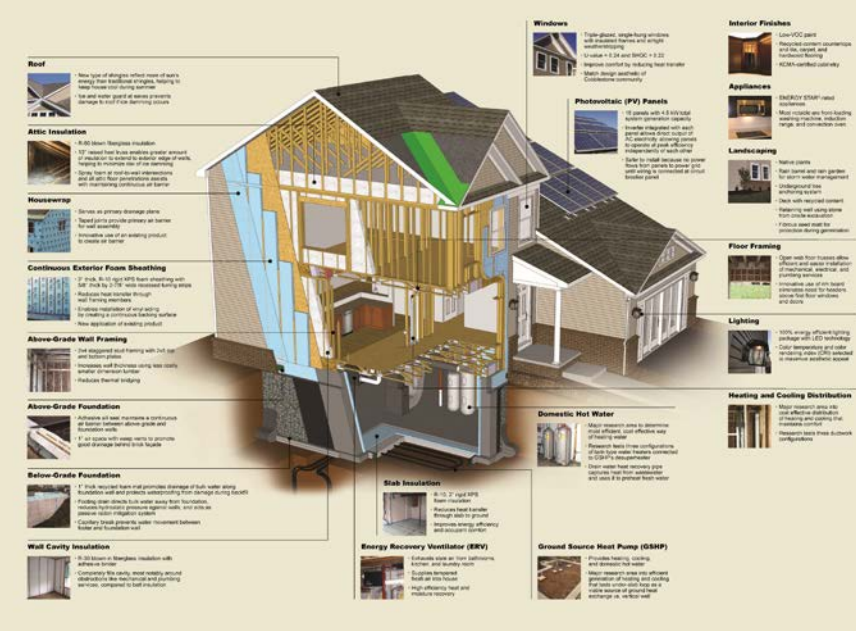


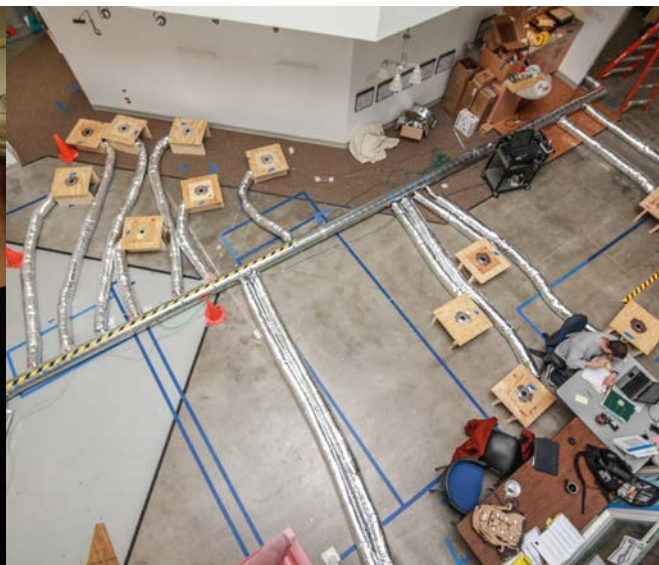


A Primer on Panelized Construction

Anthony Grisolia
Managing Director, Innovation Programs
IBACOS



IBACOS[®]
 | innovation |





Builder Trends

- As of 2014, top 20 builders were already panelizing at a much greater rate than the rest of the U.S. housing market – roughly 40% --based on a combination of ProSales, NAHB and IBACOS research data (*source: Covestro*)
- However, modular, precut and panelized construction combined only accounted for 3.5% of homes built in 2016
- Integrated design and engineering is viewed as a critical first step for offsite by all players involved, but most housing providers are either not using or are underutilizing the capabilities of BIM in their own design processes
- Perceived cost premiums are a big barrier to adoption of offsite solutions in the U.S. according to housing providers and offsite housing manufacturers alike

