# Getting to Zero Energy Homes (ZEHs)
# Faster, Better and Greater Value

NAHB IBS™

IBS Education

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# Meet Your Speakers


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https://www.youtube.com/user/SIPAvideo

# Outline

- Getting to Zero Electric Homes (ZEHs):
  - What We Know with Certainty
  - Building Blocks
  - Five Enclosure Imperatives
  - Faster, Better, Greater Value Enclosures
- Translating Faster, Better, Greater Value ZEH Enclosures
- Getting to Zero SIP Resources

# ZEHs: What We Know with Certainty

# What we Know with Certainty

1. ZEHs Have Left the Station
2. ZEHs Must Manage Greater Value Risks
3. ZEHs Must be Future Ready

# ZEHs Have Left the Station: National Codes

## Improvement in Energy Code (1975-2021)

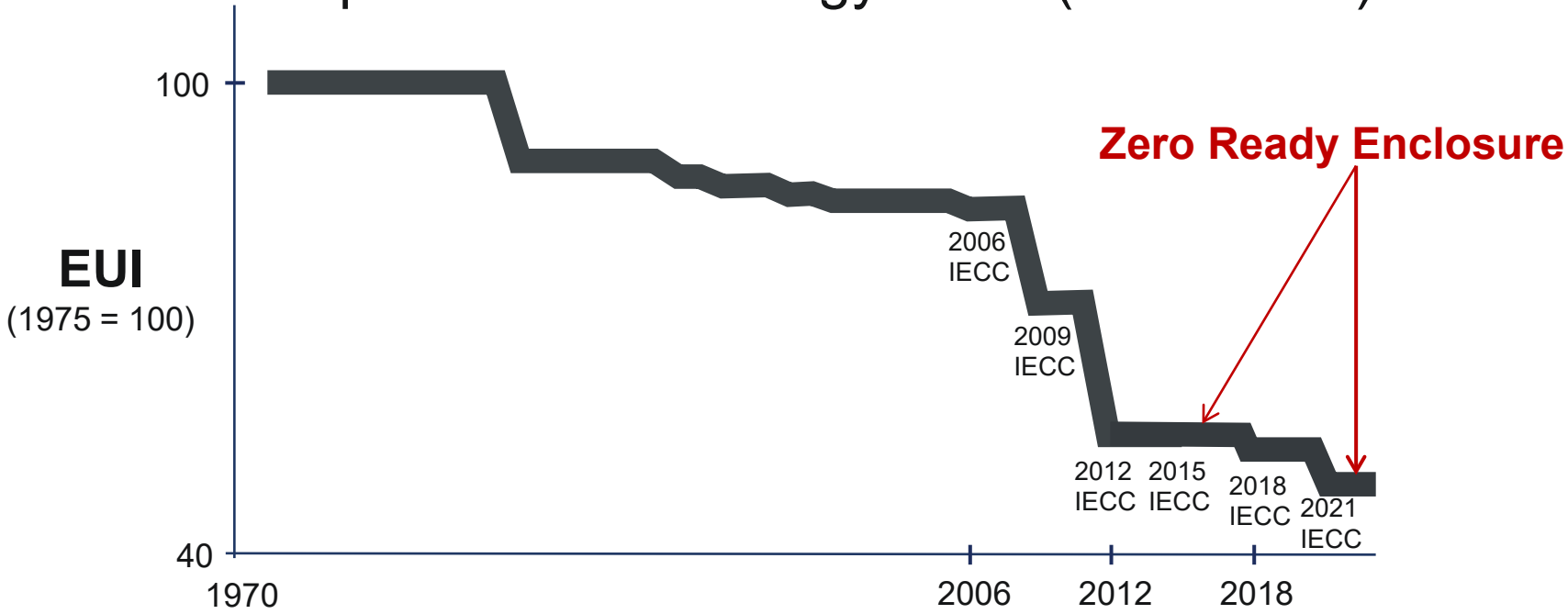
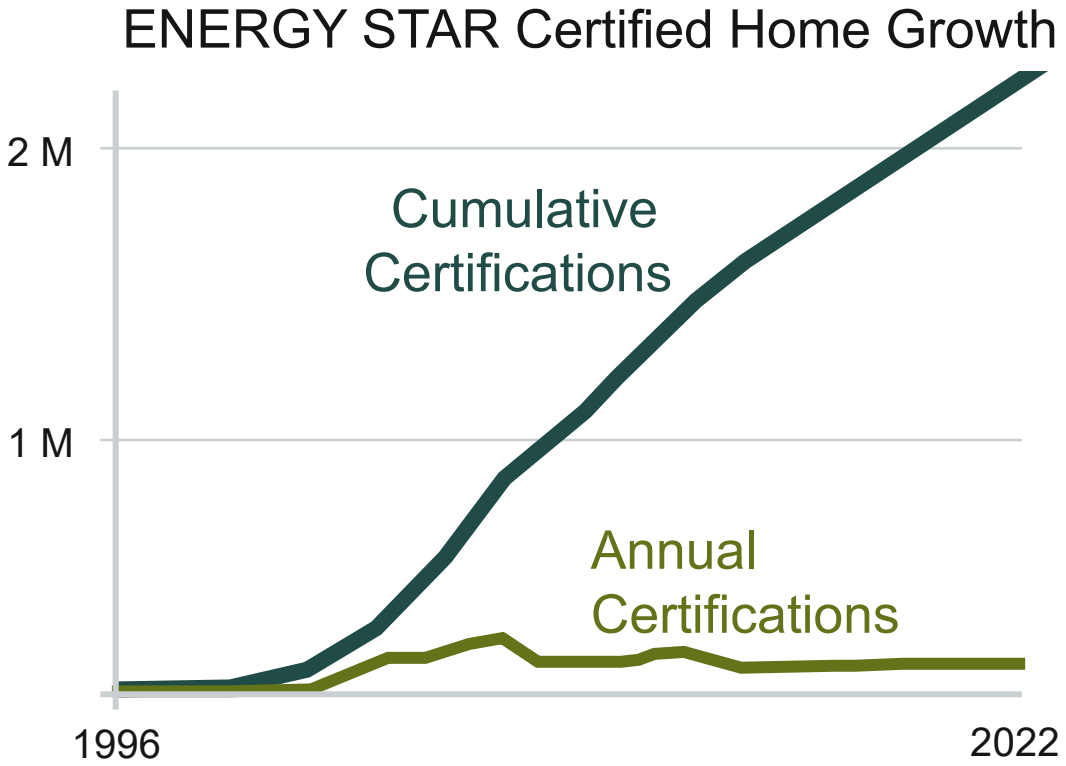



