



# RESEARCH FOUNDATION

RESEARCH FOR THE NFPA MISSION

## PROJECT SUMMARY

### Developing Technical and Regulatory Solutions for Effective Air Sealing of Separation Walls in Attached Housing to Reduce Housing Costs and Increase Efficiency, Safety, and IAQ

26 November 2019

**Background:** Energy efficiency in new buildings has made major strides in recent years, with many of these gains driven by more stringent energy codes. Within the model energy code widely implemented by states throughout the U.S. – the *International Energy Conservation Code* (IECC) – the reduction of air leakage through the building envelope is a major focus for energy savings. In the 2012, 2015, and 2018 editions of the IECC, the residential provisions for Climate Zones 3-8 require that dwellings must be tested to demonstrate air leakage which is  $\leq 3$  ACH50. Conceptually, this code requirement to establish a field-verified air-tightness specification for new homes should be a useful provision to reduce air infiltration and save energy. At the same time, limiting air leakage between adjacent dwelling units like townhouses improves fire safety, indoor air quality (IAQ), and sound performance. Plus - field verification using the blower door test gives the code official a clear pass/fail signal.

However, in practice, this code provision has triggered several undesirable consequences for townhomes, duplexes, and other forms of low-rise attached dwellings. The problems in these types of attached housing center around the Area Separation Wall (ASW) between dwelling units which must serve several functions including fire separation, structural independence, limiting sound transmission, and limiting air flow. It is complex to design, build, and code-approve ASW assemblies that clearly meet all of these requirements. The current state of affairs in the industry regarding ASWs is a collection of problems including confusion about permissible air sealing methods and materials, inconsistent testing methods and code enforcement, lost energy savings, and construction delays and cost impacts which undermine housing affordability.

In this project supported by the U.S. Department of Housing and Urban Development (HUD), the project team of Newport Partners, the Fire Protection Research Foundation (the research affiliate of NFPA), and Thrive Homebuilders will field evaluate different wall assemblies at a series of attached housing projects while also evaluating regulatory barriers and potential solutions.

**Research Goal:** The research objectives of this project are:

- To identify the best strategies for the area separation wall assemblies through field evaluations which assess constructability, air leakage, code compliance with fire provisions, and cost effectiveness.
- To identify codes/standards barriers to safe, energy efficient, and cost-effective solutions for air-sealed, fire-rated separation walls.

- To combine the findings of field evaluations and the codes assessment to develop an Application Guide for builders, designers, and code officials that identifies the best strategies for this construction assembly, highlights code/standards barriers, and provides recommendations on steps that jurisdictions can take to address them.
- To disseminate technical information through trusted industry channels to speed adoption of improved practice and spur innovation for next-generation technologies

Accomplishing these objectives will advance the ability of the housing industry to deliver townhomes/duplexes which are highly energy efficient, meet code provisions for fire safety, and maintain affordability.

**Project Tasks:** The project is comprised of the following tasks:

### **Task 1 – Project Technical Panel**

To gain multiple perspectives on the challenges associated with ASWs, a Project Technical Panel will be convened comprised of experts to provide insights and direction to the research effort. The role of the Panel will be to provide their diverse perspectives on the issue, including:

- Offering direction on the Field Evaluation, including input on the assembly details
- Providing insights on strategies to air seal UL listed assemblies in a way that does not jeopardize their listing, or would be considered permissible
- Reviewing the Application Guide to be developed at the conclusion of the project, and assist in dissemination of the Guide and the project’s findings to their respective networks

### **Task 2 – Field Evaluation**

The Task 2 field evaluation phase of this project will address the research question: what are the optimal solutions for ASWs in attached housing when assessed for constructability, cost-effectiveness, air sealing and energy performance, and code compliance. This field evaluation task provides an extremely valuable opportunity to test and measure different ASW assemblies in an actual project environment.

Test Sites: project partner Thrive Home Builders has committed to evaluate four different ASW strategies. Each of the units will have an otherwise identical building envelope, allowing the following: 1) attribute differences in air leakage to just the separation wall assembly and 2) compare the cost and constructability of ASWs of the same dimensions. Thrive will provide technical support such as helping to define the exact specifications of each wall assembly; collecting and providing cost data; providing quality assurance in the field to ensure that installation matches specifications; providing access to local code officials who will we interview for feedback; and arranging for manufacturer technical support and possible testing in the project.

The outcome of Task 2 will be extremely unique and valuable comparative data, both quantitative and qualitative, on identical duplex units comparing different separation wall assemblies based on constructability; cost (labor & materials); air leakage (guarded & unguarded); and code compliance.