Offsite Manufacturer Trends

- Most U.S. providers who serve builders and developers offer simple but precise components
- While it takes 60% less time to frame a house using components reducing the need for skilled labor in the field, offsite housing manufacturers are also facing a labor shortage
- Most offsite housing manufacturers say that they could run a second shift in their plants if they were able to find enough labor (*source: NAHB Systems Building Council*)
- Most offsite housing manufacturers intend to expand the volume of housing they deliver and enter new markets, but are gun shy in doing so without pre-commitments of demand from housing providers, due to the large capital investments required

The Builder

CHALLENGES

Severe shortage of skilled labor

Delivering a quality product

Warranty and risk

NEEDS

Opportunities to increase productivity

Better quality solution

Risk reduction





**Company Profiles:
Offsite Component
Manufacturers**

COMPANY PROFILE



OVERVIEW:

Blueprint Robotics has a 200,000 square foot factory in Baltimore and offers one of the most comprehensive panelized products on the market.

OFF-SITE FOCUS:

Integrated Panelization

PRODUCTS/SERVICES:

BIM clients' design plans
Customized Closed Wall Systems,
Roofs + Floors
Guaranteed Price

COVERAGE AREA:

Within 350 miles of Baltimore –
with intent to expand

WEBSITE: www.blueprint-robotics.com

Source:

COMPANY PROVIDER PROFILE



COMPANY PROFILE



OVERVIEW:

Build SMART currently offers a structural open wall system with continuous insulation and an integrated weather resistant barrier on the exterior. Windows and doors are pre-installed. They are also working on other systems including monitoring systems, low-energy lighting and a conditioning ERV.

OFF-SITE FOCUS:

Building Envelope System
Components

PRODUCTS/SERVICES:

Component Design Files
Design Review
Passive House Consulting
Offsite Construction + Delivery
Installer Training

COVERAGE AREA:

Based in Lawrence, Kansas, they will deliver anywhere in the U.S. They have a desire to expand and will likely open their next plant in Pennsylvania.

Source:

WEBSITE: www.buildsmartna.com

COMPANY PROFILE



COMPANY PROFILE



OVERVIEW:

Entekra™ is a design, engineering and manufacturing company that provides a Fully Integrated Off-Site Solution™ (FIOSS™) for both residential and commercial construction. Entekra opened their first U.S. plant in 2018, but their team has built nearly 175,000 homes for assembly worldwide. A single-family home can be assembled on-site in as little as one day.

OFF-SITE FOCUS:

Fully Integrated Off-Site Solution (FIOSS); Panelization

PRODUCTS/SERVICES:

Design + Engineering
Off-site Manufacturing
Delivery + Assembly
Finishing

COVERAGE AREA:

California – with plans to expand to other geographic markets across the country. **A recent \$45MM investment from LP will help fuel their expansion.**

Source:

WEBSITE: <http://entekra.com>

COMPANY PROFILE



COMPANY PROFILE



OVERVIEW:

Erickson provides complete framing solutions for residential and multi-family homebuilders, including interior and exterior wall panels, stairways and structural components, roof systems and roof trusses, and floor trusses.

OFF-SITE FOCUS:

Panelized framing construction services

PRODUCTS/SERVICES:

Panelized Framing Systems
Doors & Mill Work

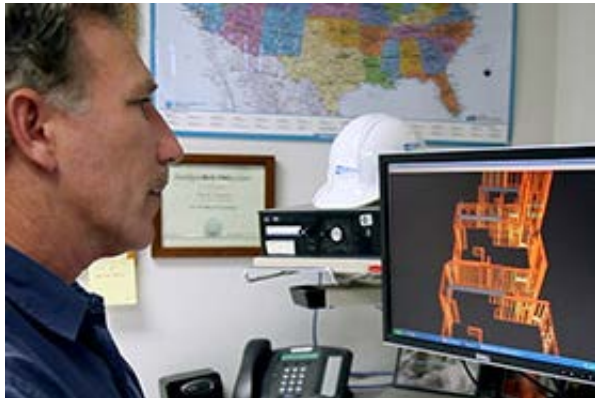
COVERAGE AREA:

Core geographic markets are
Arizona, Northern California and
the greater Reno, Nevada area.

