

PENNSYLVANIA HOUSING RESEARCH CENTER MAGAZINE

PHRC.PSU.EDU



FALL 2022

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On behalf of the Pennsylvania Housing Research Center (PHRC) team, we hope that the past year has been successful both personally and professionally. There continues to be plenty of engaging activity, innovative programming, and new opportunities for our team as we forge ahead into the fall season on campus at Penn State. Our goal in publishing this magazine is to give you a glimpse of recent accomplishments, upcoming programming, and some insights into our team, our stakeholders, and some Penn State alumni.



Brian Wolfgang, associate director

One of the most substantial changes for our team was the departure of longtime PHRC team member—Sarah Klinetob Lowe. Sarah departed the PHRC team in March 2022 to pursue new opportunities elsewhere in Penn State's College of Engineering. We are fortunate to have welcomed Darrin Wright to the PHRC team as the High-Performance Housing Specialist in July 2022. You can read more about Darrin later in this magazine. These personnel changes are a reminder that our team relies on the hard work and dedication of good people. We were lucky to have Sarah's service for many years and look forward to having Darrin on the team for many years to come.

The PHRC's prime season for activity picks up steam in the fall, and this year is no different. The articles in this magazine highlight some of our ongoing initiatives, including the PHRC webinar series, Penn State student activities, and the second iteration of the PHRC Construction Summit, scheduled in December 2022. I want to personally encourage you to get involved with our team in new ways this year. We understand that time is precious and many of you are stretched thin on your schedule. However, we know from experience that those who take time to engage with new PHRC activities, such as serving as a guest lecturer in a Penn State class or inviting our team out to speak to a local association, consistently find this commitment to be worthwhile. If you're not sure where to start, reach out to a member of our team and we would be happy to talk more about these activities.

Our team understands the challenges that the residential construction industry is facing in the current and coming years, but we also are aware of the opportunities. It is our mission to serve this industry in ways that help to offset some of that uncertainty while leaning into new areas of growth and development. We look forward to working with you in the coming year!



The PHRC staff from L-R: Rachel Fawcett, Brian Wolfgang, Darrin Wright, Ali Memari, Christopher Hine, Tracy Dorman

PHRC CONSTRUCTION SUMMIT | 2022

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

The 2022 PHRC Construction Summit is an online event intended to provide secondary schools, typically career and technical education (CTE) programs, and post-secondary schools with access to expert speakers on residential construction-focused topics in support of traditional classroom content.

DECEMBER 8, 2022 | ONLINE



LEARN MORE ABOUT THE SUMMIT

phrc.psu.edu/Conferences/PHRC-Construction-Summit/index.aspx

The summit will grant students and instructors an opportunity to hear new ideas, gain exposure to advanced topics, and interact with the PHRC team. Attendance for students and instructors is free. Continuing education for instructors will be offered.

The event will be presented in an easily accessible format with four unique sessions designed to give an in-depth look at various areas within the residential construction industry. In a webinar format, each session will last for thirty minutes with Q&A time in between sessions. The four sessions will be offered in the morning and the afternoon. For any scheduling conflicts, the sessions will also be recorded for on-demand viewing.

Stay tuned for the available topics!

INTERESTED? CONTACT DARRIN WRIGHT, DTW153@PSU.EDU.



CTE WORKING GROUP

The CTE working group is currently under development as a representative subcommittee to the PHRC Industrial Advisory Council in order to get more direct input from schools and CTE programs on how the PHRC can support them with technical educational training within the residential construction industry.

The CTE working group is open to anyone from any field within the education community that has a connection to the residential construction industry.

TO LEARN MORE AND JOIN, CONTACT DARRIN WRIGHT, DTW153@PSU.EDU.

PHRC HOUSING CONFERENCE | 2023

SAVE THE DATE | The 2023 PHRC Housing Conference highlights best practices, regulation, and innovation in the housing industry. This conference brings together all sectors of the housing industry including builders, design professionals, remodelers, code officials, educators, factory-built housing manufacturers, and product manufacturers.

- Registration opens in late 2022!
- PHRC and Pennsylvania Builders Association (PBA) members, code officials, nonprofits, and students receive a registration discount.
- Continuing education is available for sessions, which may include AIA, ICC, PA L&I, NARI, and PA PDHs for engineers.
- A hotel discount is offered with code, PAHL23A, by January 29, 2023.
- More information is available at <https://bit.ly/HOUSINGCONFERENCE>.