Image Basis: Building Energy Codes Program: National Benefits Assessment, 1992-2040

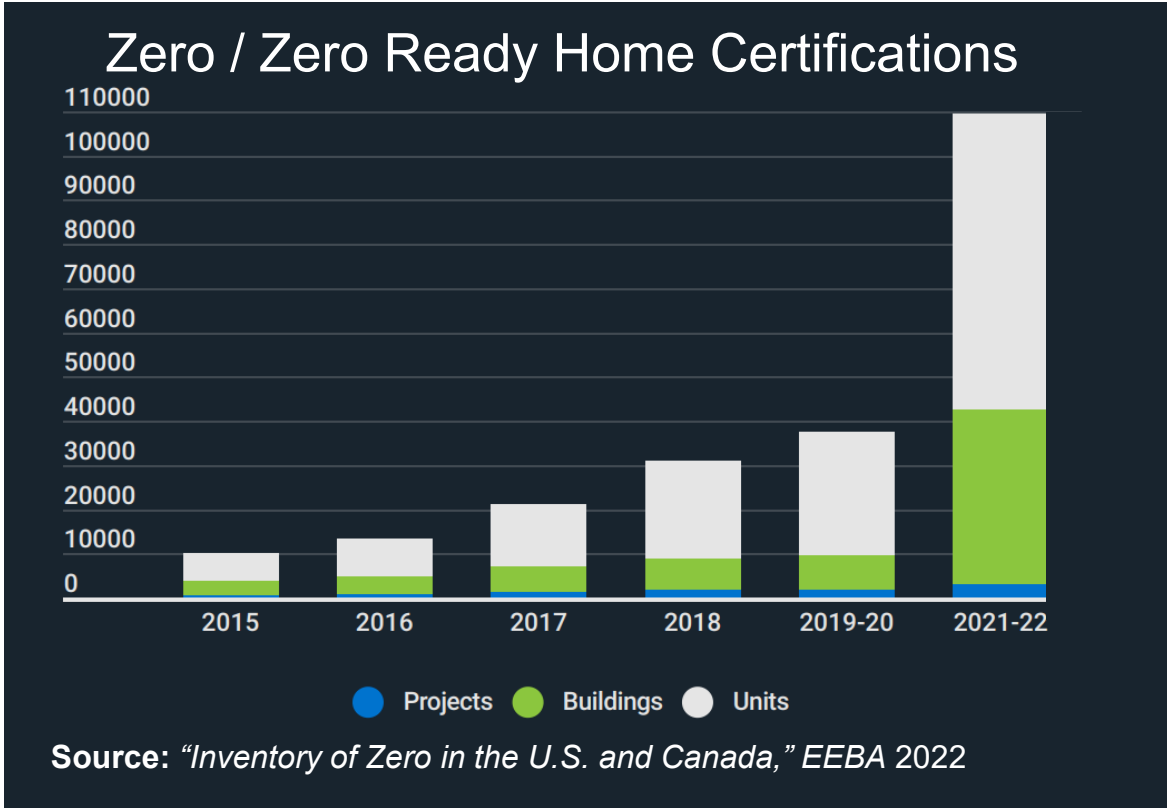
# ZEHs Have Left the Station: Certifications




**~2.5 Million**

ENERGY STAR Certified Homes

# ZEHs Have Left the Station: Certifications




**Source:** *"Inventory of Zero in the U.S. and Canada," EEBA* 2022

**440%**

growth in single-family zero energy ready and zero energy homes since 2020

# ZEHs Have Left the Station: 45L Tax Credit

- Single- & Multi-Family Prevailing Wage:
  - **$2,500**/ENERGY STAR Certified Homes
  - **$5,000**/DOE Zero Energy Ready Home
- Multi-Family Homes:
  - **$500**/ENERGY STAR Certified Home
  - **$1,000**/DOE Zero Energy Ready Home
- Manufactured Homes
  - **$2,500**/ENERGY STAR HUD-Code Home

**10-Year**

builder tax credit locked in from 2023 to 2032

# ZEHs Have Left the Station: Mainstream Builders

**Building**

HOME > BUILDING > BEAZER HOMES COMPLETES FIRST ENERGY SERIES READY HOME IN NASHVILLE AREA

Posted on: December 07, 2023

BUILDER

## BEAZER HOMES COMPLETES FIRST ENERGY SERIES READY HOME IN NASHVILLE AREA

**The home builder also launched Energy Series Ready homes in Southern California and Energy Series Ready Solar homes in Maryland.**


Courtesy Beazer Homes

Beazer Homes announced the completion of its first Nashville, Tennessee-area home to be certified as a U.S. Department of Energy (DOE) Zero Ready Home.

