



The Pennsylvania Housing Research Center

Project Plan

July 2021 – June 2022

Pennsylvania Housing Research Center

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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 15, 2021, the IAC met virtually 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 2020-June 2021 will be budgeted for the July 2021-June 2022 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, 2021, and to be completed on or before June 30, 2022.

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. Moving into the 2021-2022 project year, the ongoing pandemic will impact PHRC activities in the following ways:

- Permit fee revenue is unpredictable as the industry continues to recover.
- The resumption of in-person activities, including delivery of training programs and participation in speaking engagements, is likely to occur in the 2021-2022 project year. However, the exact timeline is currently unknown and will depend on Penn State policies, COVID-19 conditions, and audience interest in returning to in-person activities.
- Staff time will continue to be intentionally flexible to respond to new and unexpected challenges that the residential construction industry may encounter over the coming year.

Despite these challenges, the PHRC continues to be well-positioned to serve the needs of the residential construction industry in Pennsylvania and is able to pivot to adapt to changes as necessary.

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 housing industry.

A. Program Development

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

1. Existing Program Updates and Maintenance

Description: For many PHRC workshops, 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. This year in particular will require frequent updates as the Pennsylvania Uniform Construction Code will update to the 2018 codes in the first quarter of 2022.

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 newly available software platforms for on-demand education. This effort will continue with the potential expansion to programs longer than one-hour recorded webinars. Note: this project began in the 2019-2020 project year and is ongoing.

Manager/PI: B. Wolfgang & 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. Stucco & Thin Stone Veneer Design & Installation Workshop Revamp

Description: This workshop currently covers core building science principles, relevant exterior plaster code requirements, review proper flashing techniques, lath requirements, and treatment of joints between dissimilar materials. Due to anticipated code changes that will have a substantial impact on stucco and stone assemblies, this workshop will require some adjustments. Additionally, new construction details and mockups will aid in future instructional needs.

Manager/PI: B. Wolfgang

Deliverables: This project will result in an updated Stucco & Thin Stone Veneer workshop with additional instructional tools for classroom delivery.

4. Full- or Partial-Day Code Update Workshop

Description: The Pennsylvania Uniform Construction Code will update to the 2018 codes in the first quarter of 2022. The provisions impacted by these changes will be summarized in a full- or partial-day workshop, depending on the length of time needed to adequately cover the material. It is intended that this course will be delivered in-person, but online delivery will be considered when developing curriculum.

Manager/PI: C. Hine & B. Wolfgang

Deliverables: This project will result in a full- or partial-day code update workshop for delivery throughout the Commonwealth of PA.

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).

Note: the types and format of programs that will be offered in the 2021-2022 project year will depend on the feasibility of in-person instruction. Many workshops will be forced to adapt to virtual deployment.

Current PHRC training program offerings are listed below.

- a. Blueprint Reading Program
- b. Stucco & Thin Stone Veneer Design & Installation
- c. Building Envelope Design and IECC Code Compliance
- d. Residential Deck Design and Construction
- e. Building with Exterior Rigid Foam
- f. Residential Moisture Management: The 4D's
- g. HVAC Design & Installation

Manager/PI: B. Wolfgang

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, 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 webinar topics for the 2021-2022 series, while subject to change, may include:

- PA UCC Code Update Series
- All-Electric Homes
- Stucco & Stone Veneer Assemblies
- PA Alternative Residential Energy Provisions
- Air Sealing Best Practices: Scopes of Work
- Radon-Ready Homes
- Refining or Repairing Old Stormwater BMPs
- OSHA Paperwork Requirements
- Pretty Good House: Affordable High-Performance
- Moisture Control Layers & Materials

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. Builder Briefs & Other Publications

Description: The PHRC will produce publications as appropriate, including its series of short technical documents called Builder Briefs that address specific issues that have been identified by builders or remodelers. These documents are intended to be quick to read with a lot of the information presented graphically or pictorially. Potential publication topics include:

- Stucco & Stone Details
- PA Alternative Residential Energy Provisions
- PA Alternative Residential Energy Provisions Worksheet

Manager/PI: B. Wolfgang

Deliverable: Builder Briefs and other 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 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 sixth Residential Building Design and Construction Conference (RBDCC), to be held 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 the conference proceedings.
- 3. PCCA Symposium:** The PHRC will work (as needed) with the Pennsylvania Construction Codes Academy (PCCA) to develop and deliver three 1-day programs (one in the central region of the Commonwealth in conjunction with the annual PHRC Housing Conference, one in the eastern part of the Commonwealth, and one in the western part). This annual event is intended to address technical issues being faced by building code officials.
- 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 Updates
 - 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

