Healthy Living *For Life!*

EPS BUILDINGS

NEW HOME PROVEN
PERFORMANCE CASE STUDIES

NEW HOME BUILDING

Does Testing Matter?

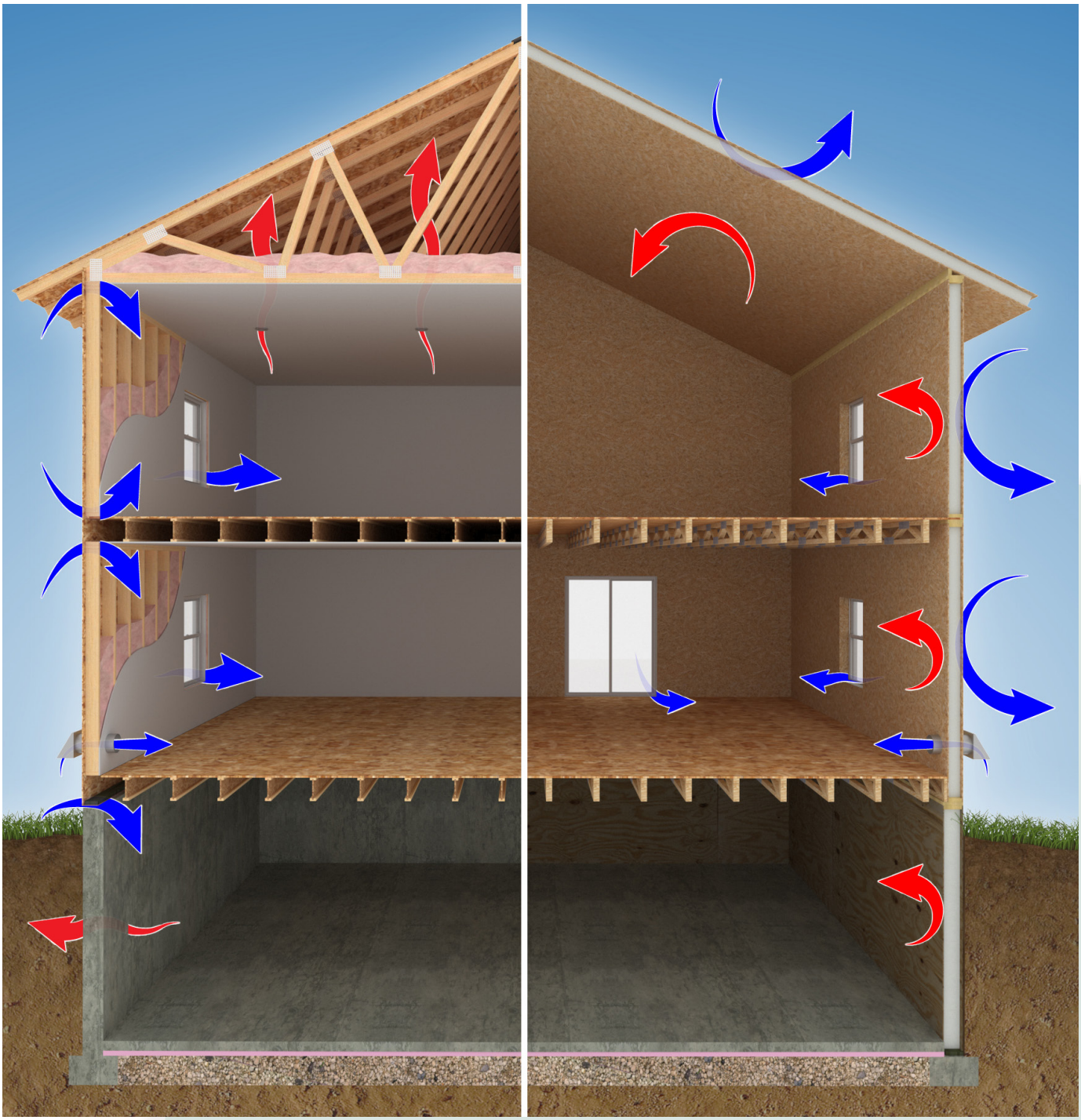
What to know before you build

After making the choice to build a new home, the process can seem daunting. From finance, to design, to appearance and final finishing, there is a long list of things that require attention in creating a home that will last your family Forever.

One of the most important considerations for a lifelong home is getting a good understanding of what your home is made of, how it is constructed, and what are the important options that must be compared to make the right choices.

We know the terminology alone can make a conversation about your new home difficult. We provide the information here to assist you in gaining knowledge about material options and construction methods. Information provided about testing methods can you build confidence in the choices you make for your new home.

Before designing your new home, consider investing in energy efficiency. You will save energy, money and your new home will be more comfortable and durable.



A side-by-side comparison of traditional stick-built to an EPS SIP-built home showing the major energy leaks in a home.

TOOLS TO MEASURE

Air-Infiltration

What is Air-Infiltration?