MARCH 1-2, 2023 | THE PENN STATER HOTEL AND CONFERENCE CENTER



Brian Wolfgang, associate director of the PHRC, offers opening remarks on March 2, 2022.



"Carbon Smart and Healthy Homes: Design, Construction, & Building Code" by Ana Konopitskaya of COEXIST on March 2, 2022

SESSION TOPICS

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 future PHRC Housing Conferences, contact Chris Hine, chine@psu.edu. Session topics include:

High-performance homes
Codes and construction
Weatherization and building science

Land development and planning
Offsite construction
Innovative technologies and materials



"Industry Standards & Application Demonstrations for Flashing and Installation of Windows & Doors" by Jim Katsaros, DuPont & Bill Dudek, Bennett Supply on March 3, 2022



"What's the Real Focus: Energy Efficient Savings vs. Healthier Home? Can They Both Be the Focus & Converted into Marketing Strategies?" by Joe Medosch of measureQuick on March 3, 2022

SPONSORSHIP OPPORTUNITIES

TO SPONSOR, CONTACT RACHEL FAWCETT, RFAWCETT@PSU.EDU, FOR MORE INFORMATION.

BECOME A MEMBER

Join the PHRC as a member today! PHRC membership fees support the outreach activities of the PHRC, students involved in the National Association of Home Builders (NAHB) Student Chapter at Penn State, 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 DORMAN, TSD5@PSU.EDU, TO BECOME A 2023 PHRC MEMBER.

2022 MEMBERS

GOLD



Hankin Group

SILVER

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

BRONZE

Ai Restoration
Liberty Homes Custom Builders
Muncy Homes
Sukonik Building Companies
The Torron Group
UpStreet Architects

ASSOCIATION

BIA of Lancaster County
BIA of Philadelphia
Builders Association of Central PA
Builders Association of Metro Pittsburgh (BAMP)
Carbon Builders Association
Central Keystone COG
HBA of Bucks and Montgomery Counties
HBA of Chester and Delaware Counties
Home Builders Association of NEPA
Indiana-Armstrong Builders Association

ASSOCIATION, CONT.

NuWool Company
PA Municipal Code Alliance
Pocono Builders Association
Tredyffrin Township
Wayne Pike BIA
York Builders Association
West Branch Susquehanna Builders Association

INDIVIDUAL

Thomas Crean
Lora Dombrowski
Jim Franey
Alan Hawman
Dean Hilliard
Richard Hotchkiss
John Hudak
Thomas McCosby
Michael Pilotti
Todd Smeigh
Brian Willis

ON-DEMAND COURSES

In a brand new offering, you are able to receive continuing education credits from the PHRC at any time or day of the week! In addition to live webinars for continuing education, the PHRC now offers on-demand courses to assist residential construction industry professionals in meeting ongoing continuing education requirements. Typical continuing education approvals include PA Dept. of Labor and Industry (L&I) contact hours, PA professional development hours (PDHs) for licensed professional engineers, American Institute of Architects (AIA) learning units, International Code Council (ICC) contact hours or continuing education units (CEUs), and National Association of the Remodeling Industry (NARI) CEUs. Upon completion of all course requirements, you will be able to download your continuing education certificate. The on-demand courses are available through Penn State Extension. New courses will be added periodically throughout the year. Course pricing varies upon the length of the course and applicable continuing education credits available. Check the specific course webpage for its cost.

REGISTER FOR ON-DEMAND COURSES

phrc.psu.edu/Industry-Education/PHRC-Training-Programs/On-Demand-Courses/index.aspx

Currently available on-demand courses (all one hour):

- Slab Insulation: Finding the Right Details
- It's More than "Just a Deck"
- Solar PV in PA: Intro to the Design of New Construction and Retrofit Residential Systems
- Reducing Thermal Bridging with Continuous Exterior Insulation
- High-Performance Walls in Pennsylvania
- Control Layers: Vapor Barriers, Vapor Retarders, & Air Barriers
- The Do's and Don'ts of Crawlspace Design and Construction Revisited
- Healthy Homes: Insights for Existing Construction
- Wall Bracing in the UCC
- Air Sealing Tips, Tricks, & Details
- PA UCC Residential Code Update: Part 1
- PA UCC Residential Code Update: Part 2
- All-Electric New Homes in PA
- Adapting to Tighter Enclosures through Scopes of Work
- 2021 PA Alternative Residential Energy Provisions Update
- Adapting Stucco & Stone Assemblies to Changing Codes
- Moisture Control Layers & Materials

