

The Year in Review - 2004



Since 1988, the PHRC has served the housing industry in Pennsylvania by carrying out applied research and delivering education, training and technology transfer. The PHRC is located both at the Pennsylvania State University in State College and at the Pennsylvania College of Technology in Williamsport, thus fostering a synergistic combination of research, application and training capabilities. Through its access to faculty, staff, students and external consultants, the PHRC addresses many issues related to housing.

The PHRC operates with extensive industry input and involvement. Projects are selected with input and approval from the PHRC's Industry Advisory Council and its Operations Committee. Members include trade associations, product manufacturers and suppliers, government agencies, developers and individual builders and remodelers. This level of industry involvement ensures that projects and services meet the needs of the housing industry.

In addition to support from Penn State and the College of Engineering, the PHRC receives direct funding from the Pennsylvania Builders Association (PBA), the home building industry, and the Commonwealth of Pennsylvania through the Department of Economic and Community Development, the Department of Environmental Protection, the Department of Labor and Industry and the Pennsylvania Housing Finance Agency. Contract funds are also received from sponsors of specific projects. The Hankin Endowment also contributes support.

Training, Education and Outreach Activities

The PHRC provided a wide array of training, education and technology transfer services to builders, remodelers, building code officials, design professionals educators and other professionals in the construction industry. Over 2,600 individuals participated in 87 workshops seminars. Including presentations and less formal educational programs the PHRC delivered educational programs to over 6,205 individuals in 2004.

12th Annual PA Housing Conference – The PHRC held its Annual Housing Conference in two locations in February 2004. At the Valley Forge, PA location, there were 169 attendees. The Monroeville, PA location had 174 attendees. The morning program consisted of three primary sessions: Update on the PA State Building Code; Basements; and Non-vented Crawlspace. The afternoon programs were split into two tracks. The Land Development track consisted of these three sessions: PA's New Stormwater Policy, Infiltration Facilities, and Legal Issues. The Housing Technology Track consisted of these two sessions: Common Code Violations and Common Building Failures.

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Factory Built Housing Programs – 2004 saw some long awaited changes at Penn College with its formal establishment of the Factory Built Housing Center (FBHC) after receiving a grant from the Ben Franklin Technology Partnership. The center will encompass both the established programs of the Modular Housing Training Institute (MHTI) and the Manufactured Housing Resource Center (MHRC) as well as any future training courses and activities for the industry. The MHTI course saw over 130 participants in 2004, while the MHRC course had over 120 students as well. In addition, the Penn College office of Workforce Development customized a leadership course for the manufacturing side of the industry. In April of 2004, the center hired its first full time director, Rick Terry, who came to the position with over 17 years of experience in both construction management and modular manufacturing. As the FBHC heads into 2005, the opportunities and demands of the FBHC continue to grow with expansion into research and the conversion of the classroom MHTI course into an online format. For additional information regarding the FBHC, you can contact Rick Terry at fterry@pct.edu or 570-327-4768.

Workshops and Training – The PHRC provides a wide array of industry based training. We have developed and held training for builders, remodelors, building code officials, design professionals, teachers, home inspectors realtors, bankers and other professionals in the residential construction industry. The following is a summary of the formal training events we put on during 2004. For a full description of the workshops please visit www.engr.psu.edu/phrc/workshops.htm

PHRC Training Programs Delivered			
PROGRAM		Activities for 1/1/04 – 12/31/04	
		# of Programs	# of Attendees
Comprehensive IRC Program for Code Officials	CO1	7	126
Overview of the IRC's Plumbing Requirements for Code Officials	CO3	5	90
Overview of the IRC's Mechanical Requirements for Code Officials	CO4	6	82
PA's New Energy Requirements for Code Officials	CO5	9	199
Comprehensive IRC Program	GA1	28	1106
Overview of the IRC's Plumbing Requirements	GA3	3	81
Overview of the IRC's Mechanical Requirements	GA4	8	285
PA's New Energy Requirements	GA5	8	247
IRC Update Program	GA6	1	26
Comprehensive IRC-Masonry Related Requirements	MA1	6	223
IBC Program for Concrete Masonry	MA2	1	29
Custom Programs	CP1	4	173
Train-the-Trainer	TT1	1	15
Total Programs Held		87	2,682

