

PENNSYLVANIA HOUSING RESEARCH CENTER NEWSLETTER



FALL 2017

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WELCOME + PHRC STAFF UPDATES

From all of us at the Pennsylvania Housing Research Center, we hope that the past year has been safe and successful. With fall finally at our doorstep, the PHRC is kicking off the season with a schedule full of webinars, speaking engagements, workshops, and other special events like the 26th PHRC Housing Conference. Some of these events represent our tried and true outreach and educational programming, while others are entirely new initiatives, such as our first annual PHRC Residential Construction Career Fair at Penn State. This newsletter highlights many of these activities and sheds some light on some of our involvement with Penn State's programs to support the future of the residential construction industry.



Brian Wolfgang, associate director

One of the biggest changes around the PHRC office is a new look for our staff. Back in January 2017, Dr. Katie Blansett moved on from the PHRC to reenter the field of stormwater engineering and consulting. We were very fortunate to have Dr. Blansett's leadership over the past four years and wish her the best! From there, a lot of shifting of positions has occurred. As of March 1, I stepped into the associate director role. Next in July, Sarah Klinetob Lowe took on the role of housing systems specialist. Finally in September, Rachel Fawcett was brought on as the new budgets & publications coordinator. Only one new face on our staff team but lots of new responsibilities to expand the valuable work that the PHRC can provide. One thing is certain – the PHRC is positioned very well to continue to offer excellent educational programming and activities to the residential construction industry.

There are many ways that you can keep in touch with the PHRC as we roll into fall, including our emails, our website, and our social media (Facebook, Twitter, LinkedIn). Keep an eye out for some new campaigns this year and beyond as we continue to expand our reach and our impact.

L-R: Chris Hine; Rachel Fawcett; Dr. Ali Memari; Tracy Dorman; Brian Wolfgang; Sarah Klinetob Lowe



We are eagerly looking forward to a productive year, and hope that you can be a part of it!

PHRC CONFERENCE WEEK | 2/28-3/1

SAVE THE DATE | PHRC Conference Week highlights best practices, regulation, research, and innovation in the residential construction industry.

- Early Bird Registration opens December 1, 2017
- Standard Registration opens January 15, 2018
- PHRC & PBA Members receive a registration discount
- Continuing education available for all sessions

FEBRUARY 28 - MARCH 1, 2018 | THE PENN STATER

SPECIAL EVENTS

Research & Education Night

Tuesday / Hintz Family Alumni Center

Happy Hour on the Exhibit Floor

Wednesday / The Penn Stater



26TH ANNUAL PHRC HOUSING CONFERENCE

This two-day event with multiple tracks provides information and updates on issues of interest to the residential construction industry. Invited speakers present on a wide-range of topics about regulation and best practices in the industry.



WEDNESDAY | TRACKS

Construction & Management
High Performance Homes
PCCA Symposium Central

THURSDAY | TRACKS

PHRC Greatest Hits
Design & Technology
Land Development

4TH BIENNIAL RESIDENTIAL BUILDING DESIGN & CONSTRUCTION CONFERENCE

This two-day event provides an academic forum to discuss the latest findings, innovations, and projects related to residential buildings. Conference presentations are based on submitted abstracts and peer-reviewed papers focusing on research, innovation, and state-of-the-art information. Registration opens in mid-October.

TOPICS INCLUDE

- Design and Construction of High Performance Homes
- Designing for Resiliency & Natural Disasters
- Cross Laminated Timber for Residential Uses
- Educating the Next Generation on Building Science



CONFERENCE SPONSORSHIP OPPORTUNITIES

EXHIBITOR | \$600

- 6' table display at Happy Hour on the Exhibit Floor (3 Hour Event)
- 1 full, two-day PHRC Housing Conference registration
- 2 passes to Happy Hour on the Exhibit Floor
- Verbal recognition during Opening Remarks
- Company name & logo placed on PHRC website
- Company name & logo published in PHRC Housing Conference program

ADVERTISER | \$200

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WEBINAR SCHEDULE | 2017-2018

Tune in every 2nd Tuesday of the month from 1-2 p.m. for free webinars! Webinars are approved for AIA, ICC, L&I, NARI, and PDH continuing education credit for a \$20 certificate. All webinars since 2011 are available to view on our website under "Industry."