Expected courses in 2022-23 (all one hour):

- Comprehensive Deck Design from Footings to Guards: Learning from the Past
- Attic Ventilation: Understanding the Why
- The Cost of Airtight Homes
- Comfort in a Bonus Room? It's in the Details

CURRENT RESEARCH + STANDARDS

STRUCTURAL DESIGN OF A CROSS-LAMINATED TIMBER (CLT) SINGLE-FAMILY HOME

Many in the architectural/engineering/construction (AEC) community have shown interest in using cross-laminated timber (CLT) as a structural building material. CLT is an aesthetically pleasing, warm mass-timber panelized product that offers users a cost-effective, renewable, durable, fire-resistant alternative to traditional building materials, such as masonry, concrete, and light-framing. CLT is currently utilized in multi-family residential structures, but it is not widely used for the construction of single-family residences. In this report, a CLT structural system alternative design is presented for a single-family residence previously designed using conventional light-framing methods. The CLT design methodologies, design references, applicable codes, structural analysis, and complete structural design calculations of the CLT panels are presented. The report also points out to potential challenges and shortcomings. Overall, it offers a unique reference to CLT home design for practicing professionals and researchers. View the report at <https://bit.ly/PHRCResearchPublications>.

PENNSYLVANIA ALTERNATIVE RESIDENTIAL ENERGY PROVISIONS + COMPLIANCE WORKSHEET

The development of the 2021 PA-Alt was led by the PHRC with guidance from a subcommittee of the PHRC Industry Advisory Council. Under the guidance of the PA Department of Labor and Industry, the PA-Alt was developed with the intent of being simpler to build and easier to enforce, more rational and flexible, focused on Pennsylvania in terms of climatic and other conditions, and equivalent to the provisions of the International Energy Conservation Code (IECC). It is important to note that a choice needs to be made by the builder or design professional between the 2021 PA-Alt, the 2018 IRC, and the 2018 IECC. The compliance worksheet is intended to aid in permit application submission when utilizing the 2021 PA-Alt. The PA-Alt and its worksheet are available to download from the PA Department of Labor and Industry and the PHRC at <https://bit.ly/PHRCStandards>.

2022-23 | WEBINAR SCHEDULE

Tune in every second Tuesday of the month, 1:00-2:00 p.m. (E.T.), and occasionally on the last Thursday of the month, 11:00 a.m.-noon (E.T.), for free webinars! Live webinars are approved for American Institute of Architects (AIA) learning units, International Code Council (ICC) contact hours or continuing education units (CEUs), PA Dept. of Labor and Industry (L&I) contact hours, National Association of the Remodeling Industry (NARI) CEUs, and PA professional development hours (PDHs) for licensed professional engineers, which includes certificate for \$20. Past webinars are available to view on our website under "Industry."

JOIN WEBINARS

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



SEPTEMBER 13 | 1:00 P.M. (E.T.)

A COMPREHENSIVE DECK DESIGN FROM FOOTINGS TO GUARDS: LEARNING FROM THE PAST

In this residential deck webinar, learn about past deck failures and briefly review the potential root causes of the failures. Next, we will review the comprehensive provisions in chapter five of the 2018 International Residential Code (IRC) along with some additional guidelines to see how current codes and guidelines have evolved in response to previous failures.



OCTOBER 11 | 1:00 P.M. (E.T.)

ATTIC VENTILATION: UNDERSTANDING THE WHY

Vented attics have long been a critical part of residential structures. With the complexity of roof designs and increased energy code requirements, attic ventilation design is worth revisiting. This webinar will examine baseline attic ventilation code requirements, highlight common trouble spots in new construction, and provide best practice recommendations for new homes.

OCTOBER 27 | 11:00 A.M. (E.T.)

WALLS THAT WORK

This webinar provides an overview of the effects of temperature, air, and water on exterior walls. It discusses how temperature differentials influence airflow through wall assemblies and how humidity and dew point affect individual material and overall system performance. The webinar concludes with an overview of acoustic and fire performance requirements for exterior walls.

NOVEMBER 15 | 1:00 P.M. (E.T.)

ON-LOT ALTERNATIVE TECHNOLOGIES SEWER SYSTEMS

The purpose of this webinar is to introduce on-lot alternative technologies sewer systems for residential applications. It will provide an overview of evaluation process of soil conditions and other factors to determine which type of sewer system would be appropriate. Also, learn how to evaluate an existing system and determine if it is functioning as designed.

