from calendar year to fiscal year reporting to coincide with the Commonwealth's fiscal year. All future reports will be based on fiscal year.

The PHRC has been audited by the Legislative Budget and Finance Committee in response to Senate Resolution 263, which required an investigation into building permit fees collected by DCED that support the PCCA, and recently the PHRC. The final report is completed but will not be released until at least mid-November.

### Training, Education and Outreach Activities

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**Workshops and Training** – The PHRC delivered 14 technical workshops and webinars to 461 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. The PHRC has 16 programs scheduled so far through the end of the fiscal year.

Counting the above training and less formal speaker service and presentations at conferences, the PHRC has provided educational services to over 1,225 individuals during this reporting period.

<b>PHRC Training Programs Delivered</b>			
<b>PROGRAM</b>		<b>Activities for</b>	
		<b>4/18/2008 – 10/15/2008</b>	
		<b># of Programs</b>	<b># of Attendees *</b>
Comprehensive IRC Program	CO1	1	12
International Residential Code Inspection Essentials	CO2	0	0
IRC's Plumbing Requirements	CO3	0	0
IRC's Mechanical Requirements	CO4	1	18
Commercial Building Provisions of the IECC	CO5C	1	15
Residential Energy Essentials	CO5R	1	14
2006 IRC Update Program	CO6	0	0
Storm water programs	SW	0	0
Residential Decks: <i>Design Construction and Inspection</i>	D1	6	168
Webinars	W1	4	234
NDS Wood Frame Design	NDS	0	0
Pennsylvania Standards for Residential Site Development		0	0
<b>Total Programs Held</b>		<b>14</b>	<b>461</b>

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

**PHRC Workshops:** 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 that are being considered for this year's programs include the following:

1. **Design and Construction of Wood Frame Buildings** – The two day program will provide an overview of wood frame design using the AFPA National Design Specification (NDS). This will include:
  - Wood columns, beams and beam-column design and analysis procedures
  - Allowable strength and stiffness of engineered solid sawn lumber and glulam
  - Design and analysis of nailed, bolted and lag screw connection
  - Numerous design check examples

This program is intended for engineers in private practice and within the factory built housing industries.

This program has been scheduled for March 10-11, 2009 in Lancaster PA. The program will be instructed by Dr. Harvey Manbeck and Dr. Bohumil Kasal.

2. **Residential Decks: *Design, Construction and Inspection*** – This one-day program will provide 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 will focus 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.

The PHRC held a pilot program on April 23<sup>rd</sup> in Harrisburg. After the pilot, the program was retooled based on input from contractors, design professionals, and building code officials. The following is a list of programs held to date and future programs on the schedule:

Fortney, M., Royer, J., Sarver, R., *Residential Deck Design, Construction & Inspection*, Harrisburg, April 23, 2008 (~19 attendees)

Royer, J., Sarver, R., *Residential Deck Design, Construction & Inspection*, York County, June 3, 2008 (~21 attendees)

Fortney, M., Royer, J., *Residential Deck Design, Construction & Inspection*, Bucks County, August 20, 2008 (~36 attendees)

Fortney, M., Royer, J., *Residential Deck Design, Construction & Inspection*, Bucks County, August 21, 2008 (~26 attendees)

Fortney, M., Royer, J., *Residential Deck Design, Construction & Inspection*, Lehigh Valley, September 17, 2008 (~31 attendees)

Fortney, M., Sarver, R., *Residential Deck Design, Construction & Inspection*, Butler County, October 1, 2008 (~42 attendees)

Fortney, M., Royer, J., *Residential Deck Design, Construction & Inspection*, Blair/Bedford County, October 22, 2008

Fortney, M., Royer, J., *Residential Deck Design, Construction & Inspection*, Poconos, October 29, 2008

Fortney, M., Sarver, R., *Residential Deck Design, Construction & Inspection*, Lancaster, February 18, 2009

Fortney, M., Sarver, R., *Residential Deck Design, Construction & Inspection*, Cranberry Township, March 24, 2009

Fortney, M., Royer, J., *Residential Deck Design, Construction & Inspection*, Lackawanna County, April 9, 2009

Fortney, M., Sarver, R., *Residential Deck Design, Construction & Inspection*, Cumberland County, May 19, 2009

The following are some comments that have been forwarded from the Pennsylvania Association of Building Code Officials (PABCO) that they received from their members:

“Attended the seminar at the Bucks County Marriott—great teachers and great information, don’t miss it!”

“Do not miss this seminar, it is the best I have been to in a long time and really is designed for the level of an inspector and builder. Excellent information that can be given to "do it yourselfers" when they come in for a permit also!"

"I took this course at Cabela’s last week and just wanted to pass along that I highly recommend it. Very informative for inspectors and contractors."

3. **Residential Mechanical Training** – The observed need for this program is two-fold. The first is the need of 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 and poorly installed ducts. This program will provide new and experienced installers the background they need to meet the mechanical requirements in the IRC.

This program is under development – Please see the update under New Program Development.

**PHRC Training Provided Through Industry Partnerships** – 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).

1. Comprehensive International Residential Code (IRC) Program	2 day
2. Pennsylvania’s Residential Energy Code Requirements	2 day
3. Overview of the IRC’s Plumbing Requirements	2 day
4. Overview of the IRC’s Mechanical Requirements	2 day
5. Residential Mechanical Plan Reviews and Inspections	1 day
6. Commercial Building Provisions of the IECC	2 day
7. Performing Residential Building Inspections	2 day
8. Special Issues for 2-Family Dwellings and Townhouses	1 day
9. IRC Update Program	1 day
10. Residential Deck Design Construction and Inspection	1 day
11. Design and Construction of Wood Frame Buildings	2 day
12. A New Era of Storm Water Management	2.5 day

The PHRC has delivered eight programs through industry partners during this reporting period and have an additional 15 programs scheduled through the end of the fiscal year.

**Pennsylvania Manufactured Housing Installer Update Training 2009** – This six hour course satisfies the DCED's continuing education requirement for *Pennsylvania Certified Manufactured Home Installers*. The course reviews critical elements of the applicable manufactured housing rules and regulations and drills deeper into understanding the manufacturer's approved installation instructions. This course will also highlight the many regulatory and code related changes to both the state and federal programs over the past several years, including coordinating manufactured housing installation with the Pennsylvania Uniform Construction Code.