WEBSITE:

<http://www.ericksoncompanies.com>

COMPANY PROFILE



COMPANY PROFILE



OVERVIEW:

HercuWall® is the first cost-effective concrete-reinforced panelized wall system. HercuWall panels are rated for 200+ mph, high-velocity hurricane zones, and are mold, rot, pest and water resistant.

ShearStrip® technology allows reinforced concrete construction without vertical rebar. HercuWalls are highly energy efficient, including a EPS foam shell with an R-30 rating.

OFF-SITE FOCUS:

Panelization

PRODUCTS/SERVICES:

Pre-cast Concrete Walls
Below + Above Ground
Applications
Blueprint to CAD conversion
Off-site Manufacturing
Delivery + Installation

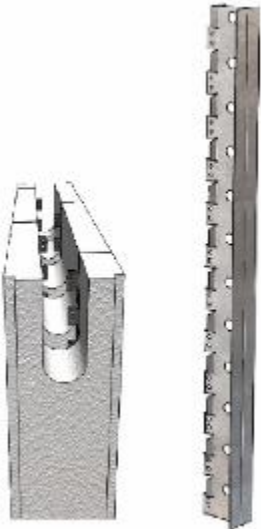
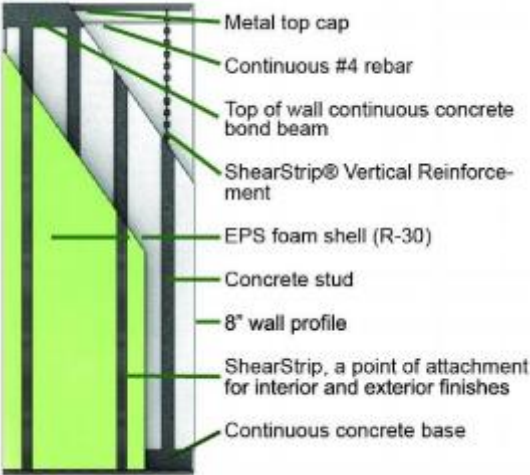
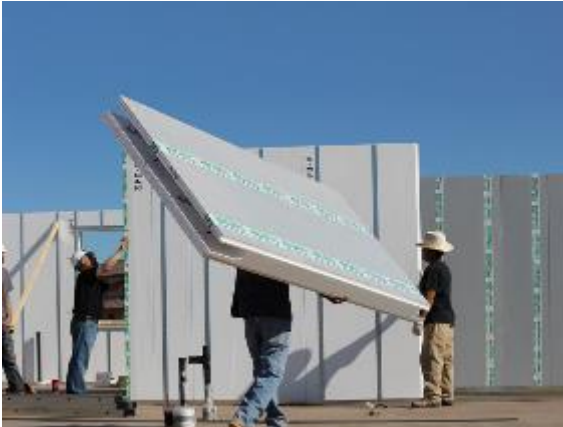
COVERAGE AREA:

Based in Tempe, Arizona;
serving the U.S.

WEBSITE: <https://hercutechinc.com>

Source:

COMPANY PROFILE



COMPANY PROFILE



OVERVIEW:

Katerra is an end-to-end building service provider for multifamily, senior living, student housing, single family and masterplan developments. In their fully-automated Phoenix facility, they produce interior and exterior wall panels, roof truss assemblies, floor systems, utility walls, cabinetry and countertops.

OFF-SITE FOCUS:

Integrated Panelization

PRODUCTS/SERVICES:

Architecture + Engineering
Interior Design
Manufacturing
Building Material Supply
General Contractor
Subcontractor
Self-perform Labor
Renovations

COVERAGE AREA:

Factories up and running in
Phoenix and Spokane, serving
the U.S.

