

PENNSYLVANIA HOUSING RESEARCH CENTER MAGAZINE

PHRC.PSU.EDU



FALL 2020

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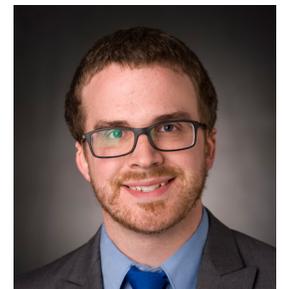
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On behalf of the Pennsylvania Housing Research Center (PHRC), we hope that you, your colleagues, and your family are doing well and staying safe. Needless to say, the past six months have been nowhere near routine for our team as we have been faced with remote work, event postponements, a constant barrage of change, and of course, personal challenges. Our team essentially packed up an incredibly successful 28th Annual PHRC Housing Conference and 2020 Residential Building Design and Construction Conference, dropped off the materials in our office, and have been working from home ever since.



Brian Wolfgang, associate director

So what is new for the PHRC team? You may have heard the phrase “hold the methods loosely” in various contexts. Often, this refers to strategic approaches to exploring new programs or pursuing innovative techniques. In the case of 2020, the PHRC team has used this phrase to guide our way through a year that has been coined “unprecedented” on almost every front.



Keynote by Lois B. Arena at the PHRC Housing Conference and 2020 RBDCC on March 5, 2019

Within the past year, our team conducted some strategic planning exercises that resulted in a revamped vision statement. At the PHRC, we envision “a residential construction industry equipped with the knowledge, skills, and technology to build better homes.” This vision is something we have held onto tightly as our team has navigated challenges stemming from the ongoing COVID-19 pandemic. But we have embraced the new opportunities that come along with online learning.

Throughout this magazine, you will find that we are busier than ever and striving to find innovative ways to engage with the residential construction industry. A fully online 29th Annual PHRC Housing Conference, an online Hankin Distinguished Lecture, and a brand-new event in December 2020 titled the PHRC Construction Summit are just a few of the ways our team continues to support this industry. While our programs will look and feel much different from before, they are all planned with our audience, our team, and our vision in mind.

I hope that you will find ways to engage with our team and our programming over the next year. It will certainly look different, but we are confident that you will benefit from the time invested. If there is anything that our team can do to support you in the next year, we hope you will reach out to us by phone or email.



Meeting with the PHRC Industry Advisory Council (IAC) on Oct. 3, 2019

UPCOMING EVENTS

PHRC CONSTRUCTION SUMMIT

LET'S GET TO WORK | Check out this special, one-day event geared toward educating the trades related to home building.

- Registration is free for educators and students. All other attendees are \$120 for 6 hours of training.
- Topics include: framing, HVAC, masonry, flashing, and indoor air quality.
- Act 48 credit will be available as well as other continuing education such as AIA, ICC, L&I, NARI, and PDH for up to 6 credit hours.
- Builders, code officials, and contractors also won't want to miss this unique event! More information at <http://bit.ly/ConstructionSummit2020>.
- Looking to advertise your company? Contact Rachel, rfawcett@psu.edu, for partnership opportunities.



DEC. 10, 2020 | ONLINE

PHRC HOUSING CONFERENCE

SAVE THE DATE | The 29th Annual PHRC Housing Conference highlights best practices, regulation, and innovation in the housing industry.

- PHRC and PBA Members, code officials, nonprofits, and students receive a registration discount.
- Continuing education available for sessions, which may include AIA, ICC, L&I, NARI, and PDH.
- More information available at <http://bit.ly/PHRC-conference2020>.

MARCH 3-4, 2021 | ONLINE

Speakers present on a wide-range of topics about regulation and best practices in the industry. Sessions will focus on high-performance housing, construction, codes, land development, and more. If you are interested in speaking at the PHRC Housing Conference, contact Chris, chine@psu.edu. Potential topics include:

High-performance homes
Panelized construction
Manufactured & modular homes

Zoning & land use
PA Uniform Construction Code
Innovative technologies & materials



Inspecting Manufactured and Industrialized Housing by Michael Moglia of PA Department of Community and Economic Development on March 4, 2019



Concrete: An Out of this World Construction Material by Aleksandra Radlinska of Penn State on March 4, 2019

SPONSORSHIP OPPORTUNITIES

PHRC gives back with the Habitat for Humanity of Greater Centre County

On Oct. 11 and Dec. 12, 2019, the PHRC staff had the privilege of serving on the recent home build site for the Habitat for Humanity of Greater Centre County (HFHGCC) in Bellefonte, Pennsylvania. Between the two days of service, the PHRC staff framed walls and openings, hung insulation, and prepped the basement for the electricians. As a nonprofit, nondenominational housing ministry, the HFHGCC builds simple, decent, affordable houses with those who lack adequate shelter and provides no-interest loans.



