



The Pennsylvania Housing Research Center

Project Plan

July 2022 – June 2023

Pennsylvania Housing Research Center

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Table of Contents

I. Preface	1
A. COVID-19 Impacts.....	2
B. PHRC Staff Changes	2
II. Training, Technical Assistance, & Outreach.....	3
A. Program Development	3
1. Existing Program Updates and Maintenance.....	3
2. PHRC Continuing Education On-Demand	3
3. PHRC Construction Summit	3
4. On-Demand Building Science Course.....	4
B. PHRC Training Program Delivery	4
C. Web-Based Training.....	5
D. Publications	5
E. Technical Assistance, Technology Transfer, & Outreach	6
III. Applied Research	9
IV. Applied Projects	10
1. Article Content and Database Creation	10
2. Understanding and Decoding Heat Gain/Loss Calculations.....	10
3. Code & Air Sealing Video Series.....	10
4. Building Enclosure Survey.....	11
V. Projected Budget.....	12

I. Preface

Annually, the Pennsylvania Housing Research Center (PHRC) seeks to identify and prioritize a series of projects that collectively satisfy the following criteria. Projects should:

- meet the residential construction industry needs and the needs of the housing consumer in Pennsylvania;
- be consistent with the mission and goals of the PHRC;
- be affordable and feasible, given the resources available and the prevailing constraints on time, expertise, and facilities; and
- be a balanced program of projects that address both the long- and the short-term needs of all sections of the industry.

The PHRC Industry Advisory Council (IAC) has the responsibility to prioritize activities and project topics. This housing industry-based body consists of builders, developers, manufacturers, suppliers, remodelers, design professionals, industry associations, building code organizations, and state agencies.

On April 21, 2022, the IAC met to discuss potential projects for the PHRC to pursue. After a thorough discourse, IAC representatives voted on projects that they felt were the highest priority for the industry. This voting resulted in a prioritization of projects. The high-priority projects are included in this plan.

The list of projects that follows identifies only those projects that are to receive funds provided to the PHRC by the Commonwealth of Pennsylvania through the Act 157 of 2006 permit fee (later amended by Act 36 of 2017). The PHRC attempts to use permit fee monies to leverage outside support. It should also be recognized that the PHRC undertakes additional projects that do not receive any of these funds and are therefore not listed in this plan.

The PHRC utilizes permit fee revenue on a one-year delay (funds collected during the fiscal year spanning July 2021-June 2022 will be budgeted for the July 2022-June 2023 fiscal year). These permit fee funds are distributed quarterly by the Department of Community and Economic Development (DCED).

The PHRC plans projects and allocates funds at the start of each year. However, there is a real need for the PHRC to be able to take on special projects during the year. These projects typically fall into two categories: the first includes short term and limited scope projects that are time sensitive, while the second requires the ability to allocate some funds to leverage additional outside funds in response to requests for proposals.

Unless otherwise noted, the projects contained in this plan are anticipated to start July 1, 2022, and to be completed on or before June 30, 2023.

A. COVID-19 Impacts

The COVID-19 pandemic has had a profound impact on all aspects of our society and economy. PHRC operations have been substantially impacted since March 2020 through the suspension of most in-person activities, remote work for PHRC staff, and unanticipated challenges to the residential construction industry. While in-person activities have largely resumed, the threat of disruption to cyclical PHRC activities remains and will have a substantial impact on the 2022-2023 project year. The PHRC team aims to be flexible in response to any future disruptions.

B. PHRC Staff Changes

The PHRC staff experienced one departure during the 2021-2022 project year. Sarah Klinetob Lowe departed the PHRC team in early March 2022. At the time of publication of this project plan, the High-Performance Housing Specialist position is planned to be filled in mid-July 2022. As a result, there may be projects in this plan that will require amendment and additional projects that may be added once the final successful candidate is brought onto the PHRC team.

II. Training, Technical Assistance, & Outreach

The PHRC has a mandate to transfer knowledge by providing the necessary training and education to the wide variety of groups that make up the housing industry. The projects that are described below are in response to the recommendations from the PHRC's Industry Advisory Council and reflect the current needs within the industry.

A. Program Development

The PHRC will develop or update the following training programs or initiatives. These programs will address issues challenging the residential construction industry.

1. Existing Program Updates and Maintenance

Description: For many PHRC training programs, there is a need to make minor course material updates based on instructor feedback throughout the year. Also, the PHRC will continue work to update and improve the photos in programs, incorporate more photos or videos as appropriate, and expand active learning exercises to increase learner participation and knowledge retention.