DECEMBER 13 | 1:00 P.M. (E.T.)

BEST PRACTICES FOR UNDERSTANDING, DIAGNOSING, AND AVOIDING PROBLEMS IN POLYURETHANE FOAM INSTALLATIONS

This webinar introduces the most common causes of material and indoor air quality (IAQ) problems in spray foam and injection foam installations and presents newly developed methods for assuring a quality installation. In addition to an overview of the types of problems, the procedures for selecting the proper product(s) and a qualified installer for a foam installation are discussed. This discussion emphasizes the importance of addressing site protection and quality control during and after the installation. Case studies are used to demonstrate what to look for when assessing polyurethane foam installations.

JANUARY 10 | 1:00 P.M. (E.T.)

AIR SEALING SOLUTIONS FOR ATTACHED HOMES

As builders and design professionals continue to adapt their details and practices to achieve greater envelope airtightness, specific types of products have become more difficult to work with than others. Attached homes, including duplexes and townhomes, present unique challenges when trying to balance the needs for fire separation and meeting airtightness goals. This session will focus on the solutions that have proven to be successful in the field. A panel of industry experts will share details, products, and designs that help to achieve code compliance, building performance goals, and overall energy efficiency.

FEBRUARY 14 | 1:00 P.M. (E.T.)

BALANCED VENTILATION: UNDERSTANDING THE OPTIONS

As homes continue to become more efficient, specifically related to envelope airtightness, a greater emphasis has been placed on IAQ. Mechanical ventilation systems are key to ensuring proper IAQ in new homes. For new construction, builders often debate the merits of readily available systems and strategies. This session will focus on balanced ventilation systems, specifically heat recovery ventilators (HRVs) and energy recovery ventilators (ERVs). The focus of this session will include the common benefits to builders and occupants in terms of performance and IAQ as well as the challenges of system complexity and cost.

MARCH 1-2

PHRC HOUSING CONFERENCE

No webinar in March due to conference.

2022-23 | WEBINAR SCHEDULE, CONT.

APRIL 11 | 1:00 P.M. (E.T.)

THE COST OF AIRTIGHT HOMES

As Pennsylvania transitions to the 2018 I-Codes for building enclosure airtightness requirements, there may be a concern on what it will require to adapt to these new changes. One of the biggest concerns is what the cost will be to implement these new requirements. The cost of air sealing a home varies depending on the size and location of the home being sealed. Air sealing costs are also determined by the scope of the project, such as whether you intend to do the basement/foundation, attic space, or a whole house sealing. Additionally, the final cost of air sealing may be determined by current rebates and assistance programs from government and utility companies.

APRIL 27 | 11:00 A.M. (E.T.)

COMFORT IN A BONUS ROOM? IT'S IN THE DETAILS

Rooms located above a garage, often referred to as bonus rooms, have been difficult for air sealing and thermal control details. In this session, learn about these locations and review details on how we can reduce the risk for air infiltration and thermal control details.

MAY 9 | 1:00 P.M. (E.T.)

LAND USE PLANNING AND REGULATION IN PENNSYLVANIA: TRENDS, CHALLENGES, AND OPPORTUNITIES

Across Pennsylvania, land use tools are evolving in response to broad changes in population, shifting economies, new technologies, and a changing climate. The purpose of the webinar is to present the current state of land use planning practices across the state with specific examples of current practices from one county. Drawing on the findings of recent research that analyzed land use practices across Pennsylvania, presenters will discuss

tools commonly used by municipalities to manage growth and development. Over the past 20 years, Pennsylvania counties have become more involved in comprehensive planning, providing GIS services, hazard mitigation planning, solid waste management, emergency management planning, and stormwater management planning. Comprehensive Land Use Plans are evolving from a data-heavy document to one that is project driven and often referred to as the "Implementable Comprehensive Plan." This session will explore that new approach to land-use planning along with implementation tools such as form-based zoning, cluster development, and planned residential development. We will also address the question of which is the better option for my community: municipal, multi-municipal, or county administration of land-use ordinances.

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 ten 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 thirty-to-sixty 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 DORMAN, TSD5@PSU.EDU, TO SCHEDULE A SPEAKING ENGAGEMENT.

