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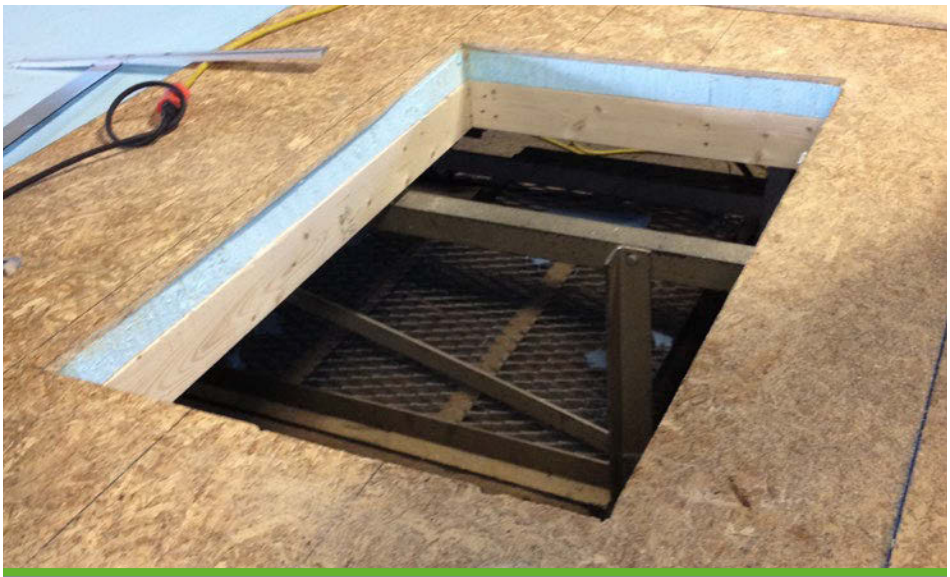
Extended Plate Wall System Expands Adoption of High-R Envelope Solutions

For decades, the residential building industry has worked to expand opportunities to increase the thermal resistance of walls. Multiple high-R wall construction methods have been developed, yet market adoption remains low because of perceived complexity and cost.

One appealing solution is an extended plate wall system (EPW). Framing for top and bottom plates is one nominal dimension larger than for studs, which provides space for a 2-inch layer of foam plastic insulative sheathing (FPIS). Wood structural sheathing (OSB or plywood) is then installed on the exterior, fastened directly to the plates and nailed through the foam to the studs. In contrast to the method of installing FPIS as a fully exterior layer, the EPW greatly simplifies air sealing, installation and detailing of windows and doors, application of a weather resistive barrier, and attachment of cladding. This is because the sheathing is on the outside, as framing crews and siding installers are most familiar with. The energy performance of EPWs is nearly as good as more complex walls with exterior continuous insulation, and EPWs handily outperform traditional walls without FPIS.



The EPW achieves more than 95% continuous insulation without adding complexity or risk, making the unique layering a clear improvement in constructability. *Photo from Home Innovation Research Labs*

The system offers tremendous opportunity for market uptake—60% to 80% of residential builders in targeted climate zones 4–8 could be potential adopters. Based on tried-and-true lumber construction methodologies, the system integrates a layer of nearly continuous rigid foam insulation with standard framing practices, preserving many conventional construction features and minimizing many common concerns associated with high-R envelope systems.

To increase builder confidence, Home Innovation Research Labs and partners studied the EPW to determine its structural performance, moisture durability, constructability, and cost-effectiveness for use as a high-R enclosure system for energy code minimum and above-code performance in climate zones 4–8. The study included structural lab testing, moisture and heat transfer simulation, as well as construction observation and 12-month moisture monitoring of two demonstration houses built in Michigan. This system can be constructed on site or as factory-built panelized walls. The sheathing on the outside helps protect the wall during shipping and installation.