**100%**

of all single-family homes committed to Zero Energy Ready Home certification by end of 2025

**Source:** *"Beazer Homes Completes First Energy Series Ready Home in Nashville Area"*, Vincent Salandro, Builder, December 7, 2023

# ZEHs Have Left the Station: Mainstream Builders

Clayton

Walk Through the Clayton Home

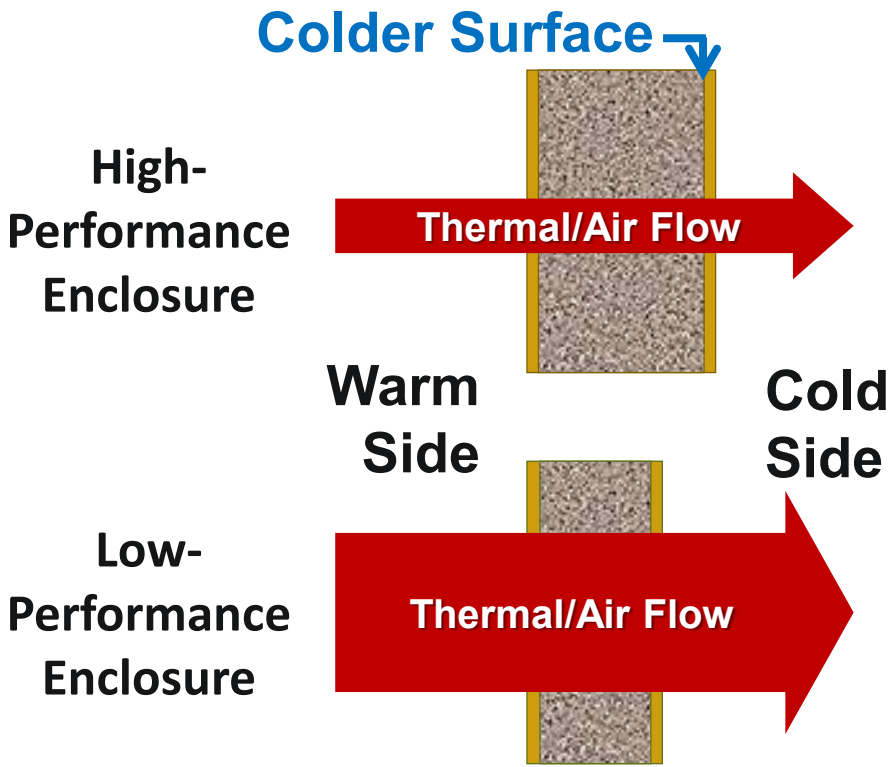
**Clayton® Commits to Build All Residential Manufactured Homes to DOE Zero Energy Ready Home™ Specifications by End of 2023**

**100%**

of all Clayton manufactured homes committed to Zero Energy Ready Home certification ($148/SF)

**Source:** *"How Much Does it Cost to Build a House in 2022"*, Rachel Abraham, Forbes

# ZEHs Must Manage Greater Value Risks




## Moisture Risk

- More Wetting Potential
- Less Drying Potential

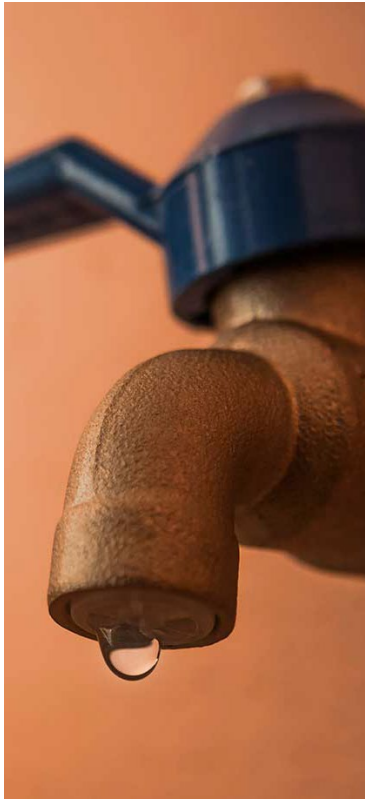
## Low Load Comfort Risk

- Less Air Flow
- Shorter Cycles
- Longer Swing Seasons

## Health Risk

- More Accumulated Contaminants

# ZEHs Must be Future Ready



**Hard Trends:**

- More Disaster Risk
- More Water Shortages
- Electrification

# ZEHs: Building Blocks

# ZEHs Building Blocks

| Why | ZEHs Live Better | | |
|---|---|---|---|
| What | Step One: Optimize Efficiency | Step Two: Manage Risks | Step Three: Be Future Ready |
| How | Efficient Enclosure | Comprehensive Moisture Control | Disaster Ready |
| | Efficient Equipment | Ultra-Low Load Comfort System | Water Efficiency |
| | Efficient Components | Comprehensive IAQ System | Electric Ready |

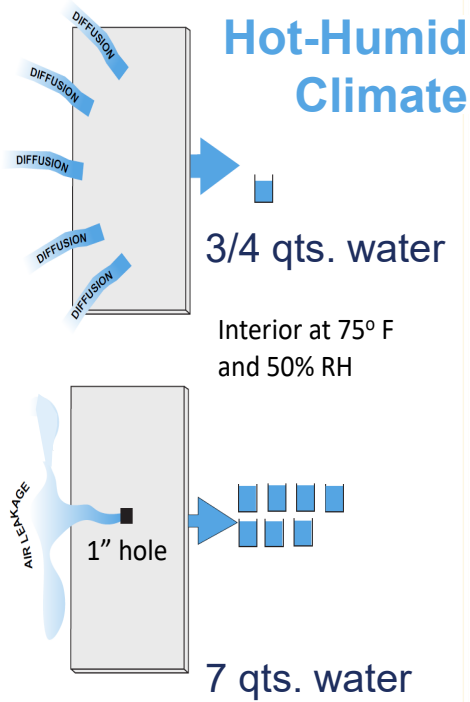
# ZEHs: Five Enclosure Imperatives

# ZEHs: Five Enclosure Imperatives

## Optimize:

1. Vapor Flow Control
2. Air Flow Control
3. Thermal Flow Control
4. Productivity
5. Disaster Resistance

# ZEHs Enclosure Imperative: Vapor Flow Control




Moisture vapor flow over Spring, Summer, and Fall from the exterior to interior with 5 Pascal pressure difference