The PHRC staff team and Penn State students on Dec. 12, 2019



The PHRC staff team and Penn State students on Dec. 12, 2019



The PHRC staff team and a Penn State student on Oct. 11, 2019



HFHGCC house under construction

Energy+ initiative begins as PHRC partners with local nonprofits & organizations



Members of the Energy+ initiative on Oct. 22, 2019

The Energy+ initiative is a program to design, implement, and evaluate residential, energy efficiency-focused capital improvements for affordable housing in the State College area. This program will systematically address residential energy efficiency toward permanent affordability of existing housing stock in order to lessen resident energy burdens, reduce the environmental impact of existing housing stock, and enhance the public investment in housing affordability. Housing partners include the State College Community Land Trust, The HOME Foundation, and the Borough of State College. Education partners include the PHRC and the Hamer Center for Community Design.

Together with the Hamer Center for Community Design, the PHRC will provide reflection and evaluation of the retrofit work process on the homes, review nationwide precedent programs, provide program recommendations for new acquisitions and existing homes, and communicate the work to broader audiences. Funding for the retrofit work is provided by the Pennsylvania Housing Affordability and Rehabilitation Enhancement (PHARE) fund. Funding for the program evaluation is provided by the West Penn Power Sustainable Energy Fund.

NAHB Professional Women in Building Council chartered with the Builders Association of Central Pennsylvania

Prioritizing gender equity in the industry, PHRC staff members including Tracy Dorman, Sarah Klinetob Lowe, and Rachel Fawcett are serving as charter members for the newly formed NAHB Professional Women in Building Council (PWB) with the Builders Association of Central Pennsylvania. PWB Councils are the voice of women in the building industry—dedicated to professional development, networking, and leadership opportunities. Dorman and Fawcett were presented with the official charter for the local PWB Council at the International Builders Show (IBS) in Las Vegas, Nevada, on Jan. 20, 2020. Below are some additional photos taken during IBS from Jan. 20-23, 2020.



Rachel Fawcett and Tracy Dorman with the official charter on Jan. 20, 2020



Penn State students with supporters from the Pennsylvania Builders Association on Jan. 20, 2020



Touring a Toll Brothers' development in Las Vegas, Nevada on Jan. 23, 2020



Meeting Matt Risinger of The Build Show on Jan. 22, 2020

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, and more.

PLATINUM	\$5,000
GOLD	\$2,000
SILVER	\$1,000
BRONZE	\$500
ASSOCIATION	\$200
INDIVIDUAL	\$125

AS A PHRC MEMBER, YOUR BENEFITS INCLUDE ...*

- **Additional speaking engagement**
- **Annual conference discounts**
- **Workshop discounts**
- **Advertising in annual magazine, conference program, and on PHRC website**

**Benefits vary between membership levels*

CONTACT TRACY, TSD5@PSU.EDU, TO BECOME A 2021 PHRC MEMBER.

2020 MEMBERS

GOLD



Hankin Group

SILVER

Ai Restoration
 PA Concrete Masonry Association
 PA Housing Finance Agency
 PA Manufactured Housing Association
 S&A Homes

BRONZE

DOW Chemical Company
 Liberty Homes Custom Builders
 Muncy Homes, Inc.
 Sukonik Building Companies
 The Torron Group
 Upstreet Architects, Inc.

ASSOCIATION

BIA of Philadelphia
 Blair-Bedford Builders Association
 Builders Association of Central PA
 Carbon Builders Association
 HBA of Chester and Delaware Counties
 Indiana-Armstrong Builders Association
 Lebanon County Builders Association
 Manheim Township
 Moon Township
 PA Municipal Code Alliance
 Pocono Builders Association
 State College Borough
 Township of Adams
 Wayne Pike BIA
 West Branch Susquehanna Builders Association
 York Builders Association

INDIVIDUAL

Thomas Crean
 Szabi Fekete
 Mark Grassi
 Alan Hawman
 Dean Hilliard
 Richard Hotchkiss
 John Hudak
 Jon Kautz
 Gary Lenker
 Thomas McCosby
 Timothy Palaski
 Justin Parry
 Roy Pedersen
 Todd Smeigh
 Joseph Young

WORKSHOPS | 2020-2021

The PHRC annually offers various training workshops typically through the PA Construction Codes Academy (PCCA). Continuing education credits are awarded based upon the topic. For 2020-2021, all workshop offerings will be online.

The three workshops described below (Building Envelope Fundamentals, Building Envelope Assemblies & Code Compliance, and Residential Deck Design & Construction) are available to be scheduled by any organization. The PHRC staff will setup, host, and instruct the online event for your organization.

CONTACT TRACY, TSD5@PSU.EDU, TO SCHEDULE A WORKSHOP.