According to the Department of Energy, a typical home contains a half-mile of cracks and gaps behind walls and around windows and doors, along with dozens of holes for pipes, vents, ducts, lighting, and wiring.

When these openings do not exist or are sealed, there are reduced drafts, moisture, dust, pollen, pests, and noise.

The energy savings can quickly add up when you think about all of the places that hot or cold air can enter or exit your home.

The air exchange rate is also known as air changes per hour (ACH). The 2012 IECC Building Codes mandates testing and a verified maximum air leakage rate of 5 ACH in Climate Zones 1-2 and 3 ACH in Climate Zones 3-8. All new construction is required to be both visually inspected and pressure tested. This requirement makes new homes much tighter than previous codes.

The Code also calls for a permanently affixed certificate posted on or near the electrical panel showing the results of whole-house pressure tests in addition to the predominant R-values of insulation.

How is Air-Infiltration Measured?

A blower door test is done to measure the airtightness of a building enclosure. The best time to perform a test is after the building has been enclosed and before the interior is finished. This will allow any potential openings to be sealed before the interior and exterior finishes are installed.

A blower door consists of a frame that blocks a door, with a mounted fan, and equipment that can measure air pressure and air flow. A technician sets up the equipment and the fan pushes air out of the house, depressurizing the interior. This causes air to be pulled in through any cracks, seams or other overlooked areas. The fan is adjusted to create a difference of 50 Pascals between the inside and outside. This allows the leakiness to be measured.

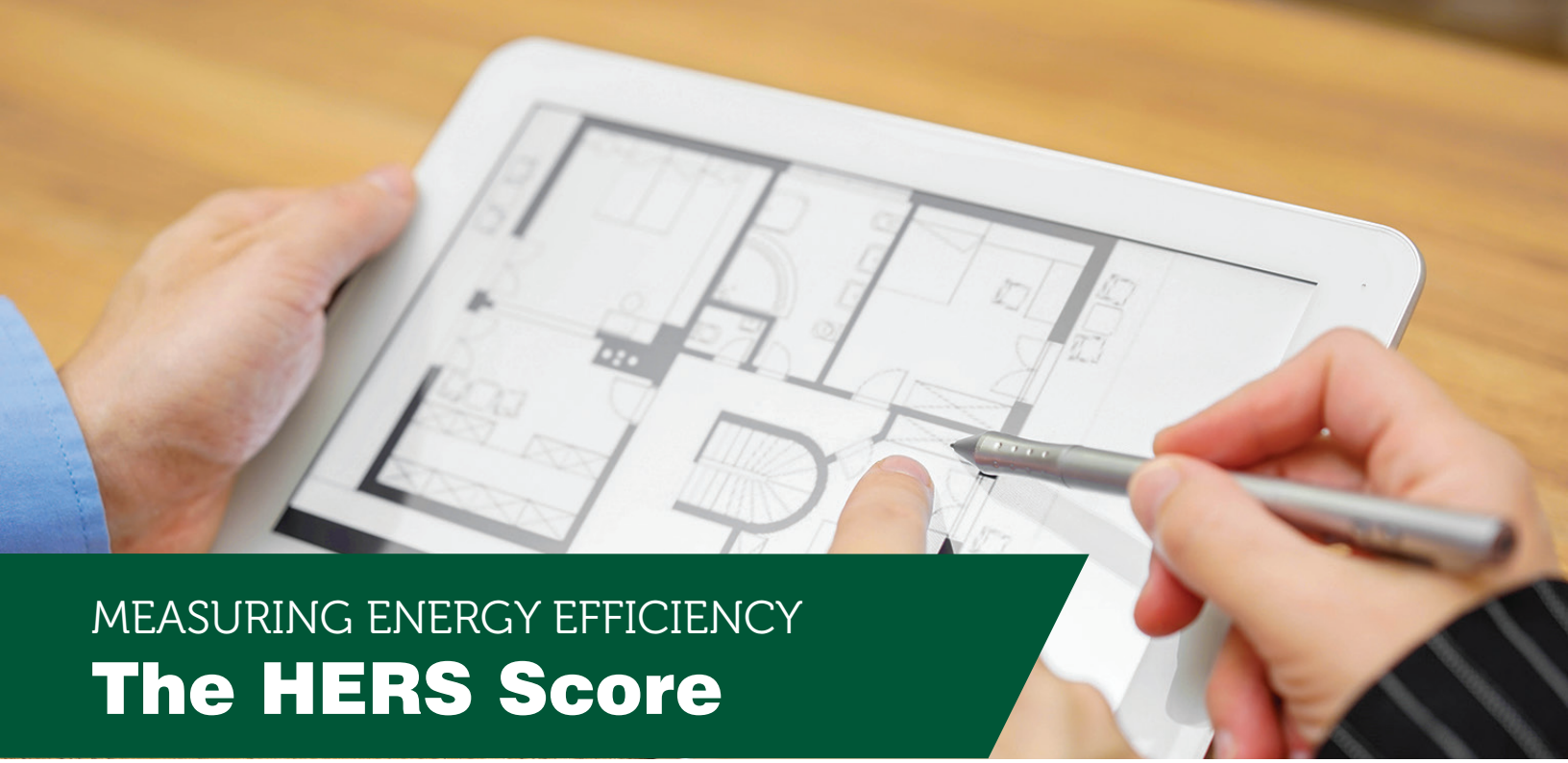
Why Does it Matter?