## Managing Risk:

Air leakage is much more critical to controlling vapor flow than diffusion:

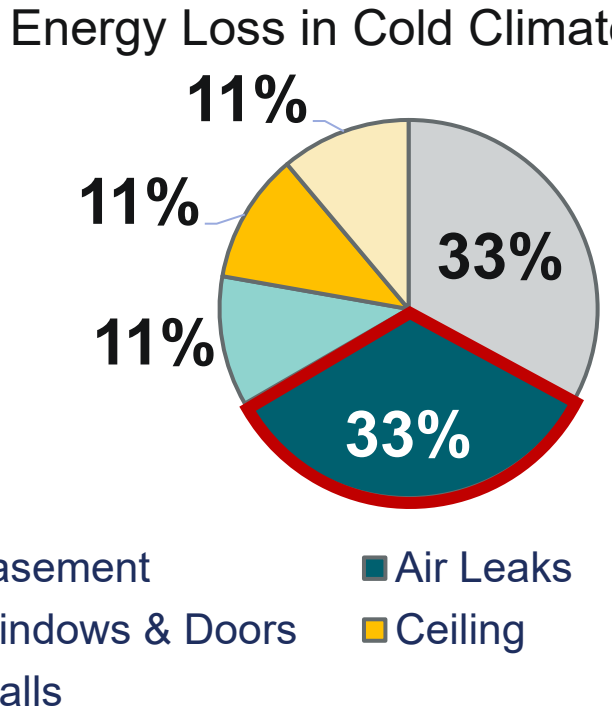
**~10X Greater Value**

in Hot-Humid Climates

**~1**

in C

# ZEHs Enclosure Imperative: Air Flow Control




**Source:** *"The Principal Designer of the House that Inspired the Global Passivhaus Movement Reflects on the Project that Started it All,"* ecohome, October 5, 2020

**3X**

greater energy loss due to air leakage than walls, ceiling, windows/doors

# ZEHs Enclosure Imperative: Air Flow Control

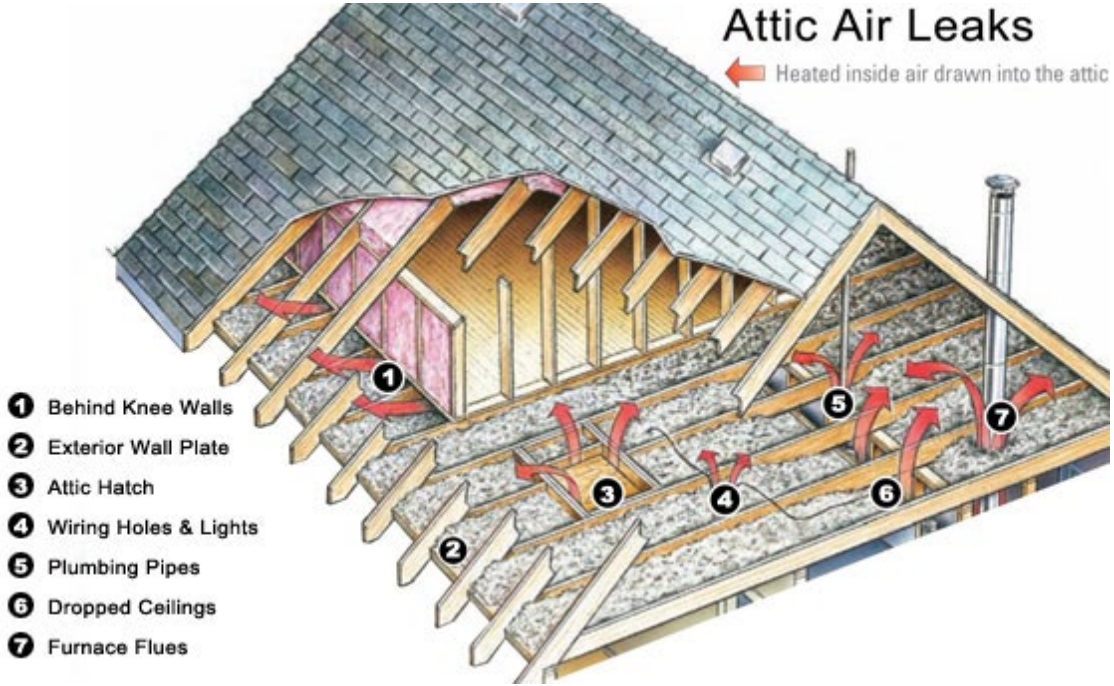
| Climate Zones | ACH50 Requirements/Targets | | | |
|---|---|---|---|---|
| | Zero Energy Ready | ENERGY STAR V3 | 2012 - 2018 IECC | Passive House |
| 1-2 | 1.5 ACH50 | | | |
| 3-4 | | | | |
| 5-7 | | | | |
| 8 | | | | |