This program is being offered by the Housing Standards Division of the Pennsylvania Department of Community and Economic Development. The programs are scheduled for November 12, 2008 in State College & December 17, 2008 in Clarion. The PHRC is providing administrative support for the programs.

**New Program Development** – The PHRC will develop the following new training programs. These programs will address issues challenging the residential construction industry (builders, remodelers, building code officials, materials suppliers, etc.). During this period the following programs will be developed:

1. **Residential Mechanical Training** – The observed need for this program is two-fold. The first is the need of 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 and poorly installed ducts. This program will provide new and experienced installers the background they need to meet the mechanical requirements in the IRC.

Based on industry input, this program will be geared toward the industry as a whole, including mechanical contractors, builders, remodelers, and code officials rather than solely inspectors, as previously proposed. A list of common mechanical code violations has been compiled based on informal surveys of code officials across Pennsylvania. Potential industry partners have been identified. Several site visits have been conducted with code inspectors and approximately 30% of the required photographs of code violations and proper installations have been taken or collected. Portions of the training program related to duct sealing and installation issues have been completed.

2. **Multi-Family Program** – There are specific requirements for multi-family structures built under the IRC that require special attention by the building code official. The program will highlight such issues as fire separation requirements and accessibility. This program will focus on effective plan review and inspection practices and provide an understanding of fire rated assemblies.

The program outline has been developed and we are in the process of developing the program content. The program will review the key requirement for two-family dwellings and townhouses. A focus of the program will be the conversion of single family homes to two family buildings. The program will be completed by the end of 2008 and program offerings will commence in the first two quarters in 2009.

3. **Residential Green Building** – The interest in green building has increased at an impressive rate. However, the industry is finding it challenging to find a good source of unbiased information on innovative construction technologies and methodologies. This program, or series of programs, will help builders understand how to build green and how to have their development and homes certified by major voluntary green building programs.

The PHRC has partnered with Lisa Iulo, Assistant Professor of Architecture at Penn State, to perform a comparison and feasibility study of major green building programs in Pennsylvania. An on-paper comparison of NAHB Green and LEED has been initiated, but is stalled as the final NAHB National Green Building Standard has not been approved by ANSI or released to the public. The PHRC and Ms. Iulo will meet with several builders familiar with green building, and possibly program verifiers, to assess the builder's perspective on the feasibility of several key items in each program. Several potential participants have been identified.

4. **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 will highlight the most significant changes between the 2006 and 2009 IRC, and identify potential impacts to builders, designers and building code officials. The result of this will be a new training program to be offered to builders and code official organizations.

The PHRC staff has reviewed the 2007 IRC supplement and is in the process of reviewing the results from the ICC's final action hearings held in September. The primary program development will occur in March –May 2009 and will be offered starting in late May or June.

**Web-Based Training** – The PHRC is developing and deploying 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 PHRC held two pilot webinars to evaluate the technology required to broadcast a high quality program and establish the minimum requirements for attendees. In addition, the first three webinars of the series have been presented and archived. The programs are being held for no charge. Participants must establish a free *Friends of Penn State Account* prior to the program. Below is a list of programs held and scheduled through the end of the fiscal year:

Turns, M., *Inspecting Residential Duct Systems: Making the Connections* (Pilot I), May 19, 2008 (~25 attendees)

Turns, M., *Inspecting Residential Duct Systems: Making the Connections* (Pilot II), June 10, 2008 (~25 attendees)

Turns, M., *Introduction to Green Building*, August 12, 2008 (~52 attendees)

Turns, M., *Ducts I – Inspecting Residential Duct Systems: Making the Connections*, September 9, 2008 (~72 attendees)

Turns, M., *Ducts II – Inspecting Residential Duct Systems: Obtaining Adequate Airflow*, October 14, 2008 (~71 attendees)

Fortney, M., Buddenbohn, R., *Inspecting Attached Decks: Ledger Board Flashing Details*, November 11, 2008

Fortney, M., Turns, M., *Relocated Manufactured Housing Alternative Installation Standards*, December 9, 2008

Turns, M., *Intro to Residential Solar Technologies: Resources and Solutions*, January 13, 2009

Fortney, M., Turns, M., *Alternatives to Traditional Foundations: Shallow Frost-Protected Foundations*, March 10, 2009

Fortney, M., Turns, M., Buddenbohn, R., *Sneak Peek: Critical Changes in the 2009 IRC*, April 14, 2009

**Webinar hosting service:** In addition to presenting webinars for the regularly scheduled PHRC webinar series, the PHRC offers to host and moderate webinars for industry partners per their request.

The PA Department of Community and Economic Development (DCED) approached the PHRC about hosting a webinar on a time-sensitive subject requiring quick delivery to installers of manufactured housing. The program titled, *24 CFR 3286: Federal Manufactured Housing Installation Standards*, was presented by Mark Conte on October 8, 2008 from the PHRC “command center” in State College. The program described new Federal regulations for installation of manufactured housing that go into effect October 20, 2008, as well as issues specific to Pennsylvania installers. Over 96 people attended this program.

**Technology Transfer & Outreach** – 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 16 years this conference has been the premiere technical conference for housing and land development issues in Pennsylvania. This 2-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 PHRC is well underway in the marketing and administrative activities for the conference. Some of the key items include:

1. Conference date set for February 11-12, 2009.
  2. Initiated an online registration system for the conference and leadership dinner.
  3. Secured the Hilton in downtown Scranton for the event.
  4. Identified the Trolley Museum for the leadership dinner on February 11<sup>th</sup>.
  5. Started identifying locations for the 2010 conference to be held near Pittsburgh.
  
  6. Met with local Builders Associations in Northeastern PA about the conference development processes and marketing ideas.
  7. Developed, printed and distributed the save the date post card.
  8. Developed 2-page advertisement for the PBA Magazine.
  9. Developed marketing pamphlet for use in local BA newsletters.
  
  10. Conducted an electronic survey of potential conference topics to help prioritize topics for the Steering Committees.
  11. Held conference calls with the housing and land development steering committees.
  12. Developed the initial conference agendas.
  13. Started securing speakers.
2. **Speaker Service** – The PHRC holds and/or participates in talks and seminars directed at the construction industry. This may include trade and professional association functions and regional meetings, local association meetings, or state or national conferences. Please see below for a list of the 11 presentations given during this reporting period.