Source:

COMPANY PROFILE



COMPANY PROFILE



OVERVIEW:

PURewall™ panels are constructed with the insulation and weather-resistant barrier installed in the panelization facility, so a completed wall is ready to be installed as soon as it gets to the job site.

OFF-SITE FOCUS:

Panelized walls

PRODUCTS/SERVICES:

Panelized walls

COVERAGE AREA:

Sacramento CA, Winchester VA,

WEBSITE:

www.covestro.com/en/purewall/purewall

COMPANY PROFILE



COMPANY PROFILE



OVERVIEW:

Raney Construction Incorporated (RCI) manages the construction of the structural shell (slab, block, framing, inspection), supplying BIM-based engineering, labor and material for all facets in a complete turnkey manner. RCI manufactures and distributes floor panels, wall panels, stairs and trusses and provides on-site installation.

OFF-SITE FOCUS:

VITS – Vertically Integrated Total Solutions (VITS); Panelization

PRODUCTS/SERVICES:

Design + Engineering
Off-site Manufacturing
Onsite JIT Installation

COVERAGE AREA:

Based in Groveland, Florida and serving the Southeast U.S.; Raney is currently looking to expand their operations

WEBSITE: <https://www.facebook.com/rcishell/>

Source:

COMPANY PROFILE



COMPANY PROFILE



OVERVIEW:

Superior Walls feature patented, insulated, precast concrete wall panels that are formed in a factory-controlled setting and delivered to the new home jobsite, where the panels are lifted into position with a crane and carefully bolted together and sealed. The walls are custom-designed and built to virtually any architectural style, complete with window and door openings.

OFF-SITE FOCUS:

Panelization

PRODUCTS/SERVICES:

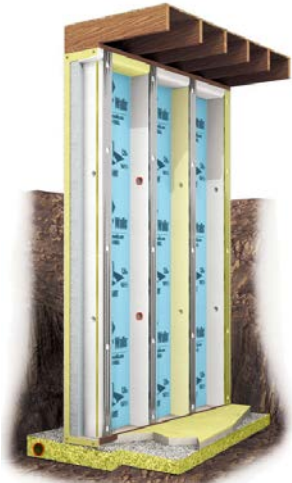
Pre-cast Concrete Walls
Below + Above Ground
Applications
Blueprint to CAD conversion
Off-site Manufacturing
Delivery + Installation

COVERAGE AREA:

Based in Pennsylvania, with a network of dealers throughout the U.S. and Canada

Source:

COMPANY PROFILE



COMPANY PROFILE



OVERVIEW:

A Bensonwod brand, Tektoniks' technology platform offers efficient production of high performance and high-quality wood-based panels and structures. Automated production lines and manufacturing machines use fully engineered drawings that have been designed according to Tektoniks specifications. Once manufactured, the components are transported and rapidly assembled on-site.

OFF-SITE FOCUS:

Prefabricated construction components

PRODUCTS/SERVICES:

Closed Panel Enclosure Systems
Timber Fabrication
Architectural Millwork

COVERAGE AREA:

Ship from production facility located in southwestern New Hampshire.