**Why 1.5 ACH/50 Max Everywhere:**

- Minimize Energy Loss
- Contaminant Control:
  - Moisture
  - Smog
  - Dust
  - Pests
  - Pollen
  - Odors
- Readily Achievable

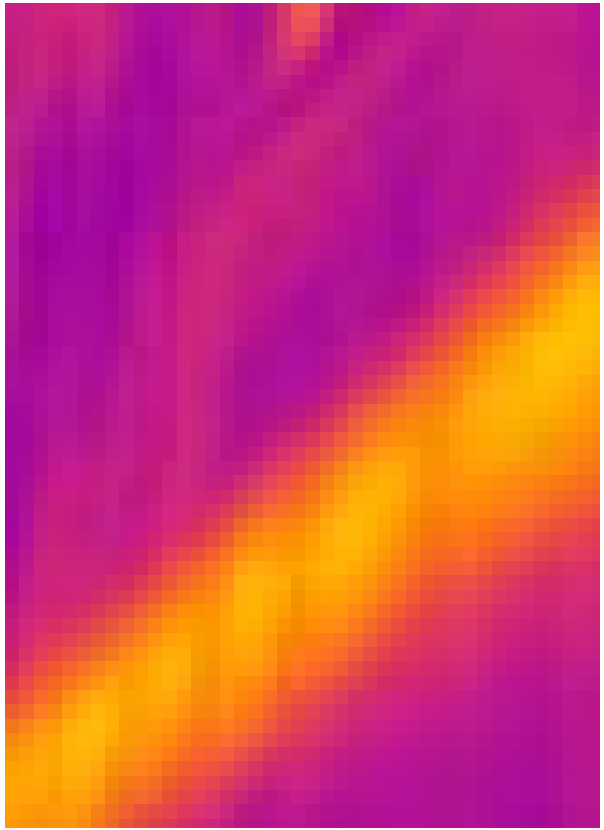
# ZEHs Enclosure Imperative: Air Flow Control

## Attic/Ceiling Most Egregious Interface




- Greatest Delta T
- Pressure (Stack Effect)
- Air Barriers
  - Knee Walls
  - Dropped/Raised Clgs.
  - Shafts
  - Attic Eaves
- Air Leakage
  - Penetrations
  - Duct Boots
  - Access Panels
  - Drywall to Top Plate
- Worst HVAC Location

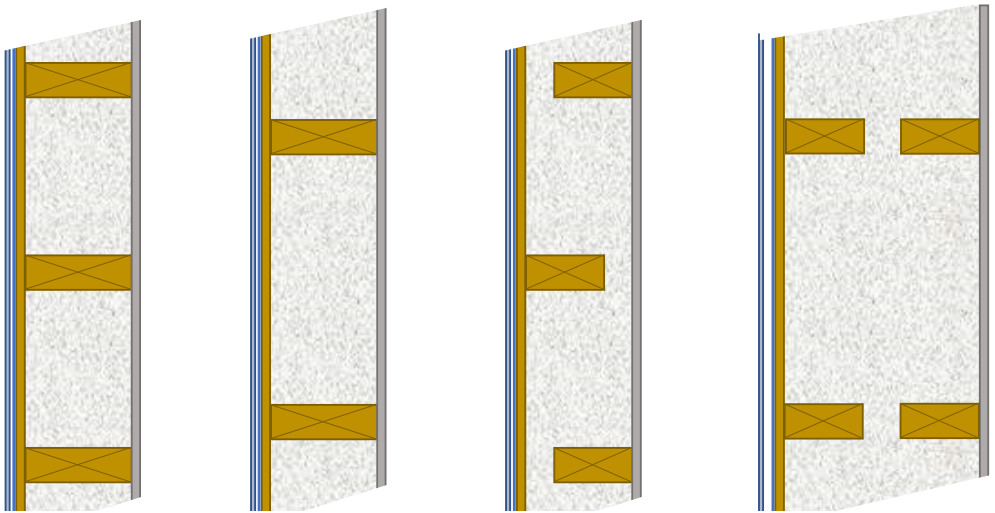
# ZEHs Enclosure Imperative: Thermal Flow Control

# ZEHs Enclosure Imperative: Thermal Flow Control

## Moisture Control, Quality Installation, and Thermal Bridging Risk

### Maximum Risk



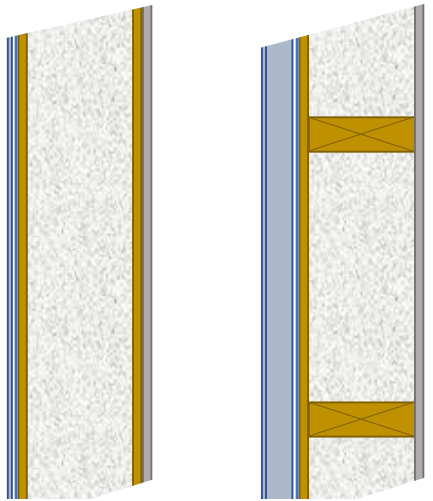
Conventional Framing
25-30% F.F.

Advanced Framing
19% F.F.

Staggered Stud Framing
12% F.F.

Double-Wall Framing
10% F.F.