Turns, M., *Introduction to Green Building*, Simplex Homes Annual Builder Meeting, Scranton, PA, April 18, 2008 (~75 attendees)

Turns, M., *Energy Code Compliance and Enforcement*, Pennsylvania chapter of the American Institute of Building Design, Harrisburg, PA, May 10, 2008 (~15 attendees)

Turns, M., *Introduction to Green Building*, Poconos Builders Association, Stroudsburg, PA, May 20, 2008 (~25 attendees)

Fortney, M., *Introduction to Green Building*, Fayette County Builders Association, Uniontown PA, May 20, 2008 (~25 attendees)

Turns, M., *Introduction to Green Building*, Building Industry Association of Northeastern Pennsylvania, Kingston, PA, July 15, 2008 (~10 attendees)

Turns, M., *Introduction to Green Building*, York County Builders Association, York, PA, August 14, 2008 (~35 attendees)

Turns, M., *Introduction to Green Building*, Lawrence County Builders Association, New Castle, PA, September 11, 2008 (~25 attendees)

Turns, M., *Concepts in Sustainable Design and Green Building*, AE470: Residential Building Design and Construction, October 1, 2008 (~20 attendees)

Turns, M., *Introduction to Green Building*, Huntingdon County Builders Association, Huntingdon, PA, October 2, 2008 (~20 attendees)

Turns, M., *Overview of Pennsylvania's Alternative Energy Provisions*, York County Builders Association, York, PA, October 9, 2008 (~35 attendees)

Turns, M., *Case Study: Energy Efficient House Design and Construction*, AE470: Residential Building Design and Construction, October 13, 2008 (~30 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.

The PHRC developed and distributed a newsletter in October 2008. The *PHRC's Year in Review January-June 2008* was also developed and distributed electronically to all IAC Members.

**WWW Site** – The PHRC continues to improve the web site ([www.engr.psu.edu/phrc](http://www.engr.psu.edu/phrc)) to help disseminate information. An executive summary from each of the reports, as well as "builder", "research", and "technical" briefs are available on-line.

The PHRC has redesigned its web site to make it more user friendly and to distribute more documents electronically. This includes builder briefs, research reports, archived webinars, etc.

#### **Conferences Attended:**

- Fortney, M., DCED's Community Development and Practitioners Conference, April 28, 2008
- Fortney, M., PSATS Annual Convention, Hershey, PA. May 12-13, 2008
- Turns, M., US DOE's Energy Codes 2008. Saint Paul, MN, July 23-24, 2008

#### **Conference Presentations:**

- Fortney, M., Turns, M., *Codes and Building Science: Conflicts, Resolutions, and Results*, ACI Home Performance Conference, Pittsburgh, PA, April 8, 2008 (~40 attendees)
- Fortney, M., *Emerging Energy and Construction Issues in Pennsylvania*, DCED's Community Development and Practitioners Conference, April 2008 (~250 people)
- Turns, M., Terry F., *Going Green with Modular Housing*, ACI Home Performance Conference, Pittsburgh, PA, April 10, 2008 (~4 attendees)

- Turns, M., *Introduction to Green Building*, Pennsylvania Association of Housing and Redevelopment Authorities (PAHRA) Conference, Gettysburg, PA, June 2, 2008 (~30 attendees)
- Turns, M., *Status of Energy Codes in PA*, US DOE's Energy Codes 2008. Saint Paul, MN, July 24, 2008 (~150 attendees)

#### **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
- Building Environment and Thermal Envelope Council (BETEC)
- 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

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## **Publications**

### **Reports:**

Turns, Mike, *Energy Code Enforcement and Compliance in Pennsylvania: Lessons from the Field*, PHRC Research Series Report No. 106, July 2008

Kasal, B., Memari, A., Manbeck, H., Adams, A., *Experimental Cyclic Racking Evaluation of Light-frame Wood Stud and Steel Stud Wall Systems*, PHRC Research Series Report No. 107, April 2008

### **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.

Memari, A., and B. Kasal. 2008. *Comparison of In-plane Lateral Load Resistance of Interior Steel Stud and Wood Stud Light-Frame Walls* ASCE Structures Congress 2008, Vancouver, Canada, April 24-26, 2008.

Wehsener, J., and B. Kasal. 2008. Echtzeit-Röntgenuntersuchungen an duktilen stabförmigen Holzverbindungen bei dynamischer Beanspruchung. Bautechnik 85. 10/2008. (in print).

Kasal, B. 2008. RILEM TC 215 AST In-situ evaluation of structural timber. SACOMATIS. In RILEM Proceedings PRO 59. Binda, L., M. di Prisco, and R. Felicetti (Editors). Volume 2. RILEM Publications. Bagnaux. ISBN 978-2-35158-061-5. 1025-1032.

B. Kasal, A. Adams, and M. F. Drdacky. 2008. Application of digital radiography in evaluation of components of existing structures. SACOMATIS. In RILEM Proceedings PRO 59. Binda, L., M. di Prisco, and R. Felicetti (Editors). Volume 1. RILEM Publications. Bagnaux. ISBN 978-2-35158-061-5. 581-592.