REGISTER FOR WORKSHOPS

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

OCT. 13, 2020

IRC 151: BUILDING ENVELOPE FUNDAMENTALS

Online, 4 Credit Hours

Residential structures are being built in vastly different ways today than in past decades, incorporating new materials, techniques, and assemblies. These changes have dramatically altered the way buildings interact with their surrounding environment. Understanding that interaction requires a working knowledge of building science. This workshop is designed to provide builders, designers, and code officials with an introduction to building science principles and practices as they relate to the building envelope and current International Residential Code (IRC) provisions.

NOV. 12, 2020

IRC 151: BUILDING ENVELOPE FUNDAMENTALS

Online, 4 Credit Hours

DEC. 3, 2020

IRC 151: BUILDING ENVELOPE FUNDAMENTALS

Online, 4 Credit Hours

JAN. 26, 2021

IRC 154: BUILDING ENVELOPE ASSEMBLIES & CODE COMPLIANCE

Online, 4 Credit Hours

Residential structures are being built in vastly different ways today than in past decades, incorporating new materials, techniques, and assemblies. These changes have dramatically altered the way buildings interact with their surrounding environment. Understanding that interaction requires a working knowledge of building envelope design. This workshop is designed to provide builders, designers, and code officials with an overview of the application of building science principles to the design of building envelope assemblies.

FEB. 18, 2021

IRC 105: RESIDENTIAL DECK DESIGN & CONSTRUCTION

Online, 4 Credit Hours

We will review the current code requirements for residential deck design and construction. This will begin by reviewing

multiple deck failures to gain an understanding as to why the codes are written how they are. We will then review the 2015 IRC prescriptive design requirements for joists, beams, and post sizing. We will also review the design requirements for stairs and stair illumination. The newly adopted code requirements lay the groundwork for the design of a residential deck. Upon completion, attendees will know where to find and apply the prescriptive design guidelines set forth in the IRC code books.

FEB. 24, 2021

IRC 154: BUILDING ENVELOPE ASSEMBLIES & CODE COMPLIANCE

Online, 4 Credit Hours

MARCH 3-4, 2021

PCCA SYMPOSIUM: CENTRAL

Online, PHRC Housing Conference

MARCH 11, 2021

IRC 105: RESIDENTIAL DECK DESIGN & CONSTRUCTION

Online, 4 Credit Hours

APRIL 14, 2021

IRC 154: BUILDING ENVELOPE ASSEMBLIES & CODE COMPLIANCE

Online, 4 Credit Hours

MAY 20, 2021

IRC 105: RESIDENTIAL DECK DESIGN & CONSTRUCTION

Online, 4 Credit Hours

WEBINAR SCHEDULE | 2020-2021

Tune in every second Tuesday of the month from 1:00-2:00 p.m. and occasionally on the last Thursday of the month from 11:00 a.m.-noon for free webinars! Live webinars are approved for AIA, ICC, L&I, NARI, and PDH continuing education credit for a \$20 certificate. Past webinars are available to view on our website under "Industry."

JOIN WEBINARS

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



AUG. 11 | 1:00 P.M.

WHY HOUSING IS LONG OVERDUE FOR DISRUPTION

Virtually every major industry has experienced, or is in the process of experiencing, massive disruption. Think retail, personal transportation, automobiles, computing, music, photography, media, and the list goes on. The current pandemic is only an accelerator for further disruption. Housing in the U.S. has been able to sit on the sidelines with its first-cost dominated business model and uniquely fragmented industry ... but not for much longer. That's because there is a historic convergence of five housing crises driving four disruptions that will finally transform an industry resistant to change. And ultra-high-performance home advocates will have to successfully navigate this larger disruption context. Will you be ready?

SEPT. 8 | 1:00 P.M.

SLAB INSULATION: FINDING THE RIGHT DETAILS

Concrete slabs, specifically at slab edges, can be one of the more challenging assemblies to design and construct in the building enclosure. Current energy codes have attempted to address these challenges; however, construction methods have not evolved to the point of full code compliance. This webinar will analyze the implications of slab insulation on building energy consumption and occupant health, identify critical building code requirements that address slabs, and



discuss challenges that arise with the design and trade-offs that occur in slab insulation and construction.

SEPT. 24 | 11:00 A.M.

A RANGE OF RAINSCREENS: AN IN-DEPTH LOOK AT THE VARIETY OF RAINSCREEN APPLICATIONS

Selecting the appropriate moisture management system for the building envelope can be a daunting task. Determining the appropriate rainscreen application can be based on several contributing factors—climate, building codes, cladding, and a variety of others. This course will explore the importance of rainscreens as a moisture management solution, as well as the characteristics of the assortment of applications.

OCT. 13 | 1:00 P.M.

IT'S MORE THAN "JUST A DECK"

In this residential deck webinar, we will look at past deck failures and briefly review the potential root cause of that failure. We will then look through the provisions in chapter 5 of the 2015 IRC, along with some additional guidelines to see how current codes and guidelines have evolved in response to previous failures.