- *Reduced energy costs*
  Energy savings for heating and cooling is the result of reducing the air leakage into and out of the home.

- *Avoiding Moisture Condensation Problems*
  When air moves, it takes moisture with it. This moisture can gather creating condensation and put the home at risk for mold and decay.

- *Improved Comfort*
  Less air leakage means there is a reduction in drafts, noise, moisture and pests.

- *Right-size for HVAC equipment*
  Understanding the ACH of a new home can create a better understanding for having the right size of HVAC equipment and can reduce peak heating and cooling loads.



MEASURING ENERGY EFFICIENCY

The HERS Score

What is a HERS Score?

The Home Energy Rating System (HERS™) is the industry standard by which a home's energy efficiency is measured. It is the nationally recognized system for inspecting and calculating a home's energy performance.

Third-party raters conduct inspections to verify a home's energy performance at key intervals during home construction. The HERS Index Score can tell the home owner how efficiently the home will operate so modifications can be made for greater energy savings. This helps the home owner anticipate the costs of energy bills and efficiency upgrades.

The U.S. Department of Energy has determined that a typical resale home scores 130 on the HERS Index while a standard new home is awarded a rating of 100. The lower a home rates, the more energy efficient it is. Therefore, a home rating of 70 on the HERS Index is 30% more efficient than a standard new home and a rating of 130 is 30% less efficient than a standard new home.

The lower the HERS Index, the more energy efficient a home is, meaning lower energy costs for the home owner. A low HERS Index adds long-term value and comfort to a home. As energy costs continue to climb, efforts to save on utility bills, increase home comfort and reduce our impact on the environment are now more important than ever before.

How is a HERS Score Determined?

A third-party certified home energy rater does an analysis of a home's construction plans and on-site inspections. Then, they use an energy efficiency software package to perform an energy analysis of the home's design. This analysis yields a projected, pre-construction HERS Index. Upon completion of the plan review, the rater will work with the builder to identify the energy efficiency improvements needed to ensure the house will meet the desired performance guidelines.

After construction is complete, the rater then conducts onsite inspections, typically including a blower door test (to test the leakiness of the house) and a duct test (to test the leakiness of the ducts). Results of these tests, along with inputs derived from the plan review, are used to generate the HERS Index score for the home.

Why Does it Matter?

- *Understand Whether a Home will be Energy Efficient or Not*

The HERS Index Score tells homeowners how their homes compare to similar ones in terms of energy usage. During home planning and design, a pre-rating can be done to determine the potential for energy savings.

- *Calculate a More Accurate Cost of Homeownership*

Many people considering building a new home will look primarily at prices and mortgage options when deliberating the financial cost of the home. However, evaluating the long-term energy costs of the home will provide a more accurate picture of the cost of the home.

- *Improve Home Comfort and Reduce Energy Bills*

Two things that impact homeowners directly are home comfort levels and energy bills. A drafty home, which is too cold in winter and too hot in summer, will suffer from high energy bills. What that means is that all in all, the home is performing inefficiently as a complete system.

- *Enjoy a Higher Home Resale Value*

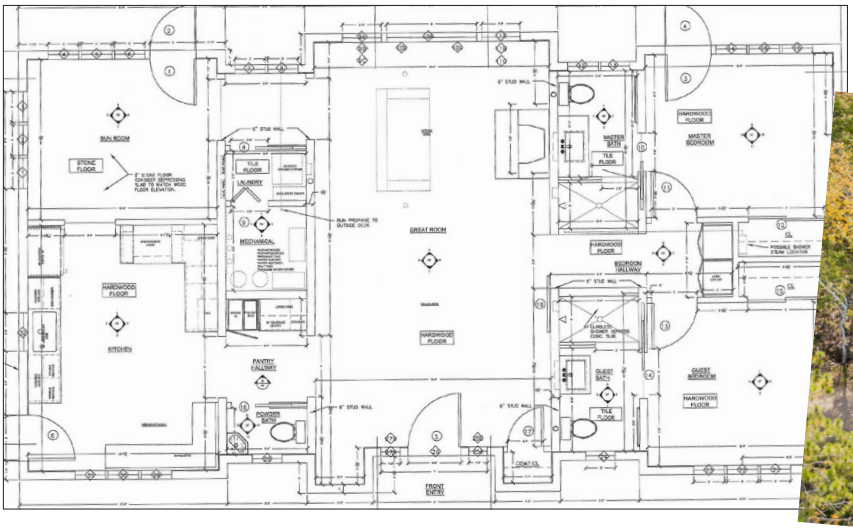
According to RESNET (Residential Energy Services Network),there is real proof that energy efficient homes are worth more and enjoy higher resale values than their counterparts. A study conducted by Earth Advantage Institute, a nonprofit group, found that newly built homes that were certified as energy efficient sold on average for 8% more than non-certified homes. Not only that but certified existing homes sold for up to 30% more than their non-certified counterparts.