- Kasal, B. 2008. In situ evaluation of timber structures— state-of-the-art and future directions. Keynote Lecture. SACOMATIS. In RILEM Proceedings PRO 59. Binda, L., M. di Prisco, and R. Felicetti (Editors). Volume 2. RILEM Publications. Bagneux. ISBN 978-2-35158-061-5. 1025-1033.
- Kasal, B. 2008. In-situ assessment of structural timber: Rilem technical committee 215 AST. In Proceedings of STRUCTURAL FAULTS & REPAIR-2008 - 12th International Conference + Exhibition, 10th - 12th June 2008. Edinburgh, Scotland.
- Kasal, B. 2008. Structural repair and reinforcement of wood with composite materials. In Proceedings of STRUCTURAL FAULTS & REPAIR-2008 - 12th International Conference + Exhibition, 10th - 12th June 2008. Edinburgh, Scotland.
- Kasal, B., and R. Anthony. 2008. In-situ assessment of structural timber: RILEM Technical Committee 215 activities and findings. Proceedings of World Conference on Timber Engineering. Myiazaki. Japan. June 2008.
- Kasal, B. and A. Adams. 2008. Radiographic investigation of structural connections. In Proceedings of World Conference on Timber Engineering. Myiazaki. Japan. June 2008.
- Heiduschke, A., B. Kasal, and P. Haller. 2008. Shake table tests of small- and full-scale laminated timber frames with moment connections. Bulletin of Earthquake Engineering.Â Springer Verlag. DOI 10.1007/s10518-008-9075-4.
- Heiduschke, A., B. Kasal, and P. Haller. 2008. Performance and drift levels of tall timber frame buildings under seismic and wind loads. Structural Engineering International, Vol. 18, Nr. 2, published by IABSE, pg. 186-191, 2008 (Invited publication).
- Kasal, B. (Editor/Author) 2008. State-of-the-art in in-situ assessment of timber. RILEM TC AST 215 Special Publication.Â RILEM Paris (In review).

## Research Activities

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**Wall Bracing Standards for Pennsylvania** – The residential structures all over the United States are exposed to high winds year round. We propose to look at the historic wind data for Pennsylvania available through the National Weather Service, and establish critical regions/counties. The assessment of wind loading with these local wind data is possible by using the existing design guidelines.

**Phase 1:** Feasibility Study

**Phase 2:** Regional Wind Mapping

**Phase 3:** Developing of Bracing Standards

Phase 1, feasibility study, that was completed in the previous fiscal year included the analysis of historical wind data in PA and determining if the development of a wind load map of for sub-regions of the state is warranted. This project is currently in phase 2 and 3 of this multi-year project.

**Phase 2** – Finished. Single wind-speed zone is proposed for the State of PA.

**Phase 3** – Typical 1 and 2-story buildings (consistent with the IRC provisions) have been selected and are analyzed for the new wind loads. Forces due to wind are calibrated and bracing methods and requirements will be evaluated.

## Applied Activities

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**MHTI & MHRC:** 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 a full-time Director of MHTI and MHRC to be employed.

**Support of Standards** – 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 - 2006: Education will be provided through various building code training programs. 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 will develop a one-hour training program for building code officials and contractors. After this is held it will be posted to the PHRC’s Web site for open viewing.

**Flood Preparedness of Pennsylvania’s Housing Stock** – Pennsylvania has more miles of waterways than any other state and is one of the most flood prone states. This project will review the current state of the art for flood resistive construction and proper procedures for flood recovery. This project will also identify key areas for future efforts to help Pennsylvania prepare for the recovery of future floods. This project will include involvement from FEMA, PEMA, and others involved in emergency response in the Commonwealth.

The PHRC will deliver a brief report highlighting the existing resources available within the Commonwealth and suggestions for improvements in the recovery following a flood.

**Analysis of Zero Energy Homes – Technical, Constructability, and Public Policy Challenges** – 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? Could builders take advantage of a greenhouse gas cap-and-trade system? 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.

A literature search has been initiated to identify research and case studies relating to Zero Energy Homes in Pennsylvania, or locations with similar climates. Information has been gathered on related public policy issues such as Pennsylvania’s recently created Alternative Energy Investment Fund. Builders with experience in building near-Zero Energy Homes have been identified as possible resources.

**Prioritizing Energy Efficiency in Remodeling Projects** – Pennsylvania has a very old housing stock; over 80% was built before the Commonwealth established an Energy Code. The potential for reducing energy use and improving comfort of our existing homes is great. Consumers and remodeling contractors usually do not consider energy improvements as part of remodeling project, but when they do, energy savings can be very significant. Many times this is a lost opportunity for the remodeling contractor. This project will develop a guide for remodeling contractors that will review available technologies, identify effective approaches, and prioritize them by energy saving potential and relative cost.

Various existing guidelines for energy efficiency in existing homes, such as ASID/USGBC’s ReGreen guidelines and RESNET’s Standard for Home Energy Assessments, have been investigated.

**DEP-DOE Grant** - Work is complete on a project funded by a grant from the U.S. Department of Energy, in partnership with the Pennsylvania Department of Environmental Protection. This project focused on the implementation of the 2006 IECC, and included the following activities: (1) code official certification training, (2) advanced training of building code officials, (3) 2006 IECC transition programs, (4) train-the-trainer programs, (5) energy code administration and enforcement, (6) evaluation of energy code compliance, (7) coordination and information sharing, and (8) development and distribution of energy code training materials.

**Update:** The PHRC Research Series Report 106, *Energy Code Enforcement and Compliance in Pennsylvania: Lessons from the Field*, has been finalized and is available to the public. This report summarizes findings from tasks 5 and 6 under this project. Report 106 and copies of all training manuals and presentation materials that were developed under this contract will be submitted to PA DEP shortly.

The PHRC is in the process of developing the final report and closing out the grant agreement. Under this contract a total of 71 programs were held by the PHRC with 2,242 individuals trained.

## **Proposals & Contracts**

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### **Pending proposals:**

DOW Chemical – *Hygro-Thermal Performance of Imperfectly Protected Bellow-Grade Walls with Interior Insulation*  
Submitted July, 2007, ~\$75,000, Status – Ongoing

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

National Science Foundation – *Sustainable, Natural Material – Composite Reinforced System and Application to Built Environment – Interface Properties Between Wood and High-Strength Composite Material*  
Submitted October, 2008, ~\$300,000 – Pending

National Science Foundation – *Modeling of Low-Rise Buildings Subjected to Extreme Wind Loads*  
Submitted October, 2008 ~\$315,734 – Pending

### **Research:**

U.S. Department of Agriculture (USDA) – *Property Evaluation of Genetically Engineered Wood from Aspen with Down-Regulated Lignin Enzymes-Mechanical Properties*, \$40,000

Hankin Endowment and PSU Funds

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

– *Radiographic Investigation of Displacement of Fasteners*, \$75,000

Pennsylvania Planning Association – *Training for Planners on the PA Land Development Standards*, \$7,750

### **Other:**

Department of Community and Economic Development (DCED) – *Project Plan 2007*

PA Department of Environmental Protection (DOE) – *Continuation of Training Programs for the Newly Adopted Building Codes*

Pennsylvania Construction Code Academy (PCCA) – *Development of Training for Code Officials*  
PHRC Memberships



## Activity Report

For the period October 16, 2008 to April 24, 2009

The following is a brief listing of the PHRC's activities and accomplishments since the last Industry Advisory Council Meeting held on October 16, 2008.