AVAILABLE SPEAKING ENGAGEMENTS

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

- PA UCC code updates
- Building enclosure control layers
- Air sealing
- Blower door testing
- Mechanical ventilation
- Moisture management
- Basement insulation
- Crawlspace
- Slab insulation
- Energy code compliance
- Exterior wall insulation
- Adhered masonry veneer
- Residential decks
- Wall bracing
- Visitability

PROFESSIONAL WOMEN IN BUILDING

Prioritizing gender equity in the industry, PHRC staff members including Tracy Dorman and Rachel Fawcett are members of the 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 serves as the chair for the local Central PA PWB Council and as secretary for the PA PWB Council.

Chartered in 2020, the Central PA PWB Council provides an opportunity for sharing strategies and solutions to promote, enhance and support professional women in central Pennsylvania's home building industry. Since its founding, the council has been active in building membership, assisting at community events, offering professional development and mentoring, awarding scholarships, and partnering with local schools.

Next Generation Investment

At the 2022 PHRC Housing Conference during the Celebrate Reception, Mollie Elkman, author of *The House That She Built*, attended to sign her children's book. The Central PA PWB Council partnered with the PA PWB Council and was able to raise over \$1,000 for scholarships from the sale of books.



Mollie Elkman signs books at the Celebrate Reception



L-R: Dylan Wadlington, Eli Kollat, Tracy Dorman, and Ben Mordan

Dorman presented an award to Eli Kollat on behalf of the Central PA PWB Council for her exemplary conduct in the State College Area High School Building Construction Trades program. After serving in the Navy, Eli plans to attend college to study software and hardware engineering. She plans to use her degree to create solar panels to maximize energy gathering and consumption within homes across the state. Her long-term goal is to open a business that is only women making and applying solar panels onto homes.

During GLOW (Girls Leadership Opportunity Week) Camp, women from the council provided swag bags for all the campers that included a hammer, tape measure, and additional items donated from the Central Pennsylvania Institute of Science and Technology. The camp provides girls experience learning different skills from woodworking to digital design at The Rivet in State College. Two members also shared about their careers with the girls. Haley Foster from Glenn O. Hawbaker, Inc. talked about her job as an excavator, and the girls were able to ask her about her favorite part of the job and how she got started in the industry. Ellie Leyo from PennTerra Engineering, Inc. and a Penn State RC program alumna spoke with them about her work as a designer. Leyo designs the land development plans for commercial and residential projects.



Ellie Leyo speaks with girls at GLOW Camp.

Networking & Professional Development



Attendees of Wine Down Wednesday at University Wine Company

Throughout the year, the council organizes events for networking such as Wine Down Wednesday to offer time for meeting others and exchanging ideas over snacks and drinks.

Council members also volunteer together in the community. In July, members served at a Habitat for Humanity of Greater Centre County home. The group was able to prime the entire house in their visit.



Council members volunteer with Habitat for Humanity of Greater Centre County

WELCOME DARRIN WRIGHT



Meet the newest member of the PHRC staff! Darrin Wright has been in the residential and commercial construction business for over thirty years. He has experience at almost every level in the industry, from carpenter to project manager, with most of his time working for custom home builders throughout the east coast. For eight years, Wright taught residential construction to secondary and post-secondary students. Starting in 2022, he began as the high-performance housing specialist at the PHRC. Wright serves as the liaison between the PHRC and career and technical education programs regarding residential construction and residential building codes. He also develops and delivers training programs and webinars for builders, remodelers, code officials, and design professionals specializing in residential building codes, residential construction practices, and building science.

HANKIN CHAIR UPDATE



PA Hemp House in New Castle, PA

It is with great pleasure that I can report on the progress we have made in support of the residential construction (RC) program over the past year. The activities include residential-related courses, student participation in national competitions, research projects on innovative materials and systems for residential construction, and the Residential Building Design & Construction Conference (RBDCC).

With a critical mass of residential-related courses, the RC program offers a twelve-credit housing certificate and a twenty-two-credit residential construction minor. We are excited that over fifty students have been awarded the residential construction minor and over thirty students are currently enrolled. Some courses offered under the RC program include AE 470: Residential Building Design and Construction, AE 471: Construction Management of Residential Building Projects, AE 542: Building Enclosure Science and Design, Arch 412: Integrative Energy and Environmental Design, CE 410: Sustainable Residential Subdivision Design, and AE 497: Ultra-High-Performance Buildings: Passive House Principles & Design.