Manager/PI: C. Hine

2. PHRC Continuing Education On-Demand

Description: The PHRC team continues to work with the Office for Digital Learning within the Penn State College of Engineering to utilize the Penn State Extension platform for on-demand education. Note: this project began in the 2019-2020 project year and is ongoing.

Manager/PI: R. Fawcett

Deliverables: This project will result in the continued development of a database of on-demand paid content that can be viewed for continuing education credit.

3. PHRC Construction Summit

Description: The first PHRC Construction Summit was offered in fall 2020 and offered low-cost training to industry professionals along with secondary students and instructors. This event will again be offered in 2022 but will have a refined focus toward secondary students and instructors. This will involve additional planning with instructors to craft an ideal program for their students' interests.

Manager/PI: B. Wolfgang

Deliverables: This project will result in the planning and delivery of an online event geared toward secondary students and instructors.

4. On-Demand Building Science Course

Description: The PHRC team continues to deploy content on Penn State Extension’s on-demand platform. The entirety of existing content consists of recorded one-hour webinars. This project will expand this offering to develop and publish an extended building science-focused course.

Manager/PI: B. Wolfgang, C. Hine, & R. Fawcett

Deliverables: This project will result in the development and deployment of an extended on-demand course focused on building science.

B. PHRC Training Program Delivery

Description: The PHRC has developed and maintains a wide array of training for many sectors of the construction industry with a focus on residential construction. These programs are intended to address technical issues facing the industry. The intended audience for these programs includes builders, remodelers, trade contractors, design professionals, educators, and building code officials. Additionally, the PHRC can customize programs to better meet the needs of an industry partner. As appropriate, AIA Learning Units (LUs) for architects, PA Labor & Industry contact hours and ICC credit hours for code officials, NARI credits for remodelers, and PA Professional Development Hours (PDHs) for engineers are offered.

The PHRC seeks to partner with relevant outside organizations whenever possible. These industry partners may include trade associations such as the Pennsylvania Builders Association or their local associations, professional associations, building code associations, as well as the Pennsylvania Construction Codes Academy (PCCA).

Manager/PI: B. Wolfgang

Deliverable: The PHRC team will partner with groups around the Commonwealth of PA to deliver existing programs and customized programs that utilize existing content. These programs will range in length and format as they are largely in response to stakeholder demand.

C. Web-Based Training

Description: The PHRC will continue its successful webinar series. Webinars are delivered live for continuing education credit, and they are archived for on-demand viewing without credit. Proposed topics are listed below. One PA Labor & Industry contact hour is offered for each webinar for PA code officials. As appropriate, AIA Learning Units (LUs) for architects, ICC credit hours for code officials, NARI credits for remodelers, and PA Professional Development Hours (PDHs) for engineers are offered.

The webinar topics for the 2022-2023 series, while subject to change based on future PHRC staffing, may include:

- Cost of Tight Homes
- Detailing Bonus Rooms
- Green Stormwater Infrastructure
- Air Sealing for Attached Homes
- Decks and the 2018 IRC
- Balanced Mechanical Ventilation
- ERI Path for Energy Code Compliance
- On-Lot Alternative Technology Sewer Systems
- Building Enclosure Issues
- Attic Ventilation

Manager/PI: B. Wolfgang

Deliverable: The PHRC will develop and deliver at least ten webinars with the option for alternative day and time rebroadcasts for code update-focused sessions. Additional programs may be added to address emerging issues as they arise.

D. Publications

Description: The PHRC will produce publications as appropriate, including both internally and externally published work. Examples of internal publications include Builder Briefs, research reports, technical flyers, and future online articles. Examples of external publications include scholarly journal articles, conference proceedings, magazine and trade publication articles, and other general interest articles upon request.

Manager/PI: B. Wolfgang

Deliverable: Internal and external publications will be researched, written, printed (as appropriate), and distributed.

E. Technical Assistance, Technology Transfer, & Outreach

Description: The PHRC continues to work to get technical information, resources, and publications to builders, remodelers, design professionals, building code officials, and others involved in the residential construction industry in new and innovative ways. This often involves leveraging existing and developing new relationships with other organizations in the residential construction industry.