JOIN WEBINARS

phrc.psu.edu/Industry-Education/Webinar-Index.aspx



SEPTEMBER 12

HOT WATER FUNDAMENTALS

As homes become more energy efficient, it is important that the mechanical systems are able to respond to the needs of the building. This webinar will discuss some of the principles of hot water generation including selection of equipment, analyzation of current code requirements for hot water systems, and examination of best practices for creating an efficient overall domestic hot water system.



Kitchen range hood

NOVEMBER 14

RESIDENTIAL MAKEUP AIR SYSTEMS AND REQUIREMENTS

There are a variety of factors that influence the environment within homes at any given time, including climate, building enclosure performance, and mechanical system operation. There are times when a specific system places this environment under conditions that are not ideal for occupants, including the operation of large kitchen range hoods and exhaust fans. These large exhaust systems (typically greater than 400 CFM) have the potential to substantially depressurize interior spaces. This webinar will take another look at residential makeup air systems, focusing on modern technologies and recent code requirements that dictate the design and construction of these systems.

DECEMBER 12

RADIANT FLOOR HEATING SYSTEMS

The design of a radiant floor heating system goes beyond just heat calculations. The structure itself must be examined and correct materials must be used with this type of heat. This webinar will look into material compatibilities when installing radiant floor heat along with simple design methods.



Thermal image from blower door test during energy audit

JANUARY 16

RESIDENTIAL ENERGY AUDITING 101

There are several approaches to residential energy auditing to achieve various goals such as a homeowner looking to save energy costs, a designer confirming a home is meeting its intended energy performance, or a utility striving for permanent energy usage reductions in its territory. This webinar will explore the various reasons for commissioning a residential energy audit, the associated energy auditing process, and final product for those end goals.



Zero-step entry; photo provided by Bridlewood Builders

FEBRUARY 13

REVISITING VISITABILITY

Another component to the Universal Design Trilogy is Visitability. Visitability is a design practice that allows the dwelling to be accessed and/or visited by someone who is physically disabled. In this webinar, we will take a look at different solutions: from the design of the interior space and room requirements to the construction of zero-step entry details at different entry points.

APRIL 10

FUTURE PROOF HOME DESIGN

Technology is an ever changing component within a home. Taking that into consideration, this webinar will look at some of that technology and how it can be incorporated into the functionality of the home now and in the future. This will range from standard wireless capabilities to complete home automation.



Zero Energy Ready Home duplex in State College, PA

MAY 8

GREENBUILD: ZERO ENERGY READY HOME (ZERH) IN STATE COLLEGE

The State College Community Land Trust, a non-profit that preserves and provides affordable, owner-occupied housing, is building a new Zero Energy Ready Home duplex. This webinar will explore the design, construction, certification process, and lessons learned from this Pennsylvania-based, solar-powered Zero Energy Ready Home duplex.

AVAILABLE WORKSHOPS

The PHRC annually offers various training workshops typically through the PA Construction Codes Academy (PCCA). Continuing education credits are awarded based upon the topic. If interested in offering a workshop, contact Tracy, tdorman@enr.psu.edu.

REGISTER FOR WORKSHOPS

phrc.psu.edu/Industry-Education/Workshop-Index.aspx

SEPTEMBER 25-28, 2017

RESIDENTIAL BUILDING ACADEMY

Clarion Inn in New Cumberland, York County

This four-day program is a comprehensive review of International Residential Code (IRC) Chapters 1-10. It includes examples, exercises, and case studies designed to illustrate daily practices performed by a Residential Building Inspector or Plans Examiner.