At the graduate level, our RC program attracts architectural and civil engineering students to conduct research for advancing building materials and architectural/structural systems used in designing and constructing homes. Graduate students work on various topics related to funded or unfunded projects. Their research topics include evaluation methods for homes built in coastal regions vulnerable to hurricanes and flooding, 3D-printed homes using concrete- and clay-based mixtures, cross-laminated timber (CLT) for home building and shelters, especially with tornado resistance, hempcrete for home building, evaluating air barriers for passive house design under earthquake-induced

drift conditions, the development of retrofit methods for energy-deficient homes to upgrade to near-Passive House standard, and the development of concrete construction based on alternatives to Portland cement to reduce carbon footprint. Several of our research projects involve laboratory experimental studies to evaluate structural performance and building science.

The use of CLT is growing in interest for many reasons, including it being renewable, durable, fire resistant, cost effective, strong, and aesthetically pleasing. There is a lack of sufficient and readily available CLT design resources, so we have developed a design of a typical CLT home following an example we developed earlier for a conventional wood-frame house. The study resulted in a report that provides CLT design methodologies, applicable standards, structural analysis, and structural design calculations, while also pointing to potential challenges and shortcomings. The report can be useful for designers and students interested in a case study of a single family CLT home design.

Another recent project studied thermal properties of a single-family home in New Castle, PA, which was retrofitted using hempcrete. The project used the heat flow meter method to measure the thermal resistance of a typical retrofitted wall of the house. Energy modeling and indoor air quality studies were conducted. Showing the potential of hempcrete, the lessons learned will guide fine-tuning of the detailing and construction approaches to use this new material. Our research is also directed toward developing mixture designs and understanding the mechanical properties of hempcrete toward structural application for home building.

As additive manufacturing has become one of our active research areas, we have been making state-of-the-art contributions with respect to mixture design for the 3D printing of concrete and clay-based materials, different types of reinforcement for structural members, and design equations so capacities of 3D-printed members can be estimated. We continue to establish collaboration with stakeholders in the 3D printing of homes.

The last project to be shared is our efforts in determining the airtightness of different air barriers at the seams

under building deformation resulting from earthquakes. This issue is of particular importance when it comes to designing and constructing homes based on Passive House standard. Our testing program has demonstrated varying responses among different types of air barrier and tape combinations when we consider building deformation due to potential earthquake effects.

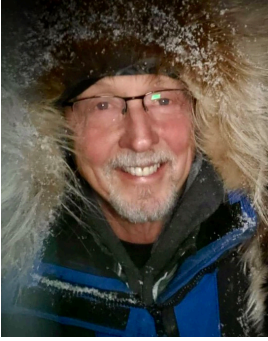
As part of our outreach activities, we were pleased to hold the annual Hankin Distinguished Lecture in November 2021. Due to the COVID-19 pandemic, we hosted an online lecture. Amanda L. Reddy presented "Florence Nightingale Was Right: The Central Role of Housing for Ensuring Health and Well-Being in a Changing World." Reddy is the executive director of the National Center for Healthy Housing, an organization founded on the premise that better housing can be a powerful platform for better health. View the lecture on the PHRC website with closed captioning.

The sixth biennial RBDCC provided a forum to discuss the latest research findings and innovations related to residential buildings. Due to the international scope of the conference during the COVID-19 pandemic, the 2022 RBDCC was also held virtually. It featured two keynote speakers: Wil V. Srubar III, associate professor at the University of Colorado Boulder and founder and managing director of Aureus Earth Inc.; and Rusty Smith, associate director of Rural Studio at the Auburn University School of Architecture, Planning, and Landscape Architecture. Srubar presented, "Transforming Buildings into Carbon Sinks," and Smith presented "Rural Studio: What Does Affordable, High-Performance Housing Truly Afford?" Sessions highlighted a variety of topics including affordability, disaster resilience, retrofits, building in Alaska, occupant behavior, mechanical and lighting systems, building science education, and innovative materials like hemp and mass timber. Conference presentations and posters were based on submitted abstracts and reviewed papers. Reviewed papers become a part of the published proceedings and will be available online.



Ali Memari, Hankin Chair

2022 HANKIN DISTINGUISHED LECTURE



Jack Hébert, founder of the CCHRC and senior research advisor for NREL

INDIGENOUS WISDOM AND 21ST CENTURY TECHNOLOGY: BUILDING SCIENCE FROM THE FAR NORTH | JACK HÉBERT

Jack Hébert was the founder and CEO of the Cold Climate Housing Research Center (CCHRC) for more than twenty years, an organization committed to promoting safe, affordable, durable, and energy-efficient housing for cold climate regions. For the past four decades, he has been designing and building in Interior Alaska through his companies Taiga Woodcraft and Hébert Homes. His homes and planned communities have created many high-quality, well-designed, environmentally appropriate, and energy-efficient buildings. He has received numerous honors, including the U.S. Green Building Council Cascadia Fellowship in recognition of his contributions to sustainable building, design, and science; the State of Alaska Governors Award for Excellence in Energy Efficient Design; and the Energy Rated Homes Presidents Award. Hébert has twice been honored as the Alaska State Home Builder of the Year. He has held numerous leadership roles in the home building industry in Alaska and nationally. Hébert has been a speaker and host at many conferences, has twice addressed the U.S. Senate Subcommittee on Energy, and