### Staff Changes:

Applications for the Land Development Specialist position have been reviewed, numerous people have been interviewed. No offers have been made and it is the current opinion to leave the position vacant.

Tanya Myers was been appointed as the first PHRC Fellow, completed her thesis defense, and will graduate from Penn State this spring. In addition to her scholarly activities, she has assisted in the development of the residential deck program, redesigned the PHRC's web site, and has been working on the wall bracing standards project. Other candidates are being considered to fill the position in the future.

### Administrative:

The PHRC has been audited by the Legislative Budget and Finance Committee in response to the Senate Resolution 263, which required an investigation into building permit fees collected by DCED that support the PCCA, and recently the PHRC. The final report *Building Permit Fee Collections and Expenditures Conducted Pursuant to SR 263 of 2008* was released in November 2008. Copies can be obtained at [lbfc.legis.state.pa.us/](http://lbfc.legis.state.pa.us/).

### Training, Education and Outreach Activities

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**Workshops and Training** – The PHRC delivered 22 technical workshops and webinars to 1,271 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. The PHRC has 4 programs scheduled so far through the end of the fiscal year.

Counting the above training and less formal speaker service and presentations at conferences, the PHRC has provided educational services to over 2,529 individuals during this reporting period.

<b>PHRC Training Programs Delivered</b>			
<b>PROGRAM</b>		<b>Activities for</b>	
		<b>10/16/2008 – 4/24/2009</b>	
		<b># of Programs</b>	<b># of Attendees *</b>
Comprehensive IRC Program	CO1	2	48
International Residential Code Inspection Essentials	CO2	1	25
IRC's Plumbing Requirements	CO3	1	32
IRC's Mechanical Requirements	CO4	0	0
Commercial Building Provisions of the IECC	CO5C	2	56
Residential Energy Essentials	CO5R	1	29
Custom Program – DCED Manufactured Housing	CP1	2	38
2006 IRC Update Program	CO6	0	0
Storm water programs	SW	0	0
Residential Decks: <i>Design Construction and Inspection</i>	D1	5	113
Webinars	W1	6	889
NDS Wood Frame Design	NDS	1	6
2009 IRC Update	CP1	1	35
Pennsylvania Standards for Residential Site Development		0	0
<b>Total Programs Held</b>		<b>22</b>	<b>1,271</b>

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

**PHRC Workshops:** 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 that are being considered for this year's programs include the following:

1. **Design and Construction of Wood Frame Buildings** – The two day program will provide an overview of wood frame design using the AFPA National Design Specification (NDS). This will include:
  - o Wood columns, beams and beam-column design and analysis procedures
  - o Allowable strength and stiffness of engineered solid sawn lumber and glulam
  - o Design and analysis of nailed, bolted and lag screw connection
  - o Numerous design check examples

This program is intended for engineers in private practice and within the factory built housing industries.

This program was held on March 10-11, 2009 in Lancaster , PA, Dr. Harvey Manbeck was the instructor.

2. **Residential Decks: *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.

UPDATE: The following is a list of programs held to date and future programs on the schedule:

Fortney, M., Royer, J., *Residential Deck Design, Construction & Inspection*, Blair/Bedford County, October 22, 2008

Fortney, M., Royer, J., *Residential Deck Design, Construction & Inspection*, Poconos, October 29, 2008

Fortney, M., Sarver, R., *Residential Deck Design, Construction & Inspection*, Lancaster, February 18, 2009

Fortney, M., Sarver, R., *Residential Deck Design, Construction & Inspection*, Cranberry Township, March 24, 2009

Fortney, M., Royer, J., *Residential Deck Design, Construction & Inspection*, Lackawanna County, April 9, 2009

Fortney, M., Sarver, R., *Residential Deck Design, Construction & Inspection*, Cumberland County, May 19, 2009

3. **Residential Mechanical Training** – The observed need for this program is two-fold. The first is the need of 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 and poorly installed ducts. This program will provide new and experienced installers the background they need to meet the mechanical requirements in the IRC.

UPDATE: This program is under development – Please see the update under New Program Development.

**PHRC Training Provided Through Industry Partnerships** – 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).

1. Comprehensive International Residential Code (IRC) Program	2 day
2. Pennsylvania's Residential Energy Code Requirements	2 day
3. Overview of the IRC's Plumbing Requirements	2 day
4. Overview of the IRC's Mechanical Requirements	2 day
5. Residential Mechanical Plan Reviews and Inspections	1 day
6. Commercial Building Provisions of the IECC	2 day
7. Performing Residential Building Inspections	2 day
8. Special Issues for 2-Family Dwellings and Townhouses	1 day
9. IRC Update Program	1 day
10. Residential Deck Design Construction and Inspection	1 day
11. Design and Construction of Wood Frame Buildings	2 day
12. A New Era of Storm Water Management	2.5 day

The PHRC has delivered 16 programs through industry partners during this reporting period and have an additional 4 programs scheduled through the end of the fiscal year.

**Pennsylvania Manufactured Housing Installer Update Training 2009** – This six hour course satisfies the DCED's continuing education requirement for *Pennsylvania Certified Manufactured Home Installers*. The course reviews critical elements of the applicable manufactured housing rules and regulations and drills deeper into understanding the manufacturer's approved installation instructions. This course will also highlight the many regulatory and code related changes to both the state and federal programs over the past several years, including coordinating manufactured housing installation with the Pennsylvania Uniform Construction Code.

This program is being offered by the Housing Standards Division of the Pennsylvania Department of Community and Economic Development. The programs were held November 12, 2008 in State College & December 17, 2008 in Clarion. The PHRC provided administrative support for the programs.