### Minimum Risk

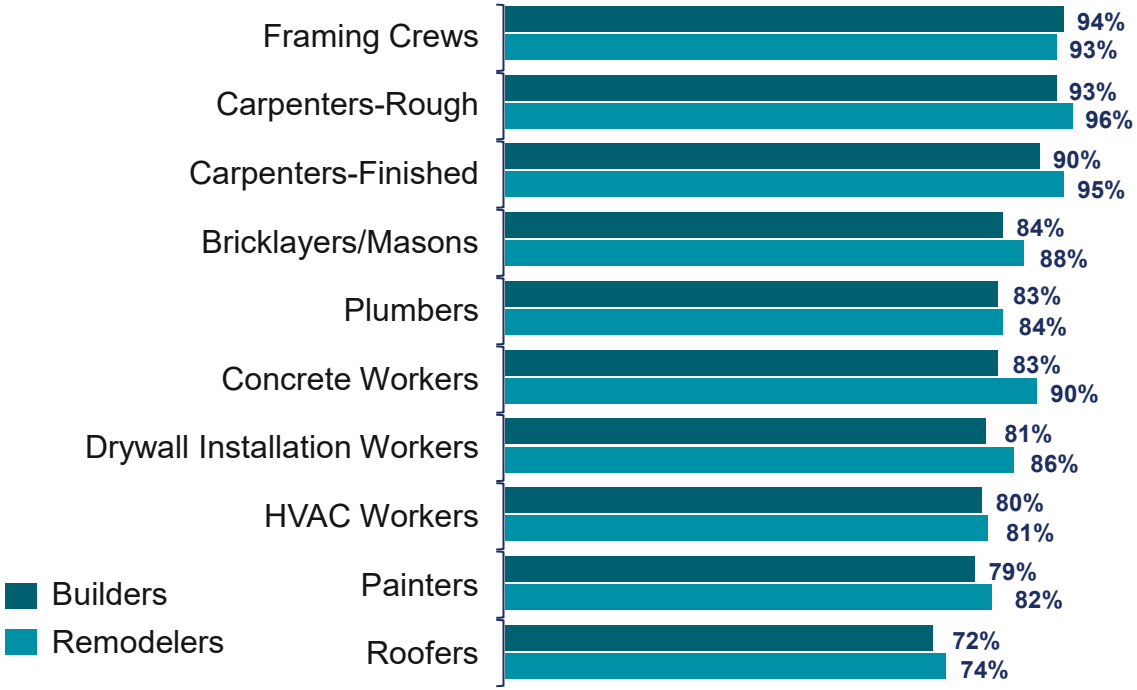


Structural Insulated Panels
5% F.F.

Rigid Insul. Sheathing
2% F.F.

# HPH Enclosure Imperative: Productivity

## Percent of Builders & Remodelers Reporting Subcontractor Shortages




**90+%**

of builders reported framing crew and carpenter shortages in 2022

**Source:** *"The Home Builder Institute (HBI) Construction Labor Market Report,"* Fall 2022

# ZEHs Enclosure Imperative: Productivity

Posted on: June 15, 2023

BUILDER

## HBI: LABOR SHORTAGE IS LIMITING FACTOR TO IMPROVING HOUSING INVENTORY AND AFFORDABILITY

**The Home Builders Institute estimates the construction industry needs to add 723,000 workers per year to keep pace with demand.**

By Vincent Salandro

**~723,000**

New workers needed each year to meet demand and combat ~1.5M home shortage

**Source:** *"The Home Builder Institute (HBI) Construction Labor Market Report," Spring* 2023

# ZEHs Enclosure Imperative: Productivity

**42.5**

average construction worker age

**Source:** Bureau of Labor Statistics

**2/5**

only two new construction workers for every five that age out or retire

**Source:** *"Spring 2023 Construction Labor Market Report,"* Home Builders Institute, 2023

# ZEHs Enclosure Imperative: Productivity

150 Years

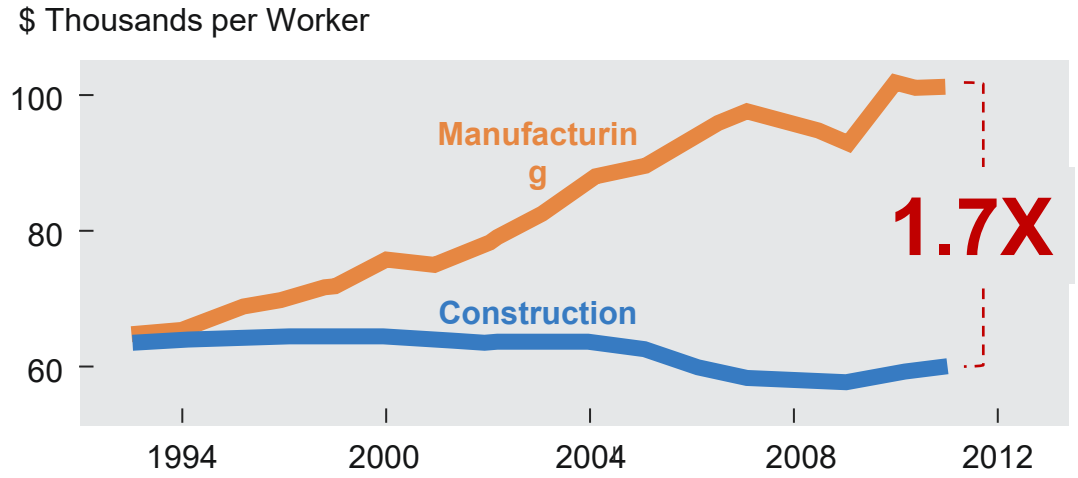
1877

2024

# ZEHs Enclosure Imperative: Productivity

## Overview of Productivity Improvement Over Time

Productivity (value added per worker), real, $2005




**Source:** McKinsey & Company

# $200B

Labor productivity gap suffered by U.S. construction industry that could be closed by adopting 21st century manufacturing methods