NOV. 10 | 1:00 P.M.

RESTORING FLOODPLAINS TO MANAGE STORMWATER

This webinar will cover a brief history of the National Flood Insurance Program

and legislative changes in the past decade, and how these changes affect development and property values. It will showcase several floodplain restoration projects that have been implemented to serve as the primary stormwater management control facility for large land development projects. The resulting projects are far exceeding their intended performance, volume reduction, and water quality functions, as required by permit authorizations. These privately funded projects also have watershed-scale and community benefits including flood attenuation, sediment and nutrient load reduction, and recreational opportunities, while providing an economic benefit to a land development project.

JAN. 12 | 1:00 P.M.

FIRE PROTECTION OF LIGHTWEIGHT FRAMING FLOOR ASSEMBLIES

This program identifies the features and benefits of wood I-joists which explains the prevalence in the market. The program also explains UL fire testing that identified the fire performance failures or light frame floor assemblies which led to changes in the floor protection requirements of the IRC. Those IRC protection requirements are explained. Alternate methods of protecting I-joist assemblies per ICC-ES Acceptance Criteria AC14 are explained along with the details of acceptable installation of specific assemblies. A statewide survey of fire marshals is reported to give attendees a sense of peer consensus on acceptable methods of protecting wood I-joist floors.

JAN. 28 | 11:00 A.M.

CONTROL LAYERS: VAPOR BARRIERS & RETARDERS

There are a few control layers within an assembly, and in this webinar, we will look at two of them. Vapor retarders and vapor barriers are distinctly different but are often interchanged. In this webinar, we will review the property differences along with applications of use for each.

WEBINAR SCHEDULE | 2020-2021

FEB. 25 | 11:00 A.M.

STRUCTURAL INSULATED PANELS (SIP) FOR RESIDENTIAL CONSTRUCTION

Recent changes to energy codes in regard to exterior wall and roof insulation requirements as well as air sealing are forcing builders to look hard at alternate framing and insulating techniques. This course will explain the benefits of building with SIPs for residential applications. The attendee will gain a better understanding of SIP products, construction, assembly, and detailing in order to properly utilize SIPs for optimum energy efficiency, labor savings, and durability. The attendee will walk away from the course with a better understanding of how SIPs can be a suitable construction method for current building industry standards.

MARCH 3-4

PHRC HOUSING CONFERENCE

No webinar in March due to conference.

APRIL 13 | 1:00 P.M.

HEALTHY HOMES: INSIGHTS FOR EXISTING HOUSING

The Building Performance Institute (BPI) has laid out eight Healthy Homes Principles that affect the health and well-being of a home's occupants. This webinar will walk through these eight principles which include "Keep it ...": Dry, Clean, Safe, Well-Ventilated, Pest-Free, Contaminant-Free, Well Maintained, and Thermally Controlled.

APRIL 29 | 11:00 A.M.

CHECKING YOUR WORK: PROPERLY INSTALLED HVAC IN NEW HOMES

Many ACs and heat pumps are installed with faults that impact both their

performance and efficiency. Come to this webinar to learn about a new RESNET/ACCA/ANSI standard with three simple field tests that can help a builder ensure they are getting what they have paid for. Not only can this make for happier homeowners, fewer service calls, and lower utility bills, it can also unlock new points for homes with a HERS/ERI rating.

MAY 11 | 1:00 P.M.

AIR SEALING TIPS, TRICKS, AND DETAILS

Air sealing continues to be a great area to increase energy efficiency and in some cases, a trouble spot to meet code compliance. In this webinar, we will look at a few specific areas that are sometimes hard to seal and review a couple techniques for each to achieve compliance.

SPEAKING ENGAGEMENTS

The PHRC offers a speaker service that provides short technical presentations to organizations or associations related to the residential construction industry. Over the past 10 years, the PHRC has made hundreds of these presentations to over 20,000 individuals. Most of our presentations offered under this service are best suited for local, regional, or state associations and companies working in Pennsylvania or cold weather climates. These 30-60 minute programs are ideal for dinner meetings or other gatherings of your members or employees.

These speaking engagements are also available for virtual delivery. Our team can create a virtual meeting space where your team, audience, or members can log in to participate in an online session delivered by the PHRC staff.

One free speaking engagement will be provided to all Pennsylvania associations/companies each year, independent of PHRC membership, which does not include overnight travel. Additional speaking engagements may be subject to a negotiated fee in order to cover travel and development costs.

CONTACT TRACY, TSD5@PSU.EDU, TO SCHEDULE A SPEAKING ENGAGEMENT.