WEBSITE: www.tektoniks.com

COMPANY PROFILE

TEKTONIKS
ADVANCED BUILDING COMPONENTS

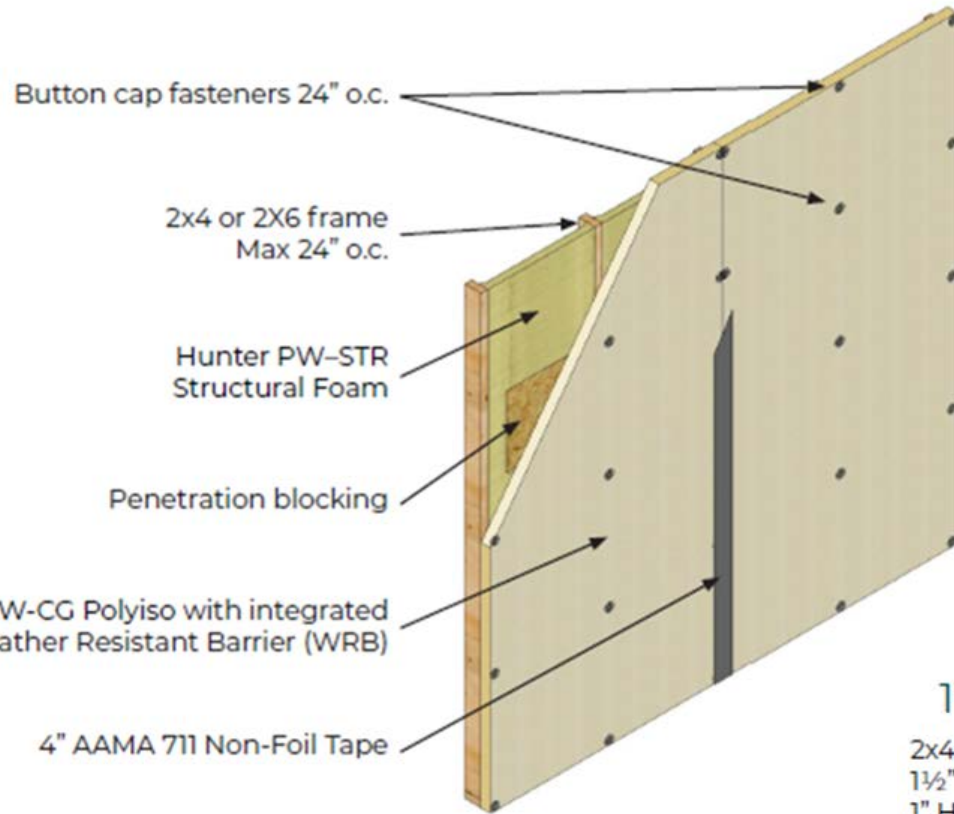


PUReWall Case Study



- **Specifications**
- **Structural**
- **Thermal & moisture performance**
- **A better value proposition**
 - New Energy Codes
 - Labor struggles
- **Productivity benefits**
- **Other benefits**

Specification



1" Exterior Foam Insulation

2x4 framed wall 24" o.c.
1½" Hunter PW-STR Structural Foam
1" Hunter PW-CG Polyiso