- **Fundamentals of Concrete Masonry Requirements of the IBC** – The PHRC has developed this one-day program for the masonry industry to educate architects, structural engineers and building code officials on the concrete masonry requirements of the 2003 International Builders Code. The pilot program was held in August 2004. Five programs were held in March 2005 with 178 attendees.
- **ASHI Standards and the IRC** – The PHRC developed this two-day program for the Pocono – Lehigh Chapter of the American Society of Home Inspectors (ASHI). The program covered all aspects of residential construction and building code compliance. This program was held in June to 60 participants.

- ***PA Construction Code Academy*** – The PHRC has partnered with the DCED’s Governor’s Center for Local Government Services, the Pennsylvania State Association of Township Supervisors and the Pennsylvania State Association of Boroughs to provide training for the Pennsylvania Construction Code Academy (PCCA). The PCCA is the Commonwealth’s mechanism to provide building code related training to local government officials and employees. Most of the CO (Code Official) programs on the above table were delivered through the PCCA. The PHRC organized and held a planning session to evaluate their short-term training initiatives. This meeting included representatives from all of the code organizations in Pennsylvania, including: ICC, PennBOC, CBO, PACO and Lancaster County Building Officials.
- ***Pennsylvania’s’ New Storm Water Policy*** – This two-hour program was offered in conjunction with the PBA leadership meeting in State College.
- ***IRC Update Program*** – The PHRC has developed a one-day program for persons to brushup on the general IRC requirements as well as provide an overview of the changes between the 2000 and 2003 IRC. The program also provides an overview of the UCC regulations and how they will be implemented.
- ***PMHA*** – The PHRC developed a custom program for the Pennsylvania Manufactured Housing Association. This program had two parts; the first addressed Pennsylvania’s new stormwater management policies and the second was on the UCCs requirements for factory built housing. The program was held in Delmont and Grantville.
- ***Executive Officers Overview of the UCC*** – The PHRC developed a custom program for the Pennsylvania Builders Association’s (PBA) executive officers on the UCC. The program was aimed at helping prepare EOs for the questions that their members will be asking. The program was attended by around 25 individuals.

Speaker Service – As a service to the home building and remodeling industry in Pennsylvania, the PHRC offers a speaker service to local and regional associations. This service is provided at no charge to associations and other interested groups. The PHRC offers short (20 to 45 minutes) sessions, often technical, that address some of the issues or problems that builders and remodelors may be facing. The following presentations were made in 2004 by M. Fortney, E. Burnett, S. Brown and K. Sagan:

- *UCC Update for HVAC Contractors*, Plumbing Heating and Cooling Contractors of America Board Meeting (PHCCA), Valley Forge, January, 2004
- *UCC Update*, Lehigh Valley Builders Association, February, 2004
- *UCC Update for HVAC Contractors*, PHCCA Board meeting, Pittsburgh, February, 2004
- *UCC Update*, Pennsylvania Builders Association Board Meeting, February, 2004
- *Overview of the REScheck compliance software*, Builders Association of Lebanon County, February 2004
- *Overview of the New Building Code for Homebuyers*, Luzerne County Builders Association, Home Show, March, 2004
- *UCC Update*, BA of Central Pennsylvania, March 24, 2004
- *UCC Update*, York County Builders Association, March 2004
- *Energy Use in the Home*, West Penn Power’s Energy Expo, April 2004
- *Stormwater Management from a Home Builders Perspective*, Presented at the Pennsylvania College of Technology, April, 2004.
- *Update on the UCC for HVAC Contractors*, Air Conditioning Contractors of America Pittsburgh Chapter, May 2004
- *Overview of the REScheck Compliance Software*, Builders Association of Metro Pittsburgh, May 2004
- *UCC Update*, S & A Homes Incorporated, June 2004