### **Task 3 – Evaluate and Address Regulatory Barriers**

The regulatory barrier phase of this project will address the research question: what are the code/standards-related barriers, and the solutions, that are impeding the consistent and enforceable deployment of energy efficient, cost-effective, and fire safe separation walls in attached housing?

There are multiple areas of concern related to codes and standards barriers for separation wall solutions in attached housing that we will evaluate. These potential barriers include the UL listings for approved fire-rated wall assemblies between the dwelling units in many cases do not show any air sealing as part of the assembly. Certain fire blocking materials are code recognized at floor intersections (i.e. framing material; fiberglass matt gypsum) but other materials like fire-rated caulk or SPF are less clear. Under this task the involvement of UL and code officials on the Technical Panel will be leveraged to clarify this issue and to develop guidance which may consist of code narrative, interpretation, or code amendments.

Another code-related issue is the air sealing requirement found in the IECC. Multiple variations of this metric have been used or considered such as: a higher ACH50 level for attached dwellings which eases the air-sealing emphasis at the expense of energy savings; a guarded blower door-based metric which only captures air leakage from the dwelling to outdoors; a CFM per square foot of building envelope (compartmentalization) metric which tends to be less stringent than the 3 ACH50 metric in the IECC; and other variations. Each of these possible code amendments will be evaluated by the team in coordination with HUD and the Panel, and analyzed in terms of pros/cons for enforceability; the likelihood of success for townhomes/duplexes; testing complexity; and energy performance. Finally, other code-related adjustments to maintain building performance but ease construction and enforcement difficulty of this provision will be identified and discussed.

The outcome of Task 3 will be an evaluation of codes/standards barriers, the implications of different strategies to address these barriers, example code provisions that jurisdictions could implement, and a look forward to what to expect in the 2021 IECC. This material will be included in the Application Guide (Task 4) and will be very helpful to jurisdictions wrestling with these issues as they consider adoption of the IECC.

#### **Task 4 – Develop Application Guide for Technical & Building Code Options for Safe and Energy Efficient Separation Walls in Attached Housing”**

The purpose of the Application Guide is to inform builders, designers, contractors, code officials, HUD decision makers on building programs, and other stakeholders of the key issues involved in building safe, energy efficient, code compliant, and cost-effective separation walls in attached housing. The Guide will incorporate the field evaluation data (Task 2) and the codes evaluation (Task 3) to provide stakeholders with a full view of the issue and recommended best practices for construction and for codes. The Guide will identify wall assembly options along with pros and cons, and also provide code-oriented recommendations.

The Application Guide will be developed in a format consistent with HUD’s publication guidelines, include numerous graphics, and be formatted for both digital dissemination as well as for printing. It is anticipated that the Application Guide will be 15-20 pages in length to make the resource informative but not so lengthy that busy stakeholders might be reluctant to review it.

#### **Task 5 – Outreach and Dissemination of the Application Guide; Final Report**

For this project to obtain the objective of improving construction practice, both through increased energy efficiency and fire protection, outreach and information dissemination are crucial elements. A multi-pronged approach will be taken to inform the relevant stakeholder groups on the project results. Outreach will include:

- NFPA Conference Presentation

- Stakeholder hotline
- NFPA and Newport webinars
- Technical articles
- NFPA Technical Committee briefs
- Website content and links to the Application Guide
- Social media tools to raise awareness of the project results and the Application Guide

**Implementation:** This research program will be conducted under the auspices of the Research Foundation in accordance with Foundation Policies and will be guided by a Project Technical Panel who will provide input to the project, recommend contractor selection, review periodic reports of progress and research results, and review the final project report.

**Schedule:** The final report for the project will be available by Q2 of 2021.

**About us:**

**About the Fire Protection Research Foundation**

The [Fire Protection Research Foundation](#) plans, manages, and communicates research on a broad range of fire safety issues in collaboration with scientists and laboratories around the world. The Foundation is an affiliate of NFPA.



**About the National Fire Protection Association (NFPA)**

Founded in 1896, NFPA is a global, nonprofit organization devoted to eliminating death, injury, property and economic loss due to fire, electrical and related hazards. The association delivers information and knowledge through more than 300 consensus codes and standards, research, training, education, outreach and advocacy; and by partnering with others who share an interest in furthering the NFPA mission. [All NFPA codes and standards can be viewed online for free.](#) NFPA's [membership](#) totals more than 65,000 individuals around the world.