OCTOBER 17, 2017

BASIC BLUEPRINT READING / HOUSE PLANS

Clarion Hotel in Exton, Chester County

This one-day program is designed to provide an introduction to the fundamentals of blueprint reading through lecture and interactive learning exercises. The exercises are designed to test your skill level and knowledge.

OCTOBER 24, 2017

TWO-FAMILY DWELLINGS AND TOWNHOUSES

Woodlands Inn in Wilkes-Barre, Luzerne County

Pennsylvania's Uniform Construction Code has adopted the IRC for the design and construction of single family dwellings, two-family dwellings, and townhouses not more than three stories in height. While many requirements of the IRC apply equally to all residential structures within its scope, there are certainly unique requirements and challenges that apply solely to two-family dwellings and townhouse construction.

OCT 30 - NOV 2, 2017

RESIDENTIAL ELECTRICAL ACADEMY

Clarion Inn in New Cumberland, York County

This four-day program is a comprehensive review of IRC Chapters 34-43. It includes examples, exercises, and case studies designed to illustrate daily practices performed by a Residential Electrical Inspector or Plans Examiner.

DECEMBER 13, 2017

IRC FRAMING DESIGN & CODE COMPLIANCE

Woodlands Inn in Wilkes-Barre, Luzerne County

This workshop will take a general look into the fundamentals of the individual framing materials utilized and how they interact and resist loading. At the conclusion, attendees will be able to review framing components in residential construction, understand certain characteristics of those materials, and apply IRC Code requirements to those materials and systems.

DECEMBER 13, 2017

FUNDAMENTALS OF EXTERIOR PLASTER & THIN STONE VENEER ASSEMBLIES

Fort Washington, HBA of Bucks & Montgomery Counties

This workshop explores relevant exterior plaster code requirements, review proper flashing techniques, lath requirements, and treatment of joints between dissimilar materials.

DECEMBER 14, 2017

BASIC BLUEPRINT READING / HOUSE PLANS

Ramada State College Hotel, Centre County

See previous description on October 17, 2017.

JANUARY 10, 2018

IRC FRAMING DESIGN & CODE COMPLIANCE

Concordville Inn, Delaware County

See previous description on December 13, 2017.

JANUARY 18, 2018

TWO-FAMILY DWELLINGS & TOWNHOUSES

Clarion Inn in New Cumberland, York County

See previous description on October 24, 2017.

JANUARY 23-24, 2018

IECC INTERNATIONAL ENERGY CONSERVATION CODE

Holiday Inn in Kulpsville, Montgomery County

This two-day course provides a comprehensive overview of the commercial building provisions of the International Energy Conservation Code (IECC). Practice exams are included at the end of each day to help attendees retain information and prepare to take the Commercial Energy Inspector or Commercial Energy Plans Examiner test.

JANUARY 29 - FEBRUARY 1, 2018

RESIDENTIAL MECHANICAL ACADEMY

Clarion Inn in New Cumberland, York County

This four-day program is a comprehensive review of IRC Chapters 12-24. It includes examples, exercises, and case studies designed to illustrate daily practices performed by a Residential Mechanical Inspector or Plans Examiner.

MARCH 5-8, 2018

RESIDENTIAL PLUMBING ACADEMY

Clarion Inn in New Cumberland, York County

This four-day program is a comprehensive review of IRC Chapters 25-33. It includes examples, exercises and case studies designed to illustrate daily practices performed by a Residential Plumbing Inspector or Plans Examiner.

BECOME A MEMBER

Join the PHRC as a member today! PHRC Membership Fees support the outreach activities of the PHRC, Penn State students involved in the NAHB Student Chapter, graduate students conducting research with the PHRC, and more.

PLATINUM	\$5,000
GOLD	\$2,000
SILVER	\$1,000
BRONZE	\$500
ASSOCIATION	\$150
INDIVIDUAL	\$100

AS A PHRC MEMBER, YOUR BENEFITS INCLUDE...