2" Exterior Foam Insulation

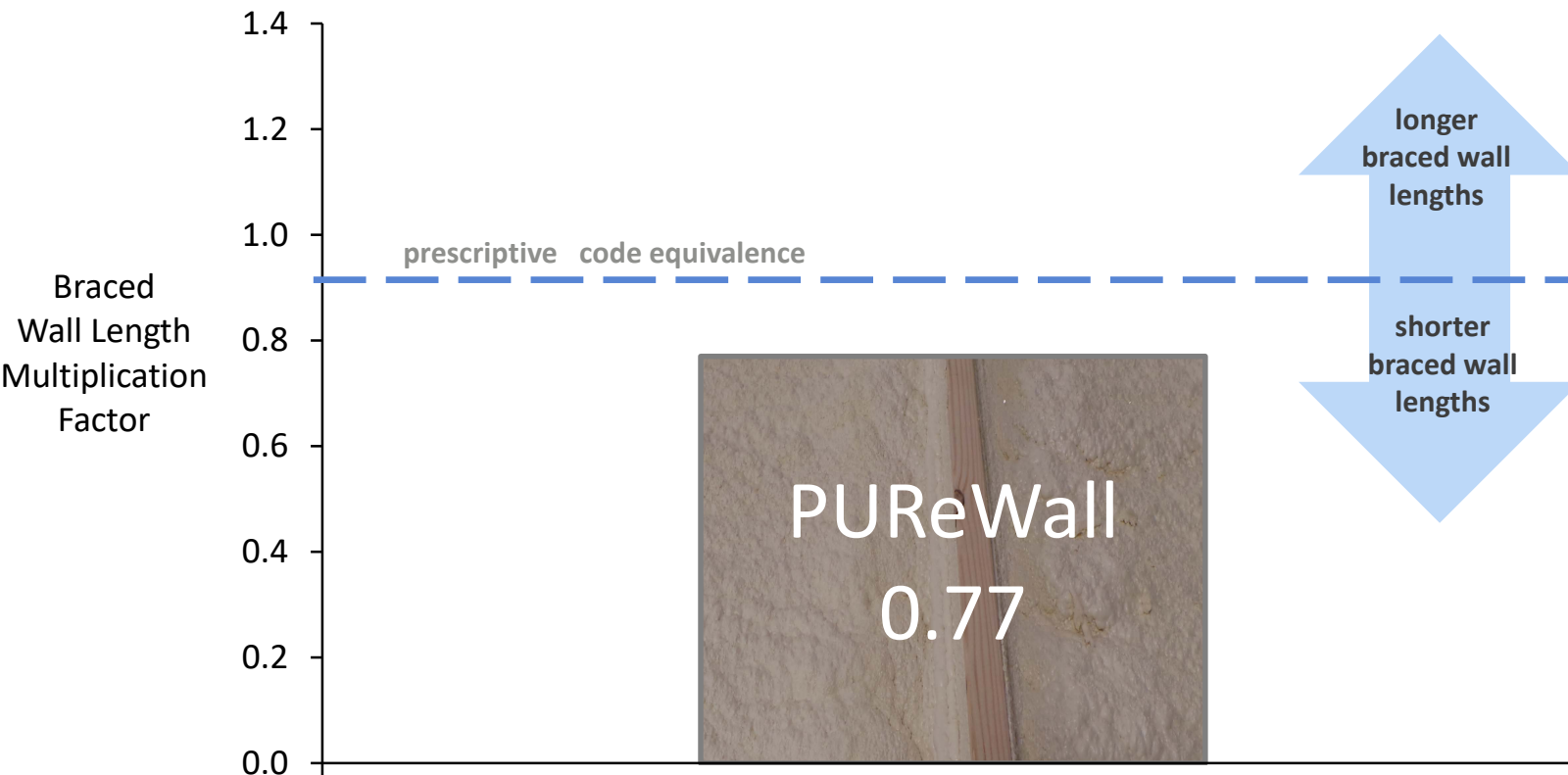
2x4 framed wall 24" o.c.
1½" Hunter PW-STR Structural Foam
2" Hunter PW-CG Polyiso