**Source:** McKinsey & Company

# ZEHs Enclosure Imperative: Productivity

| Reduced Cycle Time Benefits | |
|---|---|
| **Cost Savings** | • Reduce Carrying Cost<br>• Increased Efficiency<br>• Interest Cost Mitigation |
| **Enhanced Profitability** | • Improved Cash Flow<br>• Competitive Pricing<br>• Improved Sales and Closings |
| **Reduced Risk** | • Market Adaptability<br>• Inflation Hedge<br>• Economic Uncertainty |

Reduced cycle time impacts typically **NOT** included in the bidding process

# ZEHs Enclosure Imperative: Disaster Resistance

REUTERS® World Business Markets Sustainability Legal Breakingviews Technology Inv

Environment

## World hits record land, sea temperatures as climate change fuels 2023 extremes

By **David Stanway**

July 3, 2023 9:33 AM EDT · Updated 6 hours ago

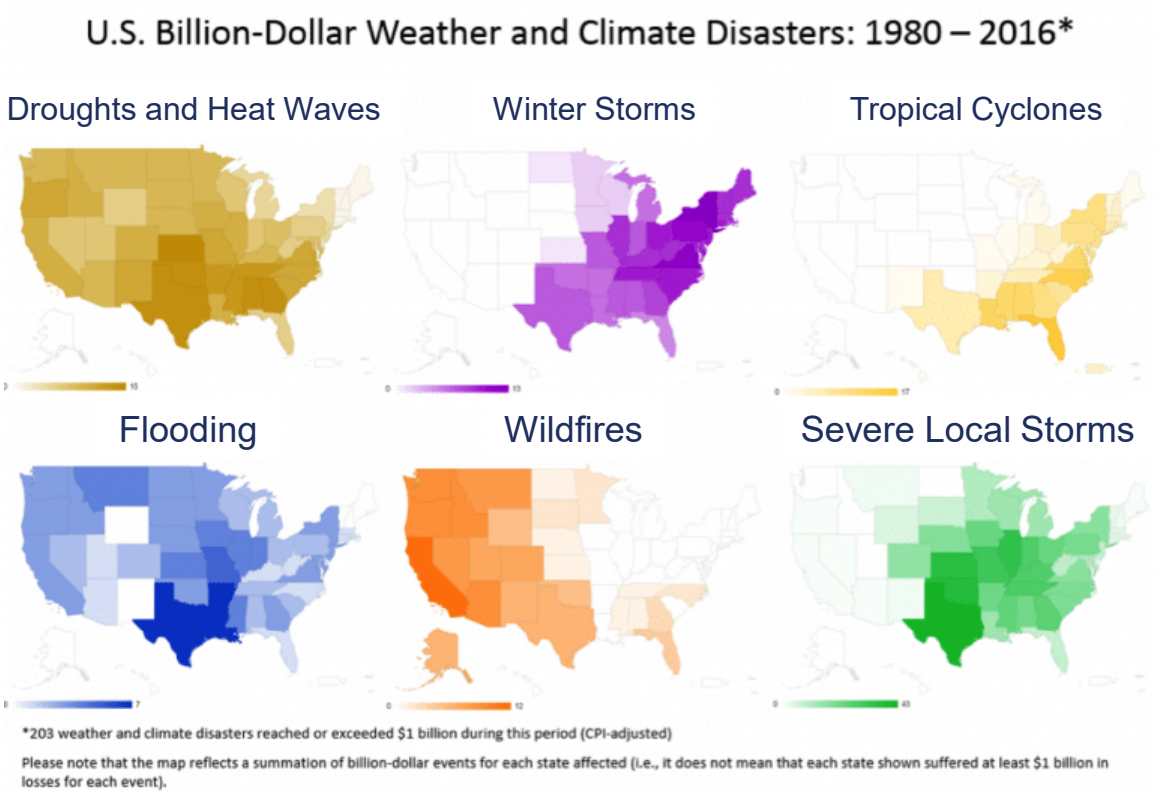
[1/7] Flames reach upwards along the edge of a wildfire as seen from a Canadian Forces helicopter surveying the area near Mistissini, Quebec, Canada June 12, 2023. Cpl Marc-Andre Leclerc/Canadian Forces/Handout via REUTERS/File Photo

## Accelerating Disaster Risk:

- Frequency
- Magnitude
- Expense

**Source:** NASA

# ZEHs Enclosure Imperative: Disaster Resistance




**No Where to Hide:**

Virtually all U.S. exposed to growing disaster risks.

**Source:** NOAA

# ZEHs Enclosure Imperative: Disaster Resistance

CNBC MARKETS BUSINESS INVESTING TECH POLITICS CNBC TV INVESTING CLUB PRO

CLIMATE

## State Farm to stop accepting homeowners insurance applications in California due to wildfires, construction costs

PUBLISHED SAT, MAY 27 2023•2:52 PM EDT

Ashley Capoot
@ASHLEYCAPOOT

A private wild land firefighter monitors a backfire along Old Lawley Toll Road during the Glass Fire in Calistoga, California, U.S., October 2, 2020. Picture taken October 2, 2020.