THE EPS DIFFERENCE

Proven Performance

The Miller Cabin located in Northern Minnesota

Year Built: 2019
Floor area: 1505 sq. ft.
Bedrooms: 2
Builder: Code Plus
SIP wall thickness: 6-inch
SIP roof thickness: 10-inch
HVAC: Electric boiler on dual fuel with propane backup,
no air conditioning, air exchange
Window U-Value: U-25
Other considerations: LED lighting, Lov-VOC, stained concrete floors



Results:

- Home Energy Rating: 37

The HERS Index Score means this home will perform 63% better than a standard built home.

- Blower Door Test: 1.41 ACH

- *Special Features: vaulted roof with SIPs and beams*

The homeowners wanted a new home that was energy efficient, healthy, and comfortable while also making it easy to build in the bluffs of Northern Minn.

- *Customer comments:*

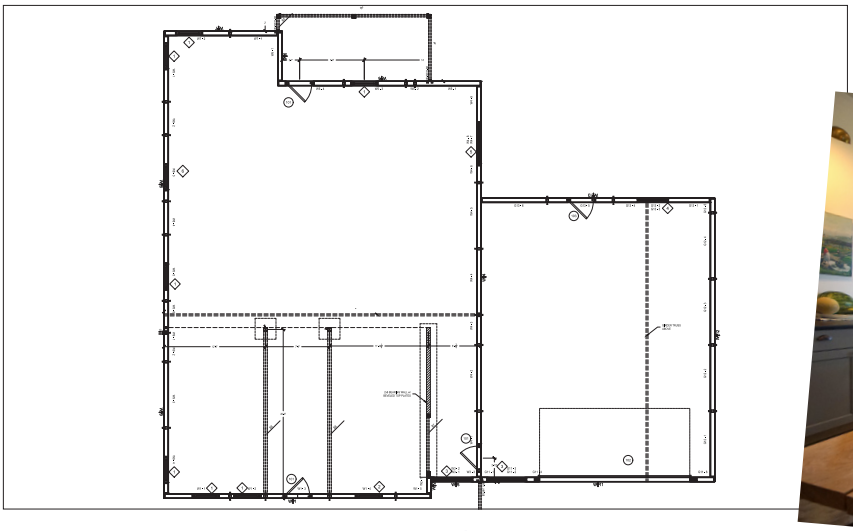
"My wife and I took on a project of building a 1500 sq. ft. cabin in the Northwoods in Ely, Minnesota. This project took 3-1/2 years to plan and complete. One of the best things we did was hire a contractor that works with SIPs manufactured by EPS. The outcome is a very tight building. Its cool in the warm months, and warm in the cold months, and quiet too. We have enjoyed our first five months stay this last summer. We hope to spend some time in the winter in 2020."

THE EPS DIFFERENCE

Proven Performance

Modern Farmhouse in South-central Minnesota

Year Built: 2019
Floor area: 1973 sq. ft.
Bedrooms: 2/3
Builder: Square One Contracting
SIP wall thickness: 6-inch
SIP roof thickness: 10-inch Neopor
HVAC: In-floor
Window U-Value: 25
Other considerations: LED lighting, Lov-VOC, stained concrete floors



Results:

- Blower Door Test: 1.51 ACH

- *Special Features: vaulted roof, large covered porch*

The homeowners were familiar with structural insulated panels and searched out EPS for their expertise and experience.

- *Customer comments:*

"We have thought about building a SIPs house since we toured a plant where the homes are built.