**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. Development input was also provided by Performance Systems Development (PSD), Affordable Comfort, Inc. (ACI), and the Energy Coordinating Agency (ECA). This training program is a requirement for contractors wishing to participate as “Trained Contractors” in the Keystone Home Energy Loan Program (Keystone HELP), and helps remodelers and other contractors to prioritize residential energy upgrades and expand their scope of work while ensuring a safe living environment for the home's occupants. 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

**New Program Development** – The PHRC will develop the following new training programs. These programs will address issues challenging the residential construction industry (builders, remodelers, building code officials, materials suppliers, etc.). During this period the following programs will be developed:

1. **Residential Mechanical Training** – The observed need for this program is two-fold. The first is the need of 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 and poorly installed ducts. This program will provide new and experienced installers the background they need to meet the mechanical requirements in the IRC.

UPDATE: This program will be geared toward the residential industry as a whole, including mechanical contractors, builders, remodelers, and code officials. A list of common mechanical code violations has been compiled based on informal surveys of code officials across Pennsylvania. Potential industry partners have been identified. Several site visits have been conducted with code inspectors and a majority of the required photographs have been taken or acquired. Additional site visits have been completed with potential presenters of the program, including one visit to visually demonstrate duct leakage using theatrical fog. Roughly 60% of the presentation has been completed, including sections on understanding the UCC, duct leakage, duct design, and new combustion air requirements for oil-burning appliances.

2. **Multi-Family Program** – There are specific requirements for multi-family structures built under the IRC that require special attention by the building code official. The program will highlight such issues as fire separation requirements and accessibility. This program will focus on effective plan review and inspection practices and provide an understanding of fire rated assemblies.

UPDATE: The program outline has been developed and we are in the process of developing the program content. The program will review the key requirement for two-family dwellings and townhouses. A focus of the program will be the conversion of single family homes to two family buildings. The program will be completed by the end of the fiscal year.

3. **Residential Green Building** – The interest in green building has increased at an impressive rate. However, the industry is finding it challenging to find a good source of unbiased information on innovative construction technologies and methodologies. This program, or series of programs, will help builders understand how to build green and how to have their development and homes certified by major voluntary green building programs.

UPDATE: This program has been given decreased priority for two reasons: (1) the downturn in the new housing market, which is causing many builders of new homes to shift more into remodeling work, and (2) the increased priority of two other PHRC projects. The project, *Prioritizing Energy Efficiency in Remodeling Projects*, (see Applied Projects below) has been given increased priority due to the shift toward remodeling resulting from the market downturn. The second project of increased priority is the result of the successful acquisition of funding from the Center for Rural Pennsylvania to study the impact of the UCC in Pennsylvania (see Research Activities below).

4. **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 will highlight the most significant changes between the 2006 and 2009 IRC, and identify potential impacts to builders, designers and building code officials. The result of this will be a new training program to be offered to builders and code official organizations.

UPDATE: The PHRC staff has reviewed the 2007 IRC supplement and is in the process of reviewing the results from the ICC's final action hearings held in September. The primary program development will occur in March –May 2009 and will be offered starting in late May or June.

**Web-Based Training** – The PHRC is developing and deploying 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. Participants must establish a free *Friends of Penn State Account* prior to the program.

UPDATE: The PHRC held seven webinars during this period. Below is a list of programs held and scheduled through the end of the fiscal year:

\*Fortney, M., Buddenbohn, R., *Act 106: UCC Review & Advisory Council (Recorded without audience)*, October, 30, 2008 (~unknown)

Fortney, M., Buddenbohn, R., *Inspecting Attached Decks: Ledger Board Flashing Details*, November 11, 2008 (~99 attendees)

Fortney, M., Turns, M., *Relocated Manufactured Housing Alternative Installation Standards*, December 9, 2008 (~80 attendees)

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.

\*SPECIAL PROGRAM – Not part of usual monthly programs

**Webinar hosting service:** In addition to presenting webinars for the regularly scheduled PHRC webinar series, the PHRC offers to host and moderate webinars for industry partners per their request.

UPDATE: The PCCA has requested the PHRC develop and hold a program for municipalities on the Home Improvements Contractor Registration Act. This is being explored for the late May or June timeframe.

**Technology Transfer & Outreach** – The following are a 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 premiere technical conference for housing and land development issues in Pennsylvania. This 2-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.

This years conference was held February 11-12, 2009.

The first day of the conference focused on technical issues around the design and construction of houses and was attended by 135 builders, remodelors, CTC teachers, building code officials and design professionals. The following is a list of the titles of some of the sessions during the first day of the conference:

Early Morning	Late Morning	Early Afternoon	Late Afternoon
Legislative Update	Green Building Programs in PA	Green Building Case Studies – What’s Worked and What Hasn’t	On-site Energy Generation
2009 IRC Code Changes	Window Technology – Separating Reality from Sales Myths	Improving Energy Performance of Existing Homes	Trusses
	Home Improvement Contractor Registration Law	Changes in IRC 2009 Wall Bracing (Part 1)	Changes in Wall Bracing IRC 2009 (Part 2)

The second day focuses on land development issues and was attended by 94 developers, builders, land development engineers, soil scientists, landscape architects, state and local regulators.

- ❖ Thermal Treatment of Stormwater Discharge
- ❖ Green Building Programs and Land Development
- ❖ What’s Behind the Rise in Costs of Housing?
- ❖ Performance of Stormwater Infiltration Facilities in Cold Climates
- ❖ Evolving Technologies for Infiltration Design
- ❖ Innovations in Erosion and Sediment Control Strategies

**Annual Leadership Reception:** The PHRC held its annual leadership reception on February 11<sup>th</sup> at the Trolley Museum in Scranton. The program was attended by over 50 PHRC members and invitees. The event is intended to gather the PHRC leadership in an informal setting.

The 2010 conference is scheduled for February 10 & 11 in the Pittsburgh area. The PHRC is working with the Builders Association of Metro Pittsburgh to secure the venue for the conference.

2. **Speaker Service** – The PHRC holds and/or participates in talks and seminars directed at the construction industry. This may include trade and professional association functions and regional meetings, local association meetings, or state or national conferences. Please see below for a list of the 13 presentations given to 529 people during this reporting period.