AVAILABLE SPEAKING ENGAGEMENTS

phrc.psu.edu/Industry-Education/PHRC-Training-Programs/Speaking-Engagements/index.aspx

- Air Sealing for 5ACH50
- Blower Doors for Builders
- Code Compliant Whole House Mechanical Ventilation
- Crawlspace Design & Construction
- Energy Codes in PA
- GreenBuild: Zero Energy Ready Home Case Study
- High-Performance Walls
- Intro to the Passive House Standard
- Manufactured Stone Veneer
- Reducing Thermal Bridging with Continuous Exterior Insulation
- Residential Deck Design and Construction
- Residential Energy Auditing
- Residential Moisture Management—the 4D's
- Solar PV in PA
- Visitability

2020 HANKIN DISTINGUISHED LECTURE



Brett C. Singer

ADVANCES, CHALLENGES, AND OPPORTUNITIES FOR INDOOR AIR QUALITY IN U.S. HOMES | BRETT C. SINGER

The COVID-19 pandemic has accelerated a decades-long process of Americans becoming more aware of indoor air quality (IAQ) as a health driver in their homes. And while appreciation for the roles of design, construction quality, mechanical equipment performance, and durability varies, there appears to be wide appreciation that occupant actions—such as smoking and use of products containing toxic chemicals—can degrade IAQ. There is more awareness that outdoor air pollution impacts IAQ, especially during wildfires; but recognition of mundane sources like natural gas burners, cooking, candles, and hobbies is still developing. Over the same period, researchers have documented the importance of housing

disparities to community health and IAQ has improved in many homes due to lower indoor emissions, decreases in outdoor photochemical air pollution, advances in building and equipment technologies, and codes and standards. Despite this progress, we continue to build homes with substantial deficiencies for controlling IAQ. And many existing homes have severe and persistent IAQ hazards.

Brett C. Singer is a staff scientist, head of Sustainable Energy and Environmental Systems, and lead of the Indoor Environment Group at the Lawrence Berkeley National Laboratory. Singer has conducted and directed research to improve understanding of air pollutant emissions, controls, and the real-world physical-chemical processes that impact exposures in both outdoor and indoor environments. His postdoctoral work on sorption and desorption processes impacting exposures to organic gases from tobacco brought increased attention to the importance of surface materials on indoor air quality and helped start the field of thirdhand tobacco smoke research. He has also made impactful contributions to understanding pollutant exposures from cleaning products and combustion appliances. Over the past decade, Singer has focused on how to synergistically improve indoor air quality and energy performance for high-performance homes with special attention to kitchen ventilation, filtration, and the performance of low-cost air quality monitors for smart home applications. He earned a bachelor of arts in engineering from Temple University and master's and doctoral degrees in civil and environmental engineering from the University of California, Berkeley.

The Hankin Distinguished Lecture Series invites world-class speakers to address Penn State students, faculty, staff, and industry professionals. The lecture is free and open to the public. 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.

TUESDAY, NOV. 17, 2020 @ 4:00 p.m. | [HTTP://BIT.LY/2020HANKIN](http://bit.ly/2020hankin)

2020 PHRC CONFERENCE WEEK RECAP



PHRC Housing Conference keynote speaker, Clayton DeKorne, on March 4, 2020



2020 RBDCC Wednesday keynote speaker, David O. Prevatt, on March 4, 2020



A Night on the Town networking event for the 2020 RBDCC on March 6, 2020



8 Chris Warren poses a question to Clayton DeKorne on March 4, 2020



PHRC Housing Conference and 2020 RBDCC Thursday keynote speaker, Lois B. Arena, on March 5, 2020



Happy Hour on the Exhibit Floor for PHRC Conference Week on March 5, 2020

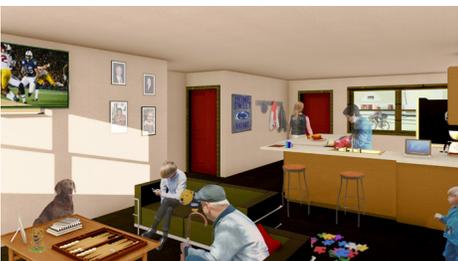
HANKIN CHAIR UPDATE



3D-printed concrete sample tests on March 4, 2020

It is a great pleasure to have another opportunity to share the accomplishments of our residential construction (RC) program during the past academic year. While the COVID-19 pandemic affected many programs and activities from mid-March, when the lockdown at Penn State started, most of our planned activities were completed or were winding down. We have a lot to be thankful for, in particular, keeping our team healthy and highly productive working from home, continuing to this day. In this update, I will review some of the major RC program-related activities achievements.