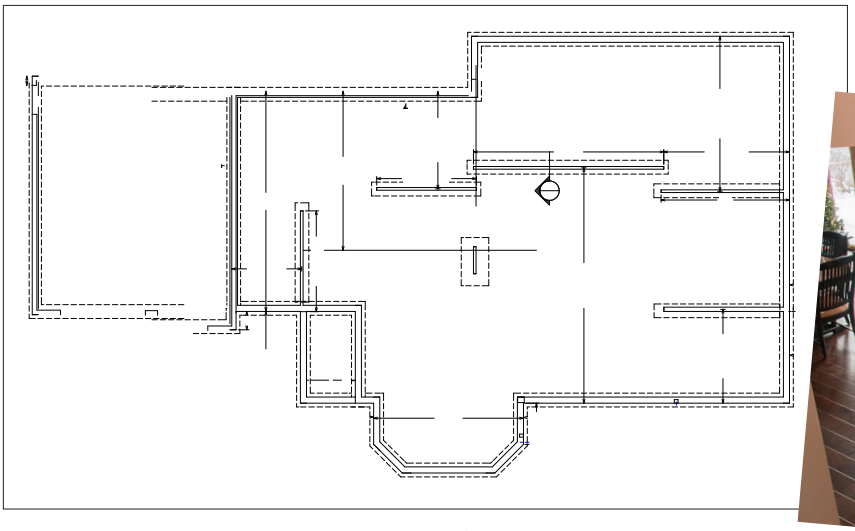
It is impressive how the houses are constructed within a confined warehouse under constant supervision. We enjoyed not having to worry about a house half-built and then sitting out in the elements. Being a realtor, I feel I was a tough critic of the home building industry. Plus, this was going to be our forever home on family land. EPS fulfilled all our expectations and more. Now, after a year in our new home, I can testify that our heating bills are very affordable! Could not be more pleased."

THE EPS DIFFERENCE

Proven Performance

Northern Minnesota Family Home

Year Built: 2019
Floor Area: 2098 sq. ft.
Bedrooms: 4
Builder: Taiga Design Build
SIP wall thickness: 6-inch
SIP roof thickness: 10-inch
HVAC: Dual fuel, in-floor, radiant heat. Primary heat source for the hydronic fluid is an interruptible electric boiler (100% efficient). The secondary source is a propane boiler (95% efficient) which also serves as a secondary source of domestic hot water. Woodburning stove with FlexBurn technology also used for heating. Air exchanger provides outside air.
Window U-Value: U-25
Other considerations: All LED lighting, energy-efficient appliances, efficient Sierra Pacific windows; Low VOC paints, wood floors



Results:

- Home Energy Rating: 42

The HERS Index Score means this home will perform 58% better than a standard home.

- Blower Door Test: 1.02 ACH

- *Special Features: vaulted roof with SIPs and numerous architectural beams*

- *Customer comments:*

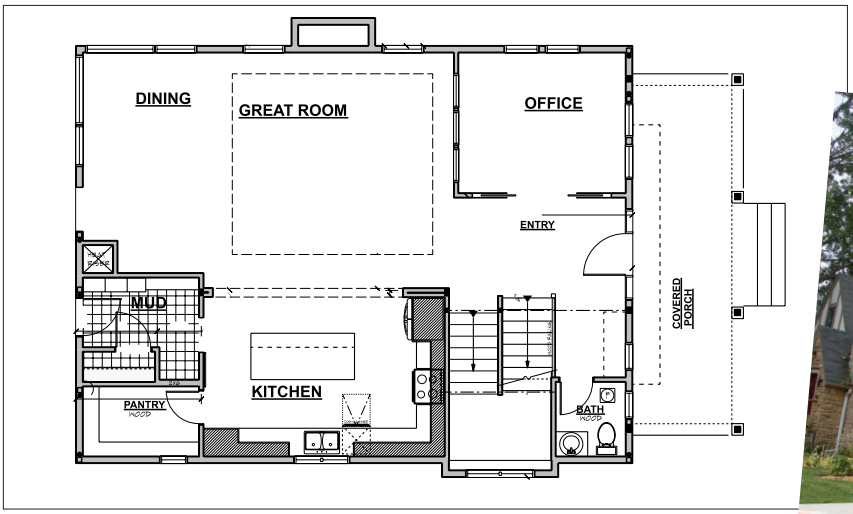
"We are finding the SIP construction to be superior to any home we have owned. The ease of erecting the SIPs proved helpful when the construction of our home entered the winter months. The house is well built and gives one the feeling of being in a very quiet, sturdy structure. Our new home is in a climate with moderately warm summers and very cold winters. In summer, it remains cool even on a hot day. On a cold winter day, the home retains heat and is very comfortable. We anticipate the annual heating costs will be lower than if we had used traditional construction techniques."

THE EPS DIFFERENCE

Proven Performance

Single-family home built in St. Paul, Minnesota

Year Built: 2019
Floor area: 2,476 sq. ft.
Bedrooms: 4
Builder: Sharkey Design Build
SIP wall thickness: 6-inch
Roof: Spray foam
HVAC: Gas, 96% forced air
Window U-Value: U-25
Other considerations: Energy-Star rated appliances, low VOC paints and carpets.



Results:

- Home Energy Rating: 36

  The HERS Index Score means this home will perform 64% better than a standard home.