Structural Performance

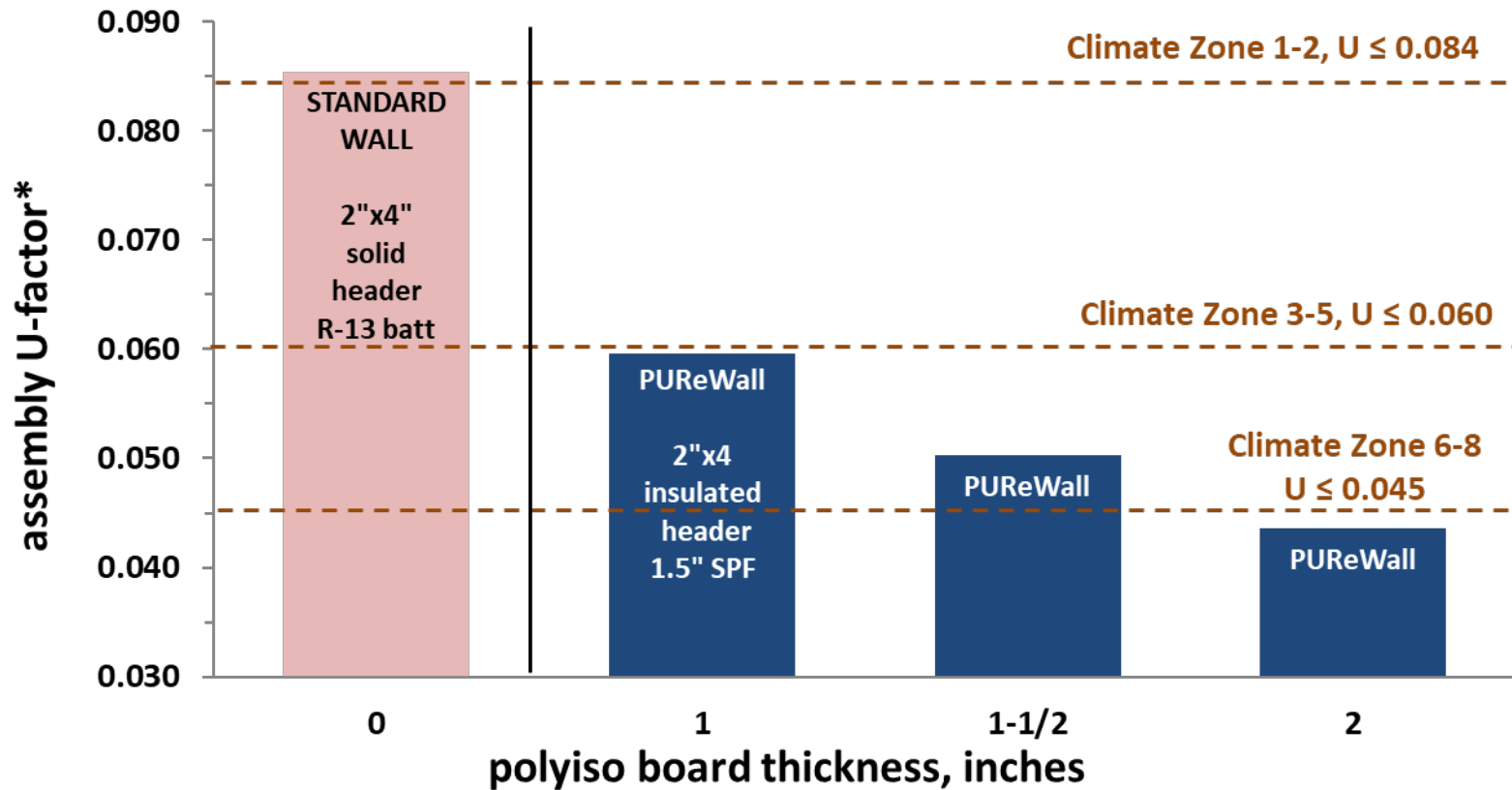


PURewall Braced Wall Length Equivalency Factor to method CS-WSP based on equivalency testing to comply with Method CS-WSP in IRC Table R602.10.3(1)