- Annual conference discounts
- Workshop discounts
- Advertising in annual newsletter & conference program and on PHRC website
- Electronic access to past conference presentations

Benefits vary between Membership Levels

CONTACT TRACY, TDORMAN@ENGR.PSU.EDU, 814-865-2341, TO BECOME A PHRC MEMBER

2017 MEMBERS

GOLD



DOW Building Solutions



Hankin Group

SILVER

PA Concrete Masonry Association
PA Manufactured Housing Association
S&A Homes

Lebanon County Builders Association
Township of Adams
Tredyffrin Township
Willistown Township
York Builders Association

BRONZE

The Duck Harbor Company
HBA of Chester & Delaware Counties
Sukonik Building Companies
Upstreet Architects, Inc.

Steve Balkey
Robert Baney
Allan Booz
John Brooks
George Deller
Lora Dombrowski
Larry Frace
Mark Grassi
Alan Hawman
Dean Hilliard
John Holahan
Jon Kautz
Paul Laskey
Roy Pedersen
Daniel Quimby
Lee Rackus
Thomas Remmele
Todd Smeigh
Tommy Songer
Ray Stackhouse
Frank Thompson

ASSOCIATION

Builders Association of Central PA
Builders Association of Northwest PA
BIA of Philadelphia
Carbon Builders Association
Central Susquehanna Builders Association
E.R. Long Associates, Inc.
HBA of Bucks & Montgomery Counties
HBA of Metro Harrisburg
Indiana-Armstrong Builders Association

INDIVIDUAL

HANKIN DISTINGUISHED LECTURE



Peter Gluck, principal of GLUCK+

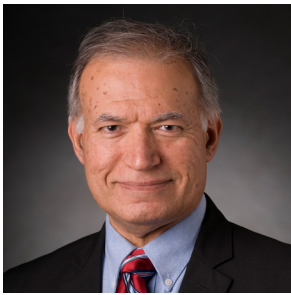
IT'S ALL ABOUT CONTEXT. | PETER GLUCK

The PHRC welcomes Peter Gluck, founder and principal of GLUCK+ in New York, as the 2017 Hankin Distinguished Lecturer. The Hankin Distinguished Lecture Series invites world-class speakers to Penn State to address students, faculty, staff, and industry professionals. The lecture is free and open to the public with a reception to follow. The lecture series was established in 2006 in honor of the late Bernard Hankin and his family for their continuous and dedicated support of the Residential Construction program at Penn State. Check out Peter's lecture description below:

What are the different contexts in which we operate as architects? First, there is topography or the "lay of the land;" second, adjacent structures or how what we design and build will "fit in;" third, social appropriateness to "the village;" and lastly, the historical context of our modern sensibilities. There are many contexts in which we build, often unrecognized. Sensitivity to these underlying forces leads to the creation of authentic places, buildings, and cities.

WEDNESDAY, NOVEMBER 8, 2017 @ 4 p.m. | HUB AUDITORIUM

HANKIN CHAIR UPDATE



Dr. Ali Memari, Hankin Chair

The Residential Construction program has had a very successful year in terms of deliverables and planned activities. Our two student competition teams, NAHB

Student Competition and DOE Race to Zero Student Design Competition, are growing each year, as we see a greater number of students joining the teams. The key to the success story of the two competition teams and their high rankings is the coaching provided by our PHRC staff who offer and share their expertise and experience to students. The 22-credit Residential Construction minor is now well known to the general body of undergraduate students in Architecture, Architectural Engineering, and Civil Engineering, as we see an increasing number enrolled in the program, eleven in 2017 compared to six in 2016, and four in 2015 when the program started. The enrollment in residential construction related courses (AE 470, AE 471, CE 410, CE 411, ARCH 412) is continuing to grow. Some of our graduate students specializing in research areas related to residential construction are finding faculty positions in other universities to help the residential construction or related programs in those schools, while others are taking their expertise gained through the program to the industry.