Manager/PI: B. Wolfgang

Deliverables: The PHRC will continue to engage in the following activities:

- 1. Annual PHRC Housing Conference:** The PHRC will continue to organize, promote, and hold the industry-focused conference. This conference has been held annually since 1992 and has established a reputation of being the premier program focusing on technical issues of housing and land development in Pennsylvania. The conference brings together the building community (builders, remodelers, design professionals, educators) with regulators (planners, building code officials, township engineers, DEP and conservation district staff, etc.) and others involved in the residential construction industry.
- 2. Residential Building Design & Construction Conference:** The PHRC will organize, promote, and hold the research-focused Residential Building Design and Construction Conference (RBDCC) in even numbered years. The RBDCC provides a unique forum for researchers, design professionals, manufacturers, and builders to keep up to date on the latest advancements and discuss their own findings, innovations, and projects related to residential buildings. RBDCC sessions will consist of technical paper presentations on recent research and innovations related to residential buildings. The RBDCC is focused on various types of residential buildings including single- and multi-family dwellings, mid-rise and high-rise structures, factory-built housing, dormitories, and hotels/motels. Full papers will be published in a conference proceedings.
- 3. PCCA Symposium & Other Events:** The PHRC will work upon request with the PCCA to plan, develop, and deliver online and in-person events in support of PCCA initiatives.
- 4. Speaking Engagements:** The PHRC will hold and/or participate in talks, seminars, and conferences directed at the housing and land development industries. This may include trade and professional association functions and regional meetings, local association meetings, or regional, state, or national conferences. Speaking engagement topics include:
 - 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

5. **General Outreach Activities:** Through our general outreach initiatives, the PHRC pursues activities to keep industry professionals up to date on technical issues, as well as informed on the services and publications the PHRC provides. These activities may include the PHRC magazine, email and social media campaigns, articles in trade journals, phone calls, and the PHRC’s website.

Our general outreach also involves attending relevant industry meetings and serving as a technical resource to legislative committees as needed.

6. **Annual Magazine:** The PHRC annual magazine will be sent electronically to PHRC members and stakeholders to keep them up to date on recent PHRC activities and to promote upcoming events. Additionally, it is archived on the PHRC website for public viewing. For the 2022-2023 project year, the PHRC intends to continue to have it delivered in the early fall to provide timely updating of the audience with the outcome of the previous year’s projects and with what to expect in the coming year.
7. **Educating the Next Generation of Tradespeople:** Educating the “next generation” of residential trade contractors is essential for the future of residential construction. With the support of the IAC, the PHRC will consider the education of the next generation of tradespeople as an ongoing project. The ultimate goal is to increase the detailed knowledge of future industry tradespeople through this general outreach and to provide students with professional development opportunities within the residential construction industry. Outreach activities include trying to increase participation of vocational students and instructors in applicable PHRC events such as the PHRC Housing Conference, PCCA Symposia, and PHRC webinars. The prime opportunity to reach this audience is through the PHRC Construction Summit which was last held in 2020. The next anticipated PHRC Construction Summit is planned for fall 2022.
8. **Professional Women in Building (PWB):** The PHRC, in alignment with its current strategic plan, prioritizes gender equity in the residential construction industry through involvement with the NAHB Professional Women in Building (PWB) activities and initiatives. This effort includes relationship building, sharing of resources, speaking at school events, leveraging resources and contacts to bring opportunities to students, and soliciting feedback from instructors and administrators to better address their needs.
9. **Support of the UCC RAC:** The PHRC will continue to support the Uniform Construction Code Review & Advisory Council and the public by serving as a general technical resource upon request.
10. **Support of Standards:** The PHRC has developed standards to respond to industry demand. Each of these standards requires training and timely technical assistance for local governments, builders/developers, design professionals, and contractors. All these standards are available electronically for free. Education on these standards will continue to be provided

through various training programs as requested and technical assistance will be provided through telephone and email support by the PHRC. The current PHRC standards include:

- 2021 Pennsylvania Alternative Residential Energy Provisions
- Foundation Systems for Relocated Manufactured Housing

11. Strategic Partnerships: The PHRC will continue to seek out new relationships and partnerships with peer organizations with activity in the residential construction industry. These partnerships are leveraged for the benefit of the PHRC audience and stakeholders. PHRC staff time will continue to be allocated in support of this overall initiative.

III. Applied Research

A very important function of the PHRC is to undertake or stimulate research and development on materials, products, procedures, and processes. These efforts may have a longer-term or a more fundamental focus than other projects. Projects in this category foster partnerships and draw on the expertise and strengths of the people and facilities available at Penn State.