- *Implications of Pennsylvania's New Energy Code*, PA Builders Association Board Meeting, July 2004
- *Impact of the UCC on Realtors*, Lancaster County Retaliators Association, September 2004
- *Overview of the REScheck Compliance Software*, Builders Association of Indiana and Armstrong Counties, October 2004
- *Instructional Facility Operators Guide to the UCC*, Penn State Facility Management, October, 2004.
- *Visitability in Pennsylvania*, Housing Development Association of Philadelphia, October 2004
- *Overview of the REScheck compliance software*, Blair County Builders Association, November 2004
- *UCC Update*, Builders Association of Metro Harrisburg, November 2004

PHRC Newsletter – The PHRC produced two newsletters that described the PHRC's projects, recent reports and other resources available to the housing industry in Pennsylvania.

www Site – The PHRC continues to improve the web site (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.

Developmental Activities

Pennsylvania's Residential Energy Code – In early 2004, the legislation for a new state-wide building code was finally realized. The passage of the Uniform Construction Code (Act 45 of 1999) required the Pennsylvania Department of Labor and Industry (DLI) to promulgate regulations for prescriptive methods to implement energy requirements. The PHRC was asked to provide a document that is simpler, more flexible, and focused on and better suited to Pennsylvania. Pennsylvania's Alternative Residential Energy Provisions were developed as an alternative to Chapter 11 in the IRC 2003.

Code Training Consortium – The Consortium consists of interested organizations, associations and state agencies that either provide building code training or represent groups that need access to training. Interest in membership in the Consortium is increasing as the group comes together. The CTC held a meeting on July 13th and October 8th in Harrisburg, PA.

Land Development Consortium – A land development consortium has been brought together to provide oversight for the Residential Development Guidelines project. This consortium includes representatives of regulatory agencies, builders, contractors, design professionals, and environmental groups. Initial meetings of the consortium were held on July 27th and September 5th.

Subdivision Design Guidelines – The PHRC has developed draft Subdivision Design Guidelines. These guidelines were developed at the request of the Pennsylvania Builders Association. The goal of this initiative is to develop a set of guidelines that could be adopted by municipalities to regulate land development activities for residential subdivision. The standards will address street parking (cartway widths, curbs, shoulders, sidewalks, grades, pavement, etc.), construction standards, water supply (systems, capacity, placement, fire hydrants, etc.), sanitary sewer, and stormwater management.

PA Stormwater Management Policy – The PHRC submitted formal comments critiquing DEP's proposed stormwater management policy.

Applied Research Activities

Ventilation Drying of Walls – These ASHRAE and NSF funded projects evaluated the contribution of ventilation drying to the performance of wall systems with screen type cladding, e.g., siding, masonry veneer, etc. One objective is to develop and publish guidelines for design and construction. This work will have a bearing on the choice and installation of sheathing membranes (housewraps and/or building paper), the sizing of drainage and ventilation capabilities, choice of cladding and the provision of weeps and vents. This program of work is being conducted in partnership with the U.S. Department of Energy's Oak Ridge National Laboratory and the University of Waterloo in Canada. Copies of the 13 final reports can be obtained from ASHRAE.

Properties of wood composite materials and structural response of wood I-joists – We have submitted five journal article manuscripts based on the work conducted by Dan Hindman for his Ph. D. program. The manuscripts report on the shear properties of composite wood products, the torsional rigidity of composite wood products and preliminary investigations of the lateral buckling behavior of composite wood rectangular and I-joist beams. Four of these manuscripts have been approved for publication and will appear in *Wood and Fiber Science* and in the *Forest Products Journal* in 2005. The fifth manuscript is under review. Dr. Hindman is now assistant professor of Wood Science and Engineering at Virginia Tech University. Graduate student, Mr. Jesse Burow, has completed his laboratory work and his Master of Science thesis on the investigation of the allowable lateral buckling loads for composite wood I-joists. His research goal was to clarify issues with and improve the design specifications for the lateral buckling load for wood I-joists. His work is scheduled to be published in late 2005 or early 2006.