moderated the Circumpolar Forum on Sustainable Shelter. He is currently a senior research adviser for the National Renewable Energy Lab (NREL), the CCHRC Founder, and an active board member of the organization. Hébert is the father of five children, four grandchildren, and an extended family of many more children and grandchildren. He believes that only through a holistic approach can we create healthy, thriving, sustainable communities. Hébert also believes that the foundation for success in adapting to these challenging times will come from the indigenous wisdom of Alaska's First People and the emerging technologies of the 21st century. Working together, all Alaskans with a deep commitment to our beautiful lands, waters, and each other have the creative talent to contribute to a healthy future for the planet.

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.

WEDNESDAY, NOV. 2, 2022 @ 4:00 P.M. (E.T.) | [HTTP://BIT.LY/2022HANKIN](http://bit.ly/2022hankin)

2022 DOE SOLAR DECATHLON

A team of engineering and architecture students from Penn State brought home third place in the Retrofit Housing Division of the U.S. Department of Energy Solar Decathlon 2022 Design Challenge Competition on April 23 at the National Renewable Energy Laboratory in Golden, Colorado.

The Solar Decathlon is a collegiate competition that challenges student teams to design and build highly efficient and innovative buildings powered by renewable energy.

The Penn State team was one of fifty-five finalists representing thirty-eight collegiate institutions. Alan Chong and Em Dent, fifth-year architectural engineering students; Alyssa Penrod and Luke Scanlon, third-year architecture students; and Jacob Spinelli, third-year mechanical engineering student, represented the 21-member group at the competition.

The student team conducted a retrofit proposal for the MorningStar House, originally designed and constructed for the 2007 Solar Decathlon Build Challenge. The Penn State Sustainability

Institute, which currently operates the house, requested the retrofit to meet an updated standard of technical and renewable energy needs, as well as a design refresh for the house to serve as a permanent structure. The retrofit proposal focused on three key areas: modernizing the outdated energy and mechanical systems; refining the building envelope; and updating interior spaces and site design. The building envelope was refined to ensure air tightness and thermal insulation to maximize energy performance, occupant comfort, and environmental quality. Despite its name, the structure operates as a learning space rather than a home, and as such, its interior and site designs were updated to match its current use for visitors to explore sustainable design and observe building science principles in action.

The competition encourages inter- and multidisciplinary collaboration to create a holistic design and features a one-credit course in the spring semester, CE 411: Residential Construction Design Project, to help align student skills. This year's course was taught by Sarah Klinetob Lowe, formerly the high-



The Penn State team accepting their third place award.

performance housing specialist of the PHRC and now operations director of the Global Building Network in the College of Engineering. Ali Memari, Bernard and Henrietta Hankin Chair of Residential Construction and director of the PHRC, served as the head competition adviser. Additional advisers included Lisa Domenica Iulo, associate professor of architecture and director of the Hamer Center for Community Design in the Stuckeman School; Rahman Azari, associate professor of architecture; and Brian Wolfgang, associate director of the PHRC.

Students, faculty, or industry interested in participating in the 2023 Solar Decathlon Design Challenge as a member or adviser should contact Wolfgang at bwolfgang@psu.edu.

2022 NAHB STUDENT COMPETITION



Penn State NAHB Student Competition team with PHRC staff members

The National Association of Home Builders (NAHB) Student Chapter at Penn State placed in the top ten of the four-year programs, production homes category, of the NAHB Student Competition held at the 2022 NAHB International Builders' Show (IBS) in Orlando, Florida. Thirty-four teams from across the United States 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 120-acre site in Celina, Texas. The Penn State team developed a fifty-page proposal for a 382 single-family home subdivision

that included five luxury base floor plans ranging in square footage from 1,751 square feet up to 3,147 square feet, all designed to meet the silver rating from the National Green Building Standard. The proposal also included thoroughly vetted market, financial, and risk analyses and a land development plan.