This cost-effective wall system preserves many conventional construction features and minimizes builder risk. *Photo from Home Innovation Research Labs*

Project Information

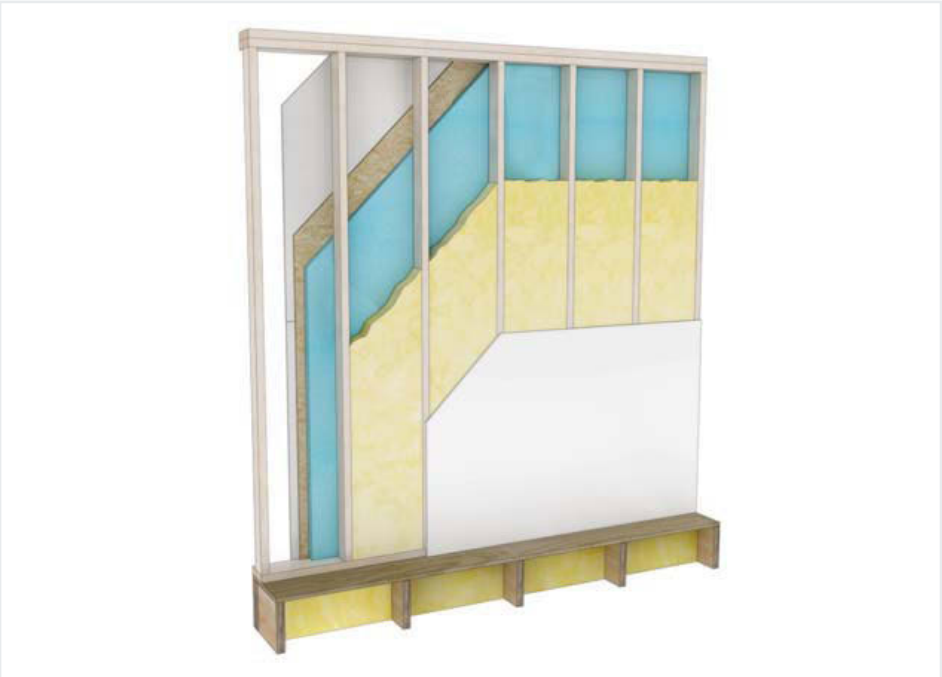
Building Component: Walls

Team and Partners: Home Innovation Research Labs, American Chemistry Council, Dow Building Solutions, Forest Products Laboratory, DuPont, Owens Corning, NYSERDA, Arn McIntyre Construction

Applications: Residential, commercial, multifamily

Year Tested: 2015–2018

Climate Zones: All



Interior view of the wall system shows the rigid foam (in blue) is interior to the wood structural panel to simplify installation of windows and siding. *Illustration from Home Innovation Research Labs*

Key Research Findings

The successful laboratory research and field demonstration of the EPW provided positive results:

- 2x4 and 2x6 wall configurations are cost-effective, offer good moisture durability and thermal performance, meet minimum insulation requirements throughout climate zones 6–8, and exceed minimum energy code prescriptive requirements in climate zones 3–5
- Valuable data from construction observation helped optimize the wall system fastening schedule and framing configuration
- Moisture, relative humidity, and temperature data from the demonstration homes indicate good durability and moisture resilience
- The calculated design racking shear load value for EPW walls is 256 plf (lbs/ft). For comparison, the minimum acceptable International Residential Code (IRC) wood structured panel braced wall is 184 plf (lbs/ft).

When properly planned and detailed for the local climate, this is a straightforward and constructible wall system that demonstrates good value, airtightness, moisture resilience, and structural performance.

Market Impact and Adoption

To facilitate market adoption, the research outcomes document key benefits, installation guidance, and data on structural, moisture, and thermal performance, which can be used by builders and designers to:

- Support incorporation of the wall system within IRC prescriptive provisions
- Improve confidence of practitioners using high-R wall solutions
- Increase market penetration for high-R walls
- Encourage use of exterior continuous insulation in factory-built panelized walls
- Reduce construction complexities
- Improve cost-effectiveness.

Builders in Massachusetts, Idaho, Michigan, Minnesota, and Montana have already expressed interest in the EPW. The study's structural test result of 256 plf (lbs/ft) for allowable design racking shear can be used by structural consultants to design residential or commercial buildings up to two stories, which would replace conventional methods. An EPW was featured by Owens Corning and Dupont at the 2018 International Builders' Show, and Hamilton Building Services made the EPW the focus of their booth at the 2016 Architecture Boston Expo. ■

Learn More

Technical Report:
www.homeinnovation.com/EPWReport

Construction Guide:
www.homeinnovation.com/EPWBuilderGuide

Builder Sell Sheet:
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