- Blower Door Test: 1.40 ACH

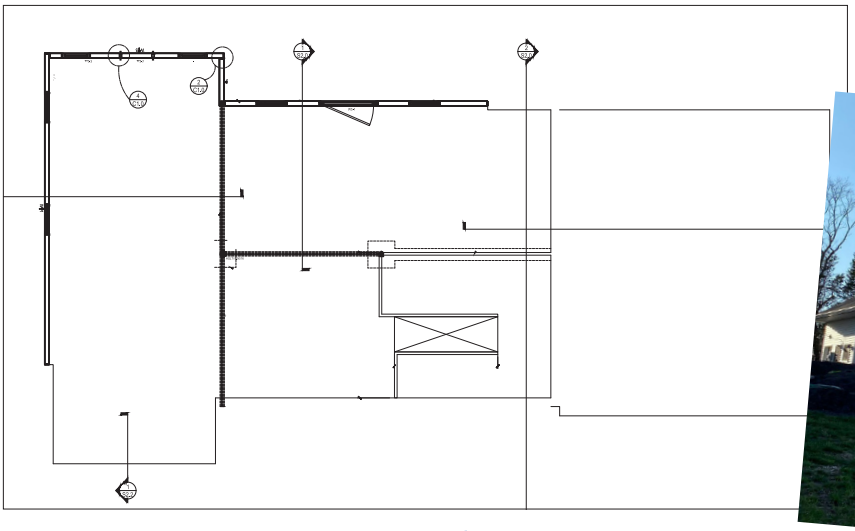
- *Special Features:* Due to a small lot, SIPs helped greatly with construction. Owner has a sensitivity to allergies and SIPs were ideal for keeping their home air-tight.

THE EPS DIFFERENCE

Proven Performance

Single-family home built in Scandia, Minnesota

Year Built: 2019
Floor area: 2200 main floor without basement
Bedrooms: 3
Builder: Self
SIP wall thickness: 6-inch
Roof: EPS Truss Package
HVAC: Forced-air/heat pump
Window U-Value: 26
Other considerations:



Results:

- Blower Door Test: 1.96 ACH

- *Customer comments:*

"When I was planning the build of my forever home, a friend of mine recommended I look into structural insulated panels that incorporated traditional stick framing practices into the panel for my lumber package. I researched the various companies and learned that EPS produces a product with far superior energy efficiency. I met Lee at the Minn. State Fair and he and the entire team at EPS were great to work with. From the engineering team to the logistics, I was amazed with everyone's professionalism. Lee went above and beyond when he came on site to meet with subcontractors contractors who were unfamiliar with SIPs to ensure they were set up for success. I had a fantastic experience working with EPS and would highly recommend them as a top choice for your future construction needs."

THE EPS DIFFERENCE

Proven Performance

Single-family home built in Minneapolis, Minnesota

Year Built: 2019
Floor area: 1620 sq. ft./ 810 per floor
Bedrooms: 3
Builder: Self
SIP wall thickness: 6-inch
SIP roof thickness: 10-inch Neopor
HVAC: In-floor heat/heat pump
Window U-Value: 25

Results:

- Blower Door Test: 2.61 ACH

THE EPS DIFFERENCE

Proven Performance

Single-family home built in Minneapolis, Minnesota

Year Built: 2019
Floor area: 3440 sq. ft.
Bedrooms: 2
Builder: ShaneCon
SIP wall thickness: 6.5-inch
SIP roof thickness: 10-inch Neopor
SIP floor thickness: 10-inch Neopor
HVAC: In-floor heat and passive
Window U-Value: 25
Other considerations: Built on top of an existing 3-story building

Results:

- Home Energy Rating: 32

The HERS Index Score means this home will perform 68% better than a standard home.

- Blower Door Test: 1.96 ACH

THE EPS DIFFERENCE

Proven Performance

Single-family home built in Willernie, Minnesota

Year Built: 2020
Floor area: 2166 sq. ft.
Bedrooms: 3
Builder: Green Halo
SIP wall thickness: 6-inch, R-26
HVAC: In-floor heat/heat pump
Window U-Value: 27
Solar Panels: 40340 W

Results:

- Home Energy Rating: 47

The HERS Index Score means this home will perform 53% better than a standard home. This home meets or exceeds the 2009 and 2012 International Energy Conservation Codes.

THE EPS DIFFERENCE

Proven Performance

Single-family home built in Maple Lake, Minnesota

Year Built: 2020
Floor area: 2128 sq. ft.
Bedrooms: 4
Builder: Arvola Builders
SIP wall thickness: 6-inch, R-26
Window U-Value: 27

Results:

- Blower Door Test: 1.92 ACH

THE EPS DIFFERENCE

Proven Performance

Multi-family living built in Mahtomedi, Minnesota

Year Built: 2012
Floor area: 332 to 464 sq. ft. per apt.
Levels: 3
Builder: Stone Construction
SIP wall thickness: 6-inch, R-26
SIP roof thickness: 10-inch
HVAC: Fuel fired hydronic distribution, natural gas; air-source electric heat pump
Windows: Andersen 100-Series SmartSun glass

Results:

- Home Energy Rating: 46

The HERS Index Score means this home will perform 54% better than a standard home.