The RC program had many accomplishments in different areas of activities, including course offerings, student competitions, graduate and undergraduate research, R&D projects, training, conferences, publications, and the career fair. The course offerings constitute a major part of our program, with courses such as AE 470: Residential Building Design and Construction, AE 471: Construction Management of Residential Building Projects, AE-CE 542: Building Enclosure Science and Design, ARCH 412: Integrative Energy and Environmental Design, CE 410: Sustainable Residential Subdivision Design, and CE 411: Residential Construction Design Project, which all together had over 190 students. The RC minor, now in its fifth year of offering, continues to be a very attractive minor for students majoring in architecture, architectural engineering, and civil engineering. Currently, over 41 students have already been awarded the RC minor and there are 18 students



Interior rendering by Penn State's 2020 DOE Solar Decathlon Design Challenge team

formally enrolled with the minor. With the 3rd PHRC Residential Construction Career Fair held in November 2019, we have provided the opportunity for several national, state, and local-level home builders to meet in-person many of our students interested in RC careers. Aside from offering formal coursework, our RC program provides opportunities for our students to participate in two national student competitions, the NAHB Student Competition and the DOE Solar Decathlon Design Challenge.

Besides the major focus on undergraduate education, our RC program has also established itself nationally and internationally as one of the unique programs that offers opportunities to graduate students for research related to technical and innovative aspects of residential building materials and systems. Currently, graduate and undergraduate students are involved in different research projects, including the effect of hurricane wind and surge flood on coastal homes, retrofit of homes for Passive House standard, use of cross-laminated timber for residential construction, 3D printing of concrete buildings, 3D printing of clay-based concrete for affordable home construction, among others. We continue to collaborate with faculty in several departments on various proposal opportunities, which in turn offer advanced topics for research by our graduate students.

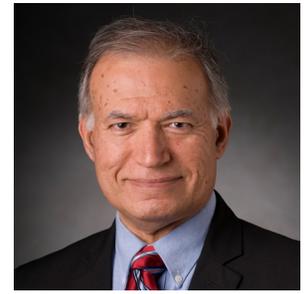


Tim McDonald speaking at the 2019 Hankin Distinguished Lecture on Nov. 13, 2019

For our Hankin Distinguished Lecture series, which was initiated in honor of the late Bernard Hankin and his family for their generous support of our RC program, we were fortunate to have one of the leading visionary practitioners in sustainable building design as the fourteenth speaker for this program. Tim McDonald, president and co-founder of Onion Flats LLC, Philadelphia, presented his lecture on Nov. 13, 2019 with the title of "Leverage Points: Climate Change and the Imperative of Affordable Housing." The lecture can be viewed on the PHRC

website with closed captioning.

We were proud to organize and deliver two concurrent conferences in March 2020 at The Penn State Hotel and Conference Center. The PHRC Conference Week was comprised of the 28th Annual PHRC Housing Conference and the 5th Biennial Residential Building Design and Construction (RBDC) Conference.



Ali Memari, Hankin Chair



Lab tour during the 2020 RBDC of 3D-printing concrete research on March 4, 2020

The 2020 RBDC was a three-day event highlighting the latest research and advancements in the housing industry, including multiple networking events. David O. Prevatt shared his presentation titled, "Wind Hazard Resilient Residential Communities—When Engineering Isn't Enough." Lois B. Arena presented on "Passive House: A Proven Path Toward Resilient, Affordable & Energy Efficient Housing." Friday was anchored by a closing plenary on "Buildings as a Drawdown Solution: Getting to Zero and Beyond" by Jay Arehart, Project Drawdown researcher, and Tom Richard of Penn State.

The PHRC Housing Conference was a two-day event with multiple tracks providing information and updates to the residential construction industry with continuing education available. The event brought together all sectors of the industry, including builders, design professionals, remodelers, code officials, educators, factory-built housing manufacturers, product manufacturers, and students.

We look forward to a unique year for our program and will continue in all of our pursuits with excellence in mind.

2020 NAHB STUDENT COMPETITION



Penn State NAHB Student Competition team and advisers on Jan. 20, 2020

The National Association of Home Builders (NAHB) student chapter at Penn State competed in the Four-Year College category of the NAHB Student Competition held at the 2020 NAHB International Builders' Show (IBS) in Las Vegas. Sixty-one teams across the U.S. participated in the annual competition. The competition challenges student teams to solve a real-life construction management problem and develop a proposal for a residential subdivision. The provided competition site was a 130-acre site in St. George, Utah. The Penn State team developed a proposal for a 386 single-family home subdivision that included four different architectural

styles built to meet the silver rating from the National Green Building Standard and a HERS Index score of 64 for the proposed best selling model. The proposal also included thoroughly vetted market, financial, and risk analyses and a land development plan.

The 2019-2020 presentation team included Jonathan Gottlieb, civil engineering, and Matthew Yerck, architectural engineering, as co-project managers; Justin Charles, architectural engineering; Ellie Leyo, civil engineering; Mallory Morrow, finance; and Benjamin Windows, architectural engineering. Additional team members included Maura Meta, architecture; Meaghan Nelson, architectural engineering; Sarah Schirf, civil engineering; and Michael Tate, architectural engineering.