We continue our efforts to identify emerging and innovative areas of research and provide such opportunities for our graduate students to conduct research. Examples of such areas include Building Information Modeling (BIM) applied to modular construction, energy efficiency and thermal resistance evaluation of building envelope insulation systems, performance-based design of residential buildings under natural hazard conditions, cross-laminated timber construction, and 3D printing of concrete. Engagement in research on this last topic funded by industry provided an opportunity to form a Penn State team of faculty-students to enter the NASA 3D-Printed Habitat Competition. The objective of this Phase 2 Competition was to create a capability to print concrete suitable for constructing habitat on Mars. The teams had to design a concrete mixture that would use at least seventy percent indigenous material similar to that found on Mars.



3D-printed cylinder

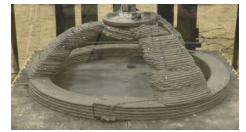
The competition consisted of three levels; each building on the experience gained in prior level. For the first level, a concrete cylinder was to be printed, the second level required a beam to be printed, and for the last level, a dome structure was to be printed at the competition site at Bradley University in Peoria, Illinois. The printed cylinder, beam, and dome had to meet a minimum strength through



3D-printed beam

structural testing.

The team used a computer controlled industrial robot arm to print the components/structure. We are proud that our team won the 2nd place award with a \$150,000 prize in the final round of printing the dome structure.



3D-printed dome

Finally, we are thrilled that our 4th RBDC Conference with 109 abstracts submitted shows more than 100 percent increase in abstracts submitted to the 3rd conference. This event will bring researchers from thirteen different countries to share their R&D efforts related to housing and residential construction. Besides the opportunity for exchange of ideas, this expertise forum will assist builders, designers, material manufacturers, and code officials to become more familiar with the latest developments and advancements in this field. The goal and hope is that this conference series will impact the home building industry for improved health, safety, serviceability, sustainability, energy efficiency, resiliency, and cost-effectiveness.



Penn State team for NASA 3D-Printed Habitat Competition

2017 NAHB STUDENT COMPETITION



Penn State NAHB Student Competition team

In January 2017, the Penn State National Association of Home Builders (NAHB) student chapter won fourth place in the Four-Year Program category of the NAHB Student Competition held at the 2017 NAHB International Builders' Show (IBS) in Orlando, Florida.

This competition challenges students to develop a real-life construction management proposal for a residential sub-division. After developing their problem solutions in the fall, thirty-four four-year institution teams from across the country traveled and presented their work to a panel of construction company executive judges.

The competition site was an existing 32-acre, \$45.8 million site in Decatur, Georgia, slated for redevelopment. The team developed a 97-page proposal for a 376-unit townhome

subdivision development that included four different floorplans built to meet the gold rating from the National Green Building Standard. The proposal also included thoroughly vetted market, financial, and risk analyses and a land development plan.

The 2016-2017 team included Emma Dickson (civil engineering, economics) as team leader and project manager, Jack Dalton (finance) as financial analyst, Alex Stack (civil engineering) as land development specialist, Austin Will (corporate innovation and entrepreneurship) as sales specialist, Josh Kappel (architectural engineering)

as chief architect, and Giuseppe Ciotti (civil engineering) as assistant project manager.

"Congratulations to the NAHB student chapter at Penn State," said Jerry Howard, CEO of NAHB. "They and their competitors showed a great deal of talent along with a depth of understanding of building industry management, from land development to marketing to scheduling to estimating."

The Toll Brothers IBS Travel Grant, the National Housing Endowment IBS Travel Award, and the University Park Allocation Committee generously provided the 2016-2017 team travel support.



Penn State NAHB RCMC design for site in Decatur, Georgia

2017 DOE RACE TO ZERO COMPETITION



Full Circle townhomes design

The PHRC supported the "Full Circle" student team to compete in the 2017 United States Department of Energy (DOE) Race to Zero Student Design Competition held on April 22-23, 2017 at the National Renewable Energy Laboratory in Golden, Colorado, which featured thirty-nine teams from thirty-three schools across the United States and Canada. The competition challenges



DOE Race to Zero Student Design Competition team for Penn State

and inspires students to design an affordable, net zero energy home that meets DOE's Zero Energy Ready Home guidelines. This year's "Full Circle" design concept was created in collaboration with the Centre County Housing & Land Trust and representatives from Ferguson Township to develop affordable, owner-occupied, high performance townhome designs that met the Township's inclusionary housing ordinance for the Turnberry Development.