5. **General Outreach Activities:** Through our general outreach initiative, 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 2021-2022 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 provide students with professional development opportunities within the residential construction industry. Outreach activities include trying to increase participation of vocational students and instructors in 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 PHRC standards include:

- 2018 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. Light-Gauge Steel Framed Home Design

Description: Considering the recent significant increase in lumber prices, there is a need for alternative framing materials and systems. According to a February 2021 NAHB report, lumber shortage has caused an increase in average single-family home cost by \$24,000, mainly because of the approximately 180% increase in lumber price (since April 2020). Accordingly, this is mainly attributed to shut down of factories since March 2020 due to COVID 19 pandemic. However, there has also been an increased demand for single-family homes as working from home became a norm for millions, requiring more suitable working environment not available in their current residences. There is a definite need for alternative construction material, and light gauge steel stud seems to offer one such solution. However, since steel studs have been primarily used as non-load bearing partition walls and backup system for building envelope in commercial buildings, there is also a need to develop typical home design with such an alternative system. This project will develop the design calculations and typical details for an already designed conventional wood-frame single-family home and develop comparisons with regard to the cost of construction and various performance attributes of interest.

Manager/PI: Dr. Ali Memari

Deliverables: The result of the work can be made available as a conference presentation and a publication.

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. Energy Retrofits

Description: Nearly 80% of Pennsylvania’s existing housing stock was built before modern building codes, resulting in higher than necessary energy bills and occupant comfort issues. This project focuses on studying the potential impacts and challenges associated with energy retrofits through local case studies. Data extracted through this project will lead to future webinars and conference presentations. Note: this project began in the 2019-2020 project year and is ongoing due to COVID-19 restrictions.

Manager/PI: S. Klinetob Lowe

Deliverables: This project will result in a future webinar and white paper.

2. Stucco & Stone Details

Description: The existing stucco & stone workshop currently covers core building science principles, relevant exterior plaster code requirements, review proper flashing techniques, lath requirements, and treatment of joints between dissimilar materials. Due to anticipated code changes that will have a substantial impact on stucco and stone assemblies, new construction details would be helpful in illustrating the impact and sequence of some of the changes directly relating to rainscreen gaps in these assemblies.

Manager/PI: B. Wolfgang

Deliverables: This project will result in the publication of stucco & stone veneer assembly construction details for use in webinars and workshops.

3. Code Update Video Series

Description: With the Pennsylvania Uniform Construction Code update planned for the first quarter of 2022, the PHRC audience will need additional information in order to adapt to these new code provisions. 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 provisions that will impact the residential construction industry.

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

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. PA Alternative Residential Energy Provisions

Description: With the Pennsylvania Uniform Construction Code update planned for the first quarter of 2022, the PHRC will need to address the necessary changes to the PA Alternative. This process will include formation of a subcommittee of the PHRC Industry Advisory Council, solicitation of public comment, modeling of proposed changes to the PA Alternative, and publication of a revised version of the standard. This project will also include an update to the PA Alternative Residential Energy Provisions worksheet.

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

Deliverables: This project will result in the publication of the 2021 PA Alternative Residential Energy Provisions and an updated PA Alternative worksheet.

V. Projected Budget

The budget for 2021-2022 project year is based on the Act 157 Funds collected during the 2020-2021 fiscal year. Table 1 shows the quarterly check values. The Act 157 Funds available for the 2021-2022 year are approximately \$443,639.29.

Due to the COVID-19 pandemic, economic disruptions began in 2020 Q4 with economic volatility expected for the near future affecting the residential construction industry. The PHRC continues to be fiscally conservative and strategic in expenditures to prepare for any future disruptions. With revenues decreasing by approximately \$20,000 from the previous year but with significantly lower expenditures in 2020-2021 due to the pandemic, the PHRC remains confident in its abilities to serve the industry. As of April 2020, DCED changed their fee collection process to only accept online payments by credit card or check for UCC permit fees, which allows for more expedient reporting to the PHRC.

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 \$268,401.77 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 2020-2021 FY (2021-2022 Project Year)

Quarter	Check Value
Q1: July 2020 - Sept 2020	\$77,811.80
Q2: Oct 2020 - Dec 2020	\$120,613.99
Q3: Jan 2021 - Mar 2021	\$101,664.21
Q4: April 2021 - June 2021	\$143,549.29
Total	\$443,639.29