The student team was coached by PHRC staff Brian Wolfgang, associate director, and Chris Hine, housing and land development specialist.

"This competition challenges our students to apply the knowledge and skills learned in the classroom to a real-life development scenario. The experience gained by participating in this competition continues to propel our graduates toward successful careers in the industry," said Wolfgang.

Team travel support was generously provided by the Toll Brothers IBS Travel Grant, the National Housing Endowment IBS Travel Award, and the University Park Allocation Committee.



One of six Penn State NAHB Student Competition house designs

2020 DOE SOLAR DECATHLON

The Penn State student team won honorable mention in the Suburban Single-Family Housing Contest of the U.S. Department of Energy Solar Decathlon Design Challenge Competition on April 19. The annual competition challenges teams to design highly energy-efficient buildings powered by renewable energy. It also offers students a unique experience to develop critical career skills, learn from both national experts and peers, and gain valuable insights from world-class thought leaders.

The competition began with students from 82 teams representing 55 collegiate institutions across 11 countries. Penn State partnered with a local affordable housing provider, the Centre County Housing and Land Trust (CCHLT), to design an affordable, solar-powered, net zero energy home that could be scalable for neighborhoods in Central Pennsylvania.



Rendering of the 2020 Solar Decathlon Design Challenge design

The team qualified as one of 48 teams selected to compete in the online final competition held April 17-19. The team's design consisted of three scales: the home, a pod of four homes, and a neighborhood. The final home design was a 1,500-square foot, one-story home with three bedrooms and two full baths. The homes were centered on a social core to bring families together in each pod. As a result, the team provided CCHLT with a community-oriented, affordable design that met the Zero Energy Ready Home standard and could be reproduced throughout the region.

The student team was led by veteran competition members Jonathan Wong, Puja Bhagat, Celina Deng, Paul Pannasow, and Holly Zimmerman, architecture; Khaled Khalil, architectural engineering; and Alex Vinitski, civil engineering.

Additional team members included the following students in architecture: Emmanuella Bakare, Kristina Barr, Farhadi Fahimeh, Adam Figueroa, Xi Jin, Mark Pantalone, Teresa Pecher, Kevin Plamenko, Kristin Roy, Luke Scanlon, Elizabeth Stefanelli, Seth Truckenmiller, and Boyuan Wu. Also, team members included Tyler Breda and Samuel



Penn State team for the 2020 DOE Solar Decathlon Design Challenge

Howard from civil engineering and Jarrett Ballister and Shane Facciponti from architectural engineering.

The competition features a one-credit course in the spring semester, CE 411: Residential Construction Design Project, which is taught by Sarah Klinetob Lowe. Ali Memari served as the head competition adviser. Additional faculty advisers included Lisa Domenica Lulo, associate professor of architecture and director of the Hamer Center for Community Design in the Stuckeman School; Andy Lau, associate professor of engineering design; and Brian Wolfgang and Chris Hine of the PHRC. If you are interested in participating in 2021 as a student, faculty mentor, or industry adviser, contact Klinetob Lowe at sek175@psu.edu.

STAFF HIGHLIGHTS

Brian Wolfgang, associate director

Wolfgang received the 2020 President's Award from the Builders Association of Central PA for service to the organization. Currently, he serves as the chair of the Education Committee and as secretary of the Board of Directors. Wolfgang completed the Pennsylvania Building Code Official (BCO) training and passed the exam to be a BCO. He connects weekly with Penn State students as a coach for the NAHB Student Competition Team and an instructor for AE 470 and CE 411. In his eighth year instructing AE 470, he has a record 100 students enrolled!



Tracy Dorman, training & events coordinator

Dorman has stepped out of her comfort zone and is currently serving as the first chairperson for the Professional Women in Building (PWB) Council of Central PA with the Builders Association of Central PA. She represented the Council at the 2020 International Builders Show in Las Vegas to receive the official charter. This November, Dorman will have been with the PHRC for 20 years! She has been with Penn State for 30 years and was eligible in 2016 for her 25-year Chair Award; she will be receiving it at the next College of Engineering awards ceremony. If you didn't know, she loves traveling, boating, and spending time with family and friends—her photo is from her 500-mile sailing trip last summer! She has been treasuring time with her two sweet granddaughters, Daisy and Rosie, ages 3 and 4, respectively; also, known as her flower babies.

Chris Hine, housing & land development specialist

This past year, Hine completed the training for his CAPS: National Association of Home Builders Certified Aging in Place designation. Also, he is now a Pennsylvania BCO: Building Code Official upon successful completion the exam. To keep learning, he attended the Alliance Housing Innovation Staycation Conference on April 22 and the New Gravity Conference on Aug. 5-7. Hine connects weekly with Penn State students as a coach for the NAHB Student Competition Team and an instructor for CE 411.