1. State of the Art Review of Alternatives to Wood Stick-Built Framing

Description: With the shortage of skilled labor in home construction, increasing price of lumber, and currently the sharp increase in gas and fuel prices, there is urgent need to find ways to control increasing price of building homes. Recent studies have already established advantages of using prefabricated wood framing panels for walls and trusses for roof over conventional stick-built practice in terms of saving on labor time and increased profit margins due to minimized material use and dumpster cost. However, while instead of stick-built, simply prefabricating the framing to make wall panels and roof trusses yields some benefits, there are still other options to explore. For example, instead of only prefabricating the wall framing, one can prefabricate the complete wall including sheathing, air/vapor barrier, insulation (e.g., spray foam on interior, and rigid insulation on exterior), and optional windows installed within the panel. Similarly, it is possible to prefabricate floor panel assembled using floor joists/trusses (including pre-cut holes in the webs) and sheathing. It is also possible to prefabricate partial or complete attic/roof made up of the assembly of roof trusses, insulation, sheathing, vapor barrier, roofing membrane, and shingles. Such an approach is a step closer to modularization, yet it allows custom design and construction of homes without the many constraints of full modular homes. Furthermore, other alternatives to wood stud framing exist that are worthy of comparison. Examples of such alternative prefabricated framing include structural insulated panels, cold formed metal framing, manufactured wood, and other innovative systems. This study will explore alternative framing systems and develop design and cost comparison of the selected systems with a traditional house design based on site built stick-built framing.

Manager/PI: A. Memari

Deliverables: The result of this work will include a PHRC report as well as a conference presentation.

IV. Applied Projects

The Applied Project category refers to projects that are application-oriented and have a direct need by the residential construction industry. This may also include longer term initiatives.

1. Article Content and Database Creation

Description: The PHRC team traditionally publishes articles on technical topics that are known as “Builder Briefs.” These multiple-page documents, while effective, can be cumbersome to develop and publish, especially on time-sensitive topics. The PHRC team is pivoting toward a more modern approach to sharing small pieces of technical content through an article/blog style database. This project would focus on creation of infrastructure for this database along with content for future publication.

Manager/PI: B. Wolfgang & R. Fawcett

Deliverables: This project will result in the development of an online article database and platform along with initial articles and content for publication.

2. Understanding and Decoding Heat Gain/Loss Calculations

Description: Heat gain/loss calculations are a common submission requirement with permit applications for new construction. Often there are questions regarding the purpose and use of these calculations, including the assumptions made to develop them. This project would dig into this issue in greater depth to produce materials and resources to guide builders in this area.

Manager/PI: B. Wolfgang & C. Hine

Deliverables: This project will result in the publication of online article content for publication on the future PHRC database.

3. Code & Air Sealing Video Series

Description: The residential construction industry faces a variety of challenges, including building enclosure issues resulting from recent code changes. Based on evolving methods for learning and content distribution, it would be helpful for many industry professionals to have access to more visual and video-based content. This project will task the PHRC with partnering with stakeholders to film on-site footage that illustrates key code issues, including air sealing, that impact the residential construction industry.

Manager/PI: C. Hine & R. Fawcett

Deliverables: This project will result in the publication of short videos on changing code provisions. These will be distributed across web and social media platforms and utilized in training programs.

4. Building Enclosure Survey

Description: The building enclosure has been the subject of substantial change, debate, and code updates over the past decade. As builders and design professionals continue to adjust and adapt their designs to meet new requirements, market demands, and best practices, the PHRC team has often encountered common misunderstandings during training events. This project would deploy a survey to PHRC stakeholders that would gather information regarding trends, common knowledge, and overall statistics regarding the building enclosure. The data extracted from this effort would heavily influence future PHRC programs, talking points, and overall content.

Manager/PI: B. Wolfgang

Deliverables: This project will result in the design and deployment of an industry-focused survey that digs into the latest building enclosure issues that the residential construction industry is facing.

V. Projected Budget

The budget for 2022-2023 project year is based on the Act 157 Funds collected during the 2021-2022 fiscal year. Table 1 shows the quarterly check values. The Act 157 Funds available for the 2022-2023 year are approximately \$504,014.63.

Due to the COVID-19 pandemic, economic disruptions began in 2020 Q4 with economic volatility, and the PHRC responded in a fiscally conservative manner to prepare for any future disruptions. The residential construction industry has continued to be active in Pennsylvania and funding appears to have stabilized, so the PHRC has shifted back to typical strategic expenditures while remaining flexible.

Located in the Department of Civil and Environmental Engineering at Penn State, the PHRC receives the added benefit of Penn State waiving their F&A (facilities & administrative) rate for this research contract. As a result, this means that PHRC retains approximately \$293,286.11 more than it normally would for a research contract. This allows PHRC to maximize any received monies in service of its mission to serve the home building industry and the residents of Pennsylvania by improving the quality and affordability of housing.

Table 1. Quarterly check values from the 2021-2022 FY (2022-2023 Project Year)

Quarter	Check Value
Q1: July 2021 - Sept 2021	\$152,914.06
Q2: Oct 2021 - Dec 2021	\$122,981.76
Q3: Jan 2022 - Mar 2022	\$135,680.75
Q4: April 2022 - June 2022	\$92,438.06
Total	\$504,014.63