THE EPS DIFFERENCE

Proven Performance

Multi-family living built in St. Peter, Minnesota

Year Built: 2019
Floor area: 20,150 per floor
Bedrooms: 2
Builder: RW Carlstrom
SIP wall thickness: 6-inch, R-26
HVAC: Heat Pump, 14 SEER
Window U-Value: 27

Results:

- Blower Door Test: 1.73-1.97 ACH per apt.

NEW HOME BUILDING

SIPs Make it Better

Structural Insulated Panels are Simply Superior

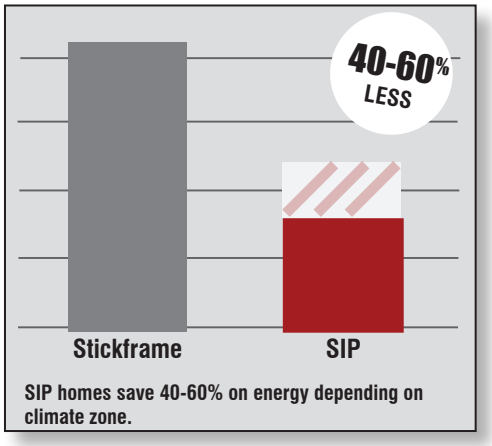
1 Enhanced Comfort

Properly installed insulation, like that in SIPs, minimizes temperature variability indoors and helps keep rooms warmer in the winter and cooler in the summer. A new home built with Structural Insulated Panels reduces air movement and drafts, moisture, noise and helps keep dust and allergens from penetrating.

2 Less Energy Usage

As much as half of the energy used in your home goes to heating and cooling. By preventing heat loss in the winter and heat gain in the summer, SIPs reduce utility bills year round.

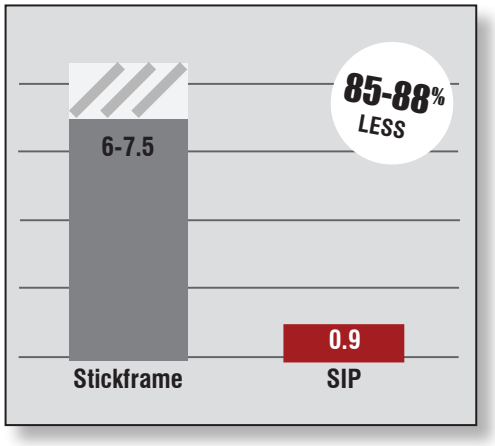
Building with SIPs creates a superior building envelope with high thermal resistance and minimal air infiltration.

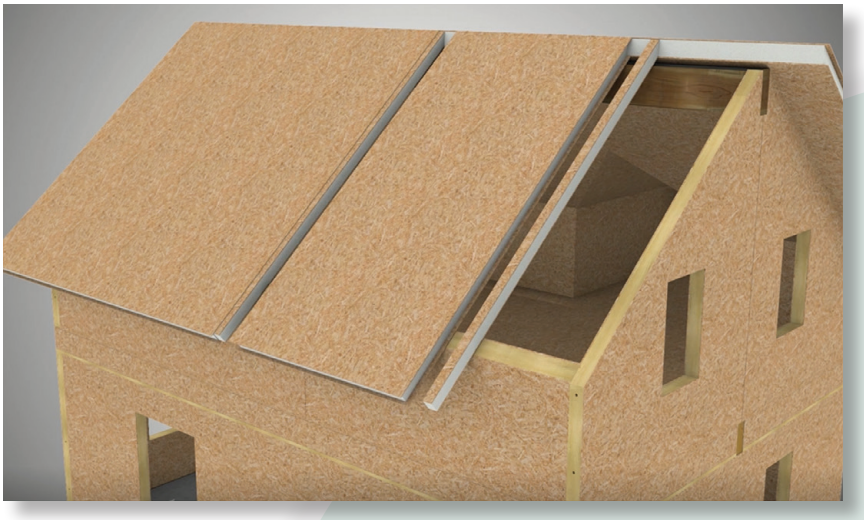


SIP homes save 40-60% on energy depending on climate zone.

3 Less Air Leakage

SIPs are one of the most airtight and well insulated building systems available, making them an inherently green product. An airtight SIP building will use less energy to heat and cool, allow for better control over indoor environmental conditions, and reduce construction waste.





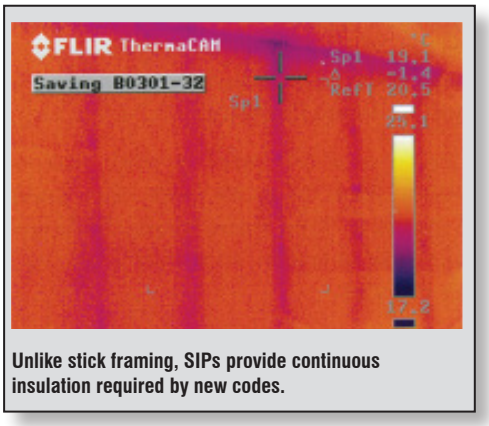
Structural insulated panels are high-performance building panels used in exterior walls, roofs and floors for residential and commercial construction. EPS manufactures the panels by sandwiching a core of rigid foam insulation between two skins of wood structural sheathing, typically oriented strand board (OSB).