Moment Capacity of Metal Truss Plate Connectors – We have completed the research project to measure the moment capacity for a wide range of metal truss plate connected truss joints. We submitted, and the sponsor (Truss Plate Institute) has accepted, the final report of our findings. We are preparing a manuscript for submission to an engineering journal for publication of the results.

Creep response of wood I-joist floor systems – We have published two articles based on earlier research efforts to measure the long term deflection of wood I-joist floor systems under dead plus sustained live loads. One article was published in the June/July issue of *Structural Building Components*; the other is scheduled for publication in the *Transactions of ASAE* in early 2005.

Visitability – The PHRC is participating in a project to review the costs and benefits of visitability guidelines in Pennsylvania. The PHFA funded project is a partnership between Life and Independence for Today and the PHRC. This project included the participation by six builders and 14 houses across Pennsylvania. The PHRC is responsible for conducting a technical and cost analysis of each house and to develop viable design details. Five technical reports will be completed by mid-2005. In October of 2004, the PHFA presented an award to the PHRC to recognize our contribution to the project. Fred Peters will be completing his Masters thesis, entitled "Visitability in Pennsylvania" which incorporates the work involved in this project.

Publications

Worley, S. K. "Frequency-Domain Analyses of the Dynamic Behavior of an Engineered Wood I-Joist Floor System," Ph.D Dissertation. *The Pennsylvania State University*, University Park, PA. 348 pp. 2004.

Straube, J.F., VanStraaten, R. and Burnett, E.F.P., "Field Studies of Ventilation Drying," *Proceedings of Performance of Exterior Envelope of Whole Buildings, Buildings IX International Conference*, Clearwater Beach, December 5-10, 2004. 13p.

Pinon, J.P., Davidovic, D., Burnett, E.F.P. and Srebric J, “The Airflow Characteristics of Ventilated Cavities in Screen-type Enclosure Wall Systems,” *Proceedings of Performance of Exterior Envelope of Whole Buildings, Buildings IX International Conference*, Clearwater Beach, December 5-10, 2004. 15p.

Shi, X., Burnett, E.F.P., “Mechanics of 2D Flexible Membranes,” *Proceedings of the Second International Mechanics Conference*, Cape Town, July, 2004.

Roeder, R.W., Jr., Manbeck, H. B., and Osterberger, T., “Creep Response of I-Joist Floor Systems,” *Structural Building Components*. June/July, 2004. Pgs. 56-58, 60.

Masser, J. E. and H. B. Manbeck. “Moment Capacity of Metal-Truss-Plate Connectors,” *Final report submitted to the Truss Plate Institute for the TPI Harnden Scholarship Grant*. Madison, WI. June 30, 2004.

Burnett E.F.P., “The Membranes in Above-grade Enclosure Wall Systems,” *Proceedings of the BETEC Spring Symposium on Membranes in Enclosure Wall systems*, Arlington, VA., June 10-11, 2004.

Burnett E.P., “9/11 and the Structural Hereafter,” *Proceedings of ASCE Conference*, New York, NY. April, 2004.

Burnett, E.F.P., “Building Enclosures: A Strategy for NSF Support,” Position paper, *Proceedings of the NSF PATH Housing Research Agenda Workshop*, February, 2004, Orlando, Florida. Volume 1, pp 48-65.

Burnett, E.F.P., “Ventilation Drying in Enclosure Wall Systems,” *Proceedings of the NSF – PATH Housing Research Agenda Workshop*, February, 2004, Orlando, Florida. Volume 2, pp 172-177.