Covestro PURewall: Technical Evaluation Report 1502-03

Thermal Performance

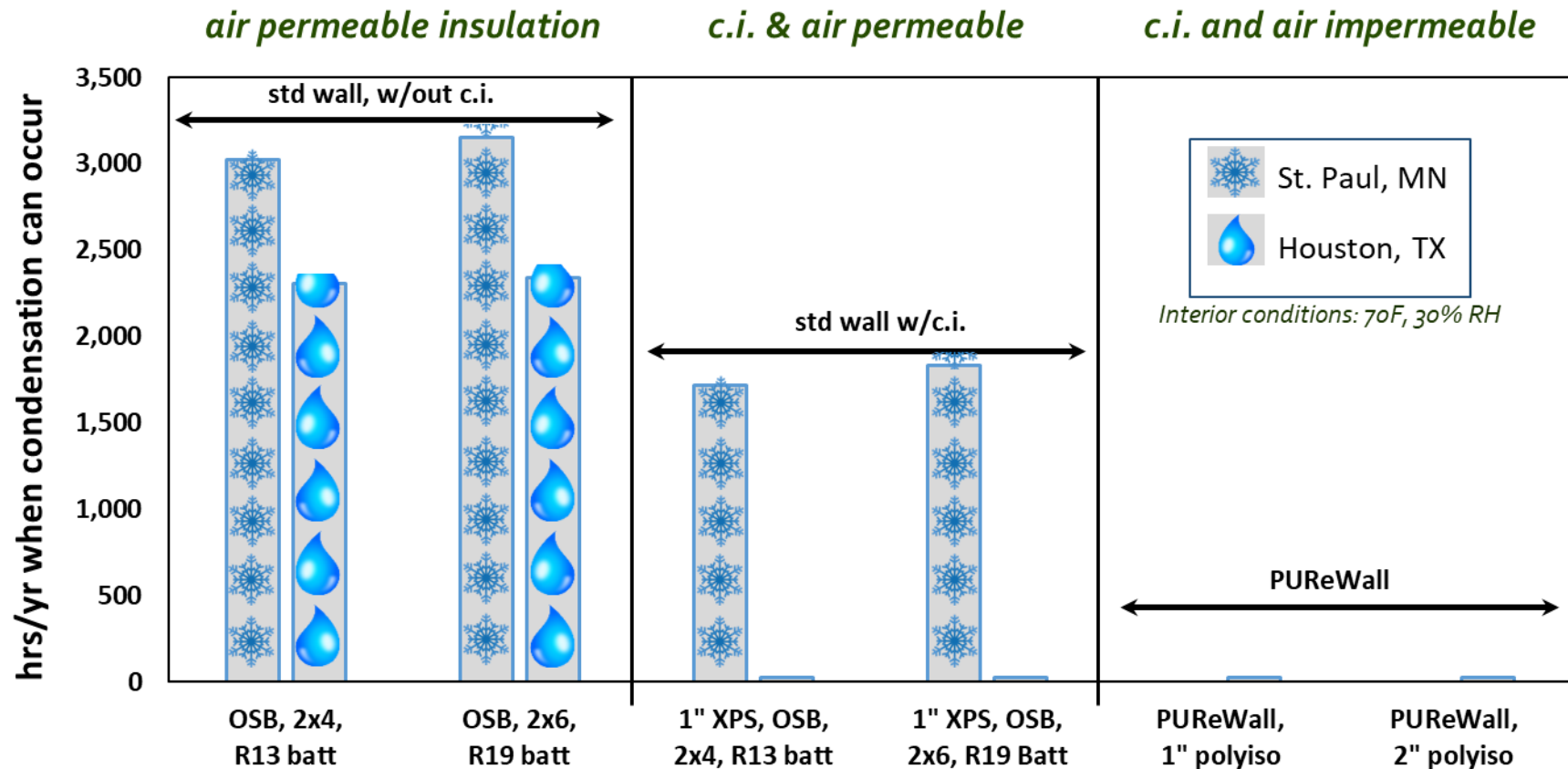


*Assumed cladding for all walls is lapped fiber cement siding.
 Assumed stud spacing for all walls is 24" oc

Condensation Performance



Potential for summer and winter condensation occurrences in different types of wall assemblies



Productivity Benefits



8am



10am



12:30pm



3:00pm



One day to erect all walls and floors with insulation and WRB integrated offsite

Implications for HERS raters

2D components (with insulation)

- Easier to determine inspection grade
- No draftstopping needed to inspect
- Air tightness, easier to achieve

3D modules

- Many of the traditional inspections are done in the manufacturing plant
- Duct tightness and air tightness still need to be completed on building site, post assembly of modules

The image features a central blue square containing the IBACOS logo. The logo consists of the word "IBACOS" in a large, white, serif font, with a registered trademark symbol (®) to its upper right. Below "IBACOS" is the word "innovation" in a smaller, white, lowercase, sans-serif font, enclosed within vertical bars on both sides. The background of the entire image is a grayscale photograph of a construction site, showing a complex network of steel beams and scaffolding that recede into the distance, creating a sense of depth and perspective.

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