NEW HOME BUILDING

SIPs Make it Better

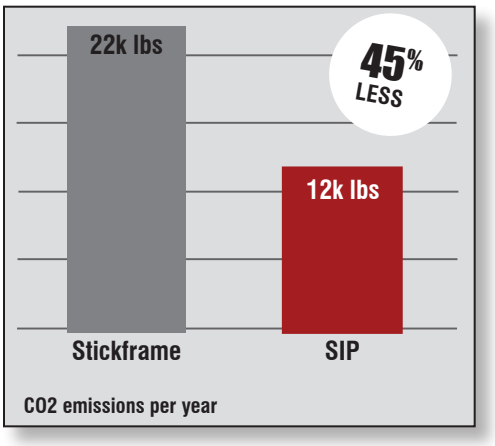
4 Less Thermal Bridging

When field-installed insulation is measured in the laboratory, the test only measures the insulation itself, and not the other components that make up the wall or roof system. Wood-framed homes rely on dimensional lumber, referred to as studs, at regular intervals to provide structural support. Lumber is a very poor insulator and forms a bridge from the outside of the home to the inside of the home where heat can pass through by conduction. This process is known as thermal bridging. Another issue with field-installed insulation is the installation itself. Fiberglass must be installed between studs and cut to fit around window openings and wiring. This process can never be perfect and leaves gaps where there is no insulation at all.



Unlike stick framing, SIPs provide continuous insulation required by new codes.

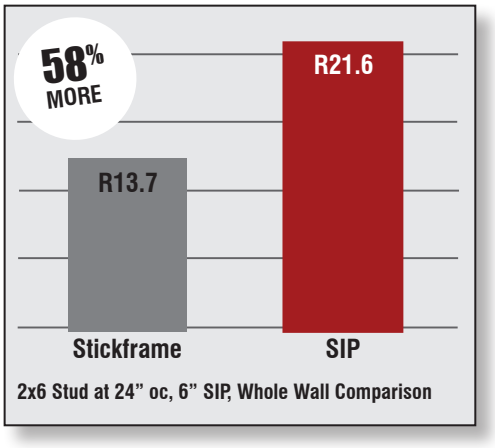
5 More Sustainable



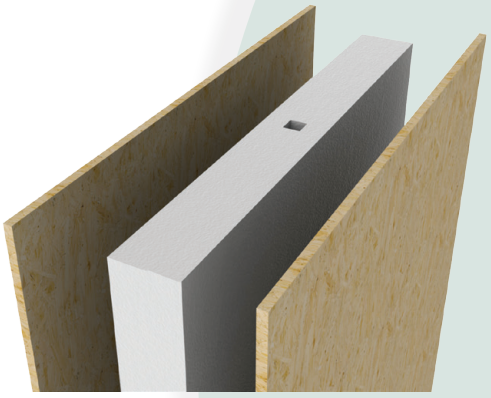
The construction and operation of buildings has a significant impact on the environment. Buildings account for 39% of total U.S. energy consumption and 38% of carbon dioxide emissions. Sustainable buildings use less energy, reducing carbon dioxide emissions and playing an important role in combating global climate change. Buildings also use a tremendous amount of natural resources to construct and operate. Constructing sustainable buildings that use these resources more efficiently, while minimizing pollution that can harm renewable natural resources, is crucial to a sustainable future.

6 More R-Value

Insulation is rated by R-value, which measures a material's thermal resistance. An insulating material with a higher R-value forms a more effective thermal barrier between the outside temperature and the conditioned space inside the home. When real world factors such as air infiltration, extreme temperatures and thermal bridging are present, field-installed fiberglass insulation can lose more than half its R-value. Research has repeatedly shown that SIPs provide continuous insulation that will maintain its stated R-value for the life of the home and outperform fiberglass insulation every time.



Wall Type	Plate Thickness	Panel Thickness	Panel Make Up	Whole Wall R-Value at exterior temp. of 75°	40°	Whole Wall R-Value NEOPOR® 75°	40°	Weight (PSF)
R-18	3⅝	4½	7/16 OSB, 3⅝ EPS, 7/16 OSB	18.0	20.6	20.25	22	3.3
R-26	5⅝	6½	7/16 OSB, 5⅝ EPS, 7/16 OSB	22.8	24.1	29.25	31.5	3.5
R-33	7⅜	8¼	7/16 OSB, 7⅜ EPS, 7/16 OSB	30.1	31.8	37.00	40.0	3.6
R-40	9¼	10⅛	7/16 OSB, 9¼ EPS, 7/16 OSB	38.5	40.0	46.0	50.0	3.9



A comparison of Whole Wall R-Value. The thickness of an EPS wall panel can be adjusted to increase R-Value.

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