Other Activities

The PHRC delivered presentations at the following conferences:

- Fortney, M., “Visitability in Pennsylvania – a technical review,” *PHFA Housing Forum*, December 2004
- Fortney, M., “Energy Efficiency in Affordable Housing,” *PHFA Housing Forum*, December 2004
- Straube, J.F., VanStraaten, R. and Burnett, E.F.P., “Field Studies of Ventilation Drying,” *Buildings IX, Clearwater Beach*, December, 2004.
- Pinon, J.P., Davidovic, D., Shi, X., Burnett, E.F.P., “The Airflow Characteristics of Ventilated Cavities in Screen-type Enclosure Wall Systems,” *Buildings IX, Clearwater Beach*, December, 2004.
- Sagan, K., “Mechanical Requirements of the UCC,” *Pennsylvania Petroleum Marketers and Convenience Store Operators, Annual Conference*, Hershey, PA, September, 2004.
- Sagan, K., “Builders and Code Officials, Bridging the Gap Through Training,” *International Code Council – Code Forum*, Salt Lake City, UT, September, 2004.
- Sagan, K. “Uniform Pennsylvania Building Code” and “How the New Uniform Code will Impact your Business,” *Lancaster Realtors Association* Lancaster, September, 2004.
- Fortney, M., “Innovative Energy Code Implementation Strategies,” *State Energy Code Conference, U.S. Department of Energy*, July, 2004.
- Shi, X., Burnett, E.F.P., “Mechanics of 2D Flexible Membranes,” *Second International Mechanics Conference*, Cape Town, July, 2004.

- Weston T., and Burnett E.F.P., “Membranes in Enclosure Wall Systems.” *BETEC 2004 Spring Symposium*, Arlington, VA., June, 2004, Conveners and editors.
- Weston Theresa, and Burnett Eric, Proceeding and Program Handbook, “The Membranes in Above-grade Enclosure Wall Systems,” *BETEC 2004 Spring Symposium*, Arlington, Va., 10-11 June, 2004, Conveners and editors.
- Fortney, M., “Making Houses Truly Affordable through Energy Efficiency Conference,” *Energy Coordinating Agency of Philadelphia*. Philadelphia, PA, May, 2004.
- Sagan, K., “Overview of IRC’s Plumbing Requirements for the Modular Housing Industry,” *PFS – Annual Conference*, Madison, WI, May, 2004.
- Fortney, M., Griebler J., and Tooley, J., “When Building Science & Codes Conflict,” *Affordable Comfort Conference*, St. Paul, MN, April, 2004.
- Brown, S., “Barriers to Better Stormwater Management,” *Pennsylvania State Association of Township Supervisors 82nd Annual State Convention*, Hershey, PA, April, 2004.
- Brown, S., “Understanding Hydrologic and Infiltration Processes as they relate to the Construction of Infiltration Practices,” *National Green Building Conference*, Austin, TX, March, 2004.
- Burnett, E.F.P. and Fortney, M.R., *Proceedings of the 12th Annual Pennsylvania Housing Conference*, The Pennsylvania Housing Research Center, Harrisburg, March 6, 2004, Editor and convener.
- Burnett, E.F.P., “Ventilation Drying in Enclosure Wall Systems,” *NSF Housing Workshop in Orlando*, February, 2004.
- Brown, S., “Low Impact Development – Are we Really Mitigating the Stormwater Impact?” *National Association of Home Builders*, Las Vegas, NV, January, 2004.

Industry Liaison – The PHRC works closely with various national, state and local groups to support efforts that are targeted at the housing industry. Groups and committees with which staff members of the PHRC have been involved include the following:

Pennsylvania Focus:

- Pennsylvania Department of Environmental Protection (DEP), Oversight Committee – Pennsylvania Stormwater Management Manual
- Pennsylvania Builders Association (PBA)—(Workforce Development Committee, Training and Education Committee, Editorial Review Board, 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 Association of Central Pennsylvania
- Pennsylvania Concrete Masonry Association Codes Committee

National and International Focus:

- Advisory Council for the Building Codes Assistance Program (BCAP)
- National Consortium of Housing Research Centers
- Building Environment and Thermal Envelope Council (BETEC)

- National Institute for Building Sciences (NIBS)
- U.S. Department of Energy, Peer review of building related research programs at Oak Ridge National Laboratory
- Third International Building Physics Conference (Conference Committees)
- PI on multi-year funded R and D project involving Oak Ridge National Laboratory and University of Waterloo; a multi-national multi-institutional initiative.