Fortney, M., Frost Protected Shallow Foundations, Builders Association of Metro Pittsburgh, October 21, 2008 (~30 attendees)

Fortney, M., Basement Insulation Strategies, Builders Association of Metro Pittsburgh, October 21, 2008, (~45 attendees)

Fortney, M., Common deck failures and how to avoid them, Builders Association of Metro Pittsburgh, October 21, 2008 (~44 attendees)

Turns, M., *Overview of Green Building Programs*, Builders Association of Metro Pittsburgh, Pittsburgh, PA, October 21, 2008 (~40 attendees)

Turns, M., *Anatomy of a Green Home*, Builders Association of Metro Pittsburgh, Pittsburgh, PA, October 21, 2008 (~40 attendees)

Turns, M., *Energy Code Compliance Tips*, Builders Association of Metro Pittsburgh, Pittsburgh, PA, October 21, 2008 (~20 attendees)

Turns, M., *Introduction to Green Building*, Lebanon County Builders Association, Lebanon, PA, October 29, 2008 (~50 attendees)

Turns, M., *Introduction to Green Building*, Lackawanna County Builders Association, Dunmore, PA, October 30, 2008 (~50 attendees)

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)

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.

The PHRC developed and distributed a newsletter in October 2008. The next newsletter will be sent out electronically in late spring. This will be the first time we issue an electronic newsletter instead of mailing hard copies.

**WWW Site** – The PHRC continues to improve the web site ([www.engr.psu.edu/phrc](http://www.engr.psu.edu/phrc)) to help disseminate information. An executive summary from each of the reports, as well as "builder", "research", and "technical" briefs are available on-line.

The PHRC has redesigned its web site to make it more user friendly and to distribute more documents electronically. This includes builder briefs, research reports, archived webinars, etc.

**Conferences Attended:**

- Turns, M., Homes within Reach Conference, Harrisburg, PA, November 18, 2008
- Fortney, M., Turns, M. PA Home Energy Conference, State College, PA, March 18-19, 2009
- Fortney, M., PSATS Annual Convention, Hershey, PA. April 2009

### **Conference Presentations:**

- Turns, M., *Green Building Case Studies: What's Worked, What Hasn't*, (panel moderator) PHFA's PA Housing Conference, February 11, 2009 (~50 attendees)
- Fortney, M., *Ask the Pros* - panel discussion, 2009 PA Home Energy Conference, March 17, 2009 (~300 attendees)
- Fortney, M., *Home Improvement Contractor Registration Act*, March 18, 2009 (~50 attendees)
- Fortney, M., *Overview of changes coming in the 2009 IRC*, March 18, 2009 (~50 attendees)

### **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

## **Publications**

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### **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.

Kasal, B. 2009. Local reinforcement of wood with composite materials. Czech Technical University, Prague. 30p. ISBN 978-80-01-04275-5

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.

Wehsener, J., and B. Kasal. 2008. Echtzeit-Röntgenuntersuchungen an duktilen stabförmigen Holzverbindungen bei dynamischer Beanspruchung. *Bautechnik* 85. 10/2008. 678-686.

Kasal, B. 2008. RILEM TC 215 AST "In-situ evaluation of structural timber." SACOMATIS. In RILEM Proceedings PRO 59. Binda, L., M. di Prisco, and R. Felicetti (Editors). Volume 2. RILEM Publications. Bagneux. ISBN 978-2-35158-061-5. 1025-1032.

Kasal, B., A. Adams, and M. F. Drdacky. 2008. Application of digital radiography in evaluation of components of existing structures. SACOMATIS. In RILEM Proceedings PRO 59. Binda, L., M. di Prisco, and R. Felicetti (Editors). Volume 1. RILEM Publications. Bagneux. ISBN 978-2-35158-061-5. 581-592.

## Research Activities

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**Wall Bracing Standards for Pennsylvania** – The residential structures all over the United States are exposed to high winds year round. We propose to look at the historic wind data for Pennsylvania available through the National Weather Service, and establish critical regions/counties. The assessment of wind loading with these local wind data is possible by using the existing design guidelines.

**Phase 1:** Feasibility Study

**Phase 2:** Regional Wind Mapping

**Phase 3:** Developing of Bracing Standards

UPDATE: Phase 1, feasibility study, that was completed in the previous fiscal year included the analysis of historical wind data in PA and determining if the development of a wind load map of for sub-regions of the state is warranted. This project is currently in phase 2 and 3 of this multi-year project.

**Phase 2** – Finished. Single wind-speed zone is proposed for the State of PA.

**Phase 3** – Finished. Typical 1 and 2-story buildings (consistent with the IRC provisions) have been selected and are analyzed for the new wind loads. Comparison between the 2006 IRC and more accurate calculations was done. PHRC Report has been prepared.



NEW

**Impact of the Uniform Construction Code in Rural Pennsylvania** – Little is known about the mix of enforcement approaches chosen by municipalities, or the fees they charge for enforcement services. This project will use existing data sets and a survey of municipal secretaries to assess building code enforcement approaches and building permit fees in Pennsylvania municipalities. Uniformity of code requirements across the state, housing permit data, and the potential impact of the code on homeowner's insurance premiums will be analyzed. A new database unifying diverse sources of data and a report will be deliverables under this project.

UPDATE: Survey questions have been developed and a press release about the upcoming survey has appeared in the April issues of Pa. Township News and Borough News. The survey is to be sent out electronically to secretaries for whom a DCED database has email addresses. Postcards will direct the remaining secretaries to a Web site to take the survey. Several databases have been obtained including DCED Municipal Statistics – City Clerk/Secretary, L&I Municipal Elections and Contact Information, L&I Municipal Code Change Ordinances and Center for Rural Pennsylvania Rural Municipalities vs. Urban Municipalities. The DCED Municipal Statistics database and the L&I Municipal Elections database have merged and cleaned to enable automatic emailing and mail label printing for the survey as well as initial analysis of municipal amendments. The PHRC is still working to obtain the DCED-13 Building Permit database from Mitch Hoffman at DCED.

## Applied Activities

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**Technical Assistance the Review and Advisory Council** – In the fall of 2008 the PA Legislature created the Uniform Construction Code Review and Advisory Council. The RAC consists of 19 members appointed by the Governor from various construction industry trades and professions as well as local government, and is charged with making recommendations to the Governor, the General Assembly and the Department of Labor & Industry regarding proposed changes to Act 45 (The Pennsylvania Construction Code Act) and changes that appear in the International Codes enforceable under this act. Initially, the Council will be involved primarily in deliberations on whether any changes made in the latest triennial version of the International Codes should be excluded from adoption in Pennsylvania.