Optimizing aesthetics, affordability, and energy performance, the resulting design was a set of three net zero energy townhomes to meet the mixed income workforce housing needs while visually appearing as equal units per ordinance requirements. This set included a 1,150 sqft, 2 bedrooms, 1.5 bathroom model for occupants earning 80 percent of the MFI, a 1,400 sqft, 3 bedrooms, 2 bathrooms model for 100 percent of the MFI occupants, and a 1,600 sqft, 3 bedrooms, 2.5 bathrooms model for 110 percent of the MFI occupants. Each townhome had a solar photovoltaic



Penn State team attending the 2017 DOE Race to Zero Competition

system that produced 100 percent of each home's energy onsite, significantly reducing residents' annual utility bills.

This interdisciplinary team was made up of undergraduate and graduate students in architecture, architectural engineering, mechanical engineering, and energy engineering and was led by Chris Hazel (M.Arch.). The team received mentoring from industry partners: Chad Owens of Timber Rock Homes, Jordan Robb of Envinity, Inc., and Andrew Poerschke of IBACOS, and Penn State faculty members: Lisa Iulo, associate professor of architecture, and Andy Lau, associate professor of engineering design. Travel support for the competition was generously provided by the West Penn Power Sustainable Energy Fund.

NAHB PWB DISCUSSION PANEL



Peggy Johnson, dean of Schreyer Honors College, professor of Civil Engineering

In honor of the NAHB Professional Women in Building Week held September 18-22, 2017, the Penn State NAHB Student Chapter hosted a discussion panel of women in the residential construction industry on September 20. Organized and moderated by students, Emma Dickson and Emily Weiland, the chapter invited four panelists—from Philadelphia, an architect and a residential project manager and from State College, a real estate professional and an engineer—to share insight and advice from their experiences. Opening remarks were provided by Dr. Peggy Johnson, dean of the Schreyer Honors College and former department head of civil & environmental engineering at Penn State.

Panelists included Amy Martino, principal and owner of Building Site Synergy; Sarah Smith, senior project manager for Toll Brothers; Sally Lenker, real estate professional—current realtor and past mortgage financier—for Coldwell Banker University Realty; and Sarah Klinetob Lowe, housing systems



L-R: Emily Weiland; Sarah Klinetob Lowe; Emma Dickson; Sarah Smith; Sally Lenker; Amy Martino

specialist for the PHRC. The chapter hopes to build off the success of this first NAHB Professional Women in Building Week event each September.



Panelists share their professional and personal experience in the industry

PHRC CAREER FAIR

1ST ANNUAL RESIDENTIAL CONSTRUCTION CAREER FAIR

We are excited to create the opportunity for the leading residential construction builders, designers, and material manufacturers to meet some of the best and brightest students with an interest in the residential sector. This mix and mingle style event is open to all Penn State students. Invited companies include Dow Building Solutions, The Hankin Group, NVR, PABCO, Rigidply Rafters, Timber Rock Homes, and Toll Brothers. Companies interested in participating next year, contact Tracy, tdorman@enr.psu.edu.

WEDNESDAY, NOVEMBER 8, 2017 @ 10 a.m. - 2 p.m. | KUNKLE LOUNGE

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The PHRC serves the home building industry and the residents of Pennsylvania by improving the quality and affordability of housing. We conduct applied research, foster the development and commercialization of innovative technologies, and transfer appropriate technologies to the housing community.

Director | **Ali Memari**
Associate Director | **Brian Wolfgang**
Housing & Land Development Specialist | **Chris Hine**
Housing Systems Specialist | **Sarah Klinetob Lowe**
Training & Events Coordinator | **Tracy Dorman**
Budgets & Publications Coordinator | **Rachel Fawcett**