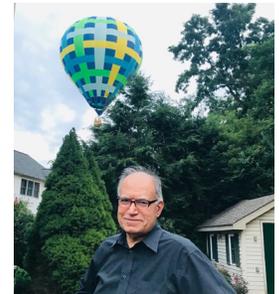


Sarah Klinetob Lowe, housing systems specialist

Since completing training as a Certified Passive House Consultant (CPHC) with the Passive House Institute of the US (PHIUS) in January 2019, Klinetob Lowe has attended several conferences, including the New Gravity Conference, the 14th Annual North American Passive House Conference, and the American Council for an Energy Efficiency Economy (ACEEE) Conference on Health, Environment, and Energy (CHEE). Also, she is ready to sit for the BPI Healthy Housing Principles exam. This summer, she has been busy developing an online micro-credential for Penn State students to learn about core passive house topics. Klinetob Lowe serves as the vice chairperson for the PWB Council of Central PA.

Ali Memari, director

As always, Memari keeps a busy schedule. He is already preparing for the 2022 RBDCC. With numerous research proposals in development and under review, his research has been focusing on cross-laminated timber in house designs, building envelopes, and with on-site robots; hempcrete partnering with a startup company and nonprofit organization; 3D printing designs from various materials; reuse of recycled plastics; passive house; and multi-hazard home design. He is entering his second year as the editor for the Journal of Architectural Engineering.



Rachel Fawcett, budgets & publications coordinator

Fawcett's personal and professional passions intersect with the belief that strong communities matter and that everyone has the right to a decent, affordable home. In May 2020, she completed her master's in community and economic development at Penn State with her paper entitled *Evaluating Inclusionary Zoning in Centre County, Pennsylvania as a tool to increase the supply of affordable housing stock and to mitigate housing segregation*—she presented it at the 2020 RBDCC. Fawcett is also the inaugural Housing Policy fellow of the Pennsylvania Housing Finance Agency (PHFA) for 2020 with her research focusing on community land trusts. Additionally, representing the State College area, Fawcett is a part of the 2020 Reinventing Our Communities' cohorts focusing on housing and racial equity for the Federal Reserve Bank of Philadelphia.

CAREER CONNECTIONS

Preparing the next generation of the residential construction industry

The PHRC seeks to educate all ages of students about the opportunities within the residential construction industry. Annually, PHRC staff advise various Penn State groups, including the National Association of Home Builders (NAHB) Student Chapter, NAHB Student Competition team, and Solar Decathlon Design Challenge team.

On Oct. 17, 2019, PHRC staff participated in the second PA Build My Future at Penn College to introduce high school students to the residential construction industry.

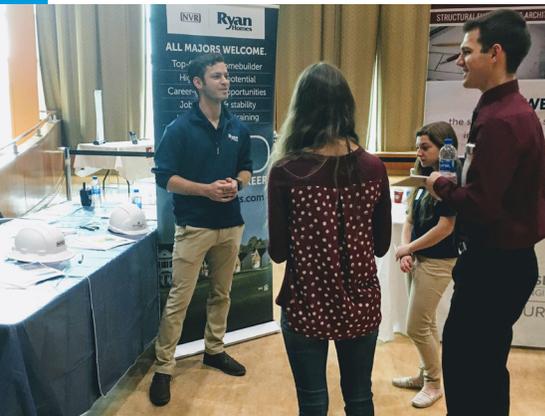
To facilitate graduates into the industry, the PHRC created the PHRC Residential Construction Career Fair. On Nov. 13, 2019, the third-annual event attracted over 75 students from a variety of majors across the University. Companies ranged from nationwide homebuilders to code officials to material manufacturers, which offered students a broad exposure to the diverse opportunities in residential construction.

Additionally, the NAHB Student Chapter at Penn State offers scholarships each year to exceptional students that are passionate about the residential construction industry. Consider providing financial support and/or introducing your company to students.

CONTACT TRACY, TSD5@PSU.EDU, TO CONNECT WITH THE NEXT GENERATION.



PHRC staff attending PA Build My Future at Penn College on Oct. 17, 2019



Giuseppe Ciotti of NVR, Inc. speaking to Penn State students on Nov. 13, 2019



Chris Hine explaining the operation of an infrared thermometer at PA Build My Future on Oct. 17, 2019



Sara Finch, Emma Dickson, and Valarie Saglimbeni of Toll Brothers with a Penn State student on Nov. 13, 2019

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The PHRC collaboratively engages with the residential construction industry to catalyze advancements in homebuilding through education, training, innovation, research, and dissemination. The PHRC envisions a residential construction industry equipped with the knowledge, skills, and technology to build better homes.

Director | **Ali Memari**
Associate Director | **Brian Wolfgang**
Housing & Land Development Specialist | **Chris Hine**
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