The 2022 presentation team included: John Mann, architectural engineering, as project manager; Lauren Brumbaugh, architectural engineering; Nathaniel Bradley, architectural engineering; Ryan Stelitano, civil engineering; Stefano Maiuri, civil engineering; and Chris Venzin, finance.

The student team was coached by staff of the PHRC: Brian Wolfgang, associate director; Chris Hine, residential design

and construction specialist; and Carl Bankert, an RC program instructor.

"Our goal is not only to help coach the team through this competition but also to provide them with the most realistic corporate board room and construction meeting room experience within the classroom," said Hine. "We remain in contact with several of our previous competition students and they continue to highlight that this competition provided them with a great foundation to begin their careers."

Team travel support was generously provided by the Hankin Group, the National Housing Endowment IBS Travel Award, the University Park Allocation Committee, and the PHRC.



The Bermuda home design exterior renderings

CROWDFUNDING CAMPAIGN

Join in for the first crowdfunding campaign to support the Residential Construction program at Penn State! Funds raised benefit student activities, competitions, and courses related to residential construction. The campaign ends on Thursday, October 20, so don't miss out on this opportunity. Some specific items that you're supporting:

- Scholarships for NAHB Student Chapter members
- NAHB Student Chapter annual registration (\$400)
- Site visits to construction sites and finished projects
- NAHB Student Competition: Registration fee (\$400) and travel funds to the International Builders Show
- DOE Solar Decathlon Design Challenge: Registration fee (\$100) and travel funds to the competition in Golden, Colorado
- Volunteer opportunities with Habitat for Humanity and other local organizations
- Community building activities for students

Don't forget to ask your employer if they would match your donation. Involvement in this program offers students the opportunity to grow in their understanding of residential construction and prepare them for their careers.

Thank you for investing in the next generation of residential construction industry professionals!

DONATE BEFORE OCT. 20

<https://bit.ly/GivePSUResCon>

Support the Future of the Residential Construction Industry



\$3,725 of \$10,000 Goal



[Give Now](#)

Screenshot of the crowdfunding campaign from the Let's Grow State platform

PBA AFFILIATE AWARD | TRACY DORMAN

Congratulations to Tracy Dorman, meeting and events coordinator of the PHRC, for winning the Pennsylvania Builders Association (PBA) Affiliate of the Year Award on July 23!

During the PBA Summer Board of Directors meeting at Seven Springs Mountain Resort, the PBA presented the annual association awards after a two-year hiatus due to the COVID-19 pandemic.

Awards were presented to members and local associations in categories including Builder, Associate, and Affiliate of the Year, as well as community service and media projects. PBA also recognized two longtime members with the Distinguished Achievement Award.

PBA members nominated individuals and projects earlier this year. After gathering the necessary information, the judges, who were appointed by the PBA president and represented past presidents, builders, associates, and executive officers, reviewed all nominees based on criteria developed by the PBA Awards Task Force in 2021.



Tracy Dorman, meeting and events coordinator

AFFILIATE OF THE YEAR AWARD | TRACY DORMAN (CENTRAL PA BUILDERS ASSOCIATION)

Extremely deserving of the recognition, Dorman has served the home building industry for more than twenty years at the PHRC. During that time, she has served as a liaison with PBA, executive officers, local, state and federal government agencies, consultants, code officials, builders, and the public.



Pennsylvania PWB Council members at the PHRC Housing Conference Celebrate Reception on March 2, 2022

Dorman was instrumental in chartering the Central PA Professional Women in Building (PWB) Council and serves as chair. She is also the secretary of the PBA PWB Council.

During the 2022 PHRC Housing Conference, she was actively involved in bringing Mollie Elkman, author of the children's book *The House That She Built* to the Celebrate Reception. During the reception, the council sold signed children's books, raising over \$1,000 for scholarships.



Tracy Dorman with the official charter for the Central PA PWB Council on Jan. 20, 2020

Dorman has been committed to the PHRC's mission and goals for the last twenty years as a team player putting in extra effort as necessary.

PENNSYLVANIA HOUSING RESEARCH CENTER

206B Sackett Building
The Pennsylvania State University
University Park, PA 16802
T: 814-865-2341
PHRC@psu.edu

PHRC.psu.edu



@PHRCPennState



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**
Residential Design & Construction Specialist | **Chris Hine**
High-Performance Housing Specialist | **Darrin Wright**
Meeting & Events Coordinator | **Tracy Dorman**
Financial & Communications Coordinator | **Rachel Fawcett**



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