UPDATE: The PHRC has offered technical assistance to the Council. This technical assistance is being offered in two forms. The first is reviewing the residential provisions of the ICC codes and prioritizing the major changes. This is done in writing, ahead of their meetings. The second is to provide information during

the meetings. This has included providing testimony on the background of specific code requirements and technical difficulties in meeting them, as well as answering questions posed by the Council. The RAC is required to have their recommendations for any exclusions of new requirements in the 2009 ICC codes to the DLI on or before May first.

**Support of Standards** – 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 - 2006: Education will be provided through various building code training programs. Technical assistance will be provided through telephone and email support by the PHRC.

UPDATE: The PHRC has reviewed the 2009 IECC and has developed a list of some of the key changes between the 2006 and 2009 IECC. These have been prioritized and the PHRC is in the process of developing a standard that will provide equivalence to the 2009 IECC and provide some flexibility to the provisions. The PHRC is in the process of developing computer models to evaluate equivalence of the various options that are being considered. The final version of the PA-Alt is due to DLI by May 15<sup>th</sup>.

The working group for the PA-Alt development consists of the following individuals:

Andy Bowman (Code Official)	Jerry Leach (Builder)
Scott Cannon (Builder)	Clem Malot (Code Official)
Ed Carr (Energy Consultant)	Tim Palaski (Code Official)
Don DeLess (Builder)	Frank Thompson (Builder)

2. Pennsylvania Standards for Residential Site Development Standards: Please see the Land Development section.
3. Foundation Systems for Relocated Manufactured Housing: The PHRC has developed a one-hour training program for building code officials and contractors. This program was initially held at our December 9<sup>th</sup> Webinar to over 80 people. A recording of this program is posted on the PHRC’s web site for open viewing ([www.engr.psu.edu/phrc/Training/Webinars.htm](http://www.engr.psu.edu/phrc/Training/Webinars.htm)).

**Flood Preparedness of Pennsylvania’s Housing Stock** – Pennsylvania has more miles of waterways than any other state and is one of the most flood prone states. This project will review the current state of the art for flood resistive construction and proper procedures for flood recovery. This project will also identify key areas for future efforts to help Pennsylvania prepare for the recovery of future floods. This project will include involvement from FEMA, PEMA, and others involved in emergency response in the Commonwealth.

UPDATE: The PHRC will deliver a brief report highlighting the existing resources available within the Commonwealth and suggestions for improvements in the recovery following a flood.

**Analysis of Zero Energy Homes – Technical, Constructability, and Public Policy Challenges** – 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? Could builders take advantage of a greenhouse gas cap-and-trade system? 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.

UPDATE: An initial literature search has been completed, identifying case studies relating to Zero Energy Homes in Pennsylvania or similar climates. Information has been gathered on related public policy issues, such as Pennsylvania's recently created Alternative Energy Investment Fund. Builders with experience in building near-Zero Energy Homes have been identified as possible resources. Information has also been obtained on Massachusetts Office of Energy and Environmental Affairs Task Force on zero net energy buildings. This project has been temporarily on hold due to time constraints caused by the development of the *Home Performance 101* training program, the mechanical training program, and the *Impact of the UCC in Rural Pennsylvania* research project.

**Prioritizing Energy Efficiency in Remodeling Projects** – Pennsylvania has a very old housing stock; over 80% was built before the Commonwealth established an Energy Code. The potential for reducing energy use and improving comfort of our existing homes is great. Consumers and remodeling contractors usually do not consider energy improvements as part of remodeling project, but when they do, energy savings can be very significant. Many times this is a lost opportunity for the remodeling contractor.

UPDATE: The PHRC has redirected this initiative slightly to leverage funds and program support from the Commonwealth. The PHRC took the lead in the development of a full-day training program and training manual titled, *Home Performance 101: The House as a System*. The program was developed to help remodelers and other contractors understand the interactions between a home's systems and how to prioritize energy upgrades. Residential energy programs and incentives, certifications, business models, building science principles and energy audit protocols are also introduced. The program development was funded by the PA Department of Environmental Protection through the West Penn Power Sustainable Energy Fund.

**DEP-DOE Grant** - Work is complete on a project funded by a grant from the U.S. Department of Energy, in partnership with the Pennsylvania Department of Environmental Protection. This project focused on the implementation of the 2006 IECC, and included the following activities: (1) code official certification training, (2) advanced training of building code officials, (3) 2006 IECC transition programs, (4) train-the-trainer programs, (5) energy code administration and enforcement, (6) evaluation of energy code compliance, (7) coordination and information sharing, and (8) development and distribution of energy code training materials.

UPDATE: This contract has been closed and all deliverables completed. The PHRC Research Series Report 106, *Energy Code Enforcement and Compliance in Pennsylvania: Lessons from the Field*, continues to be available to the public. Under this contract a total of 71 programs were held by the PHRC with 2,242 individuals trained.

## Proposals & Contracts

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### Pending proposals:

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

National Science Foundation – *Sustainable, Natural Material – Composite Reinforced System and Application to Built Environment – Interface Properties Between Wood and High-Strength Composite Material*  
Submitted October, 2008, ~\$300,000 – Pending

National Science Foundation – *Modeling of Low-Rise Buildings Subjected to Extreme Wind Loads*  
Submitted October, 2008 ~\$315,734 – Pending

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

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

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

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

**Open Contracts:**

**Research:**

U.S. Department of Agriculture (USDA) – *Property Evaluation of Genetically Engineered Wood from Aspen with Down-Regulated Lignin Enzymes-Mechanical Properties*, \$40,000

DOW Chemical – *Hygro-Thermal Performance of Imperfectly Protected Bellow-Grade Walls with Interior Insulation* , \$75,000 – Status – Ongoing

Hankin Endowment and PSU Funds

- *Low-Rise Buildings in Areas with Modest Wind Loads*, \$75,000
- *Radiographic Investigation of Displacement of Fasteners*, \$75,000

**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)*

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

Department of Community and Economic Development (DCED) – *Project Plan 2007*

Pennsylvania Construction Code Academy (PCCA) – *Development of Training for Code Officials*  
PHRC Memberships