*Stephen Lam | Reuters*

## Less Insurance Availability:

- Rapidly growing catastrophe exposure
- Historic increases in construction cost [55% from 2019-2022]
- Reinsurance market [30% - 40% increases]

**Source:** *"State Farm General Insurance Company: California New Business Update,"* May 26, 2023

# ZEHs Enclosure Imperative: Disaster Resistance

## Insurance companies ask for 42.2% rate increase for homeowners' insurance, some face 99.4% increase


Insurance companies ask for 42.2% rate increase for homeowners' insurance, some face 99.4% increase

By Dave Jordan

*Published: Jan. 5, 2024 at 7:43 PM EST*

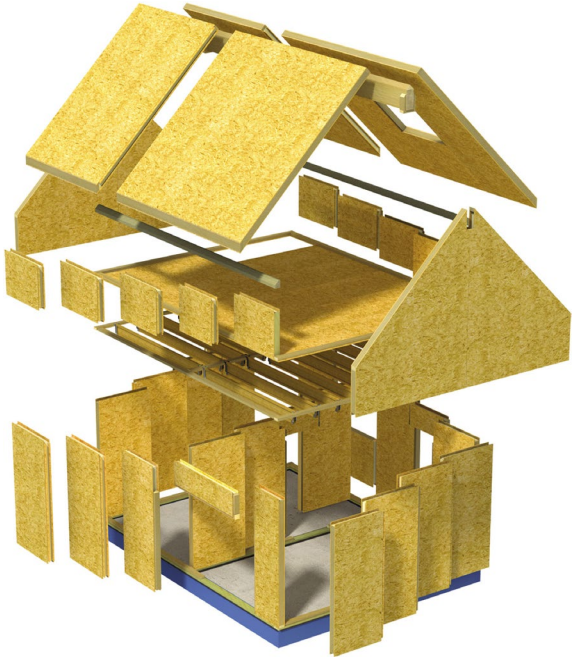
# Insurance Cost:

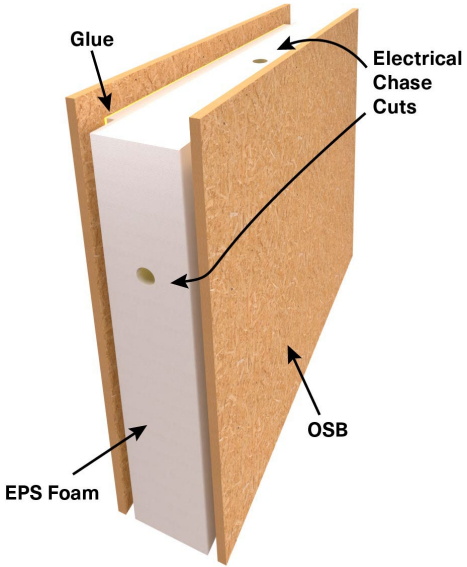
40+% average increase in homeowners' insurance cost filed with North Carolina Department of Insurance

**Source:** *WITN Channel 7*, 1/5/24

# ZEHs: Faster, Better, and Greater Value Enclosures

# Faster, Better, Greater Value Example: SIPs






## SIPs Optimize All Five Imperatives:

- Vapor Flow Control
- Air Flow Control
- Thermal Flow Control
- Productivity
- Resilience

# Optimized Air Flow Control: Getting to 1.5 ACH50

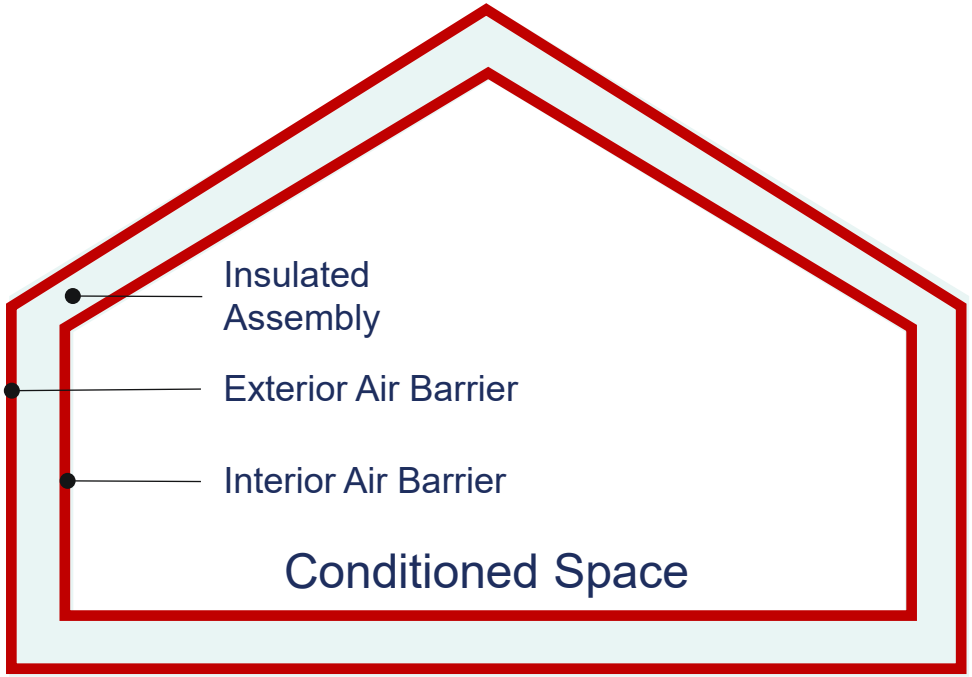
Comprehensive:

- Air Barriers
- Air Sealing

**SIPs Air Flow Benefits:**

- Optimize Control:
  - Moisture Vapor Flow
  - Outdoor Contaminants
  - Dust
  - Pests
  - Pollen
  - Odors
- One-Stop Shop
  Code & HPH Certification
- Trade-off Higher Cost
  Efficiency Measures

# Optimized Air Flow Control: SIPs Complete Air Barriers




SIPs inherently provide complete, high-quality air barriers

# Optimized Air Flow Control: Air Barrier Checklist w/Framing

## Walls

- ❑ Showers and Tubs
- ❑ Fireplaces
- ❑ Attic Knee Walls
- ❑ Skylight Shaft Walls
- ❑ Adjoining Porch Roof
- ❑ Staircase Ext. Walls
- ❑ Double Walls
- ❑ Rim/Band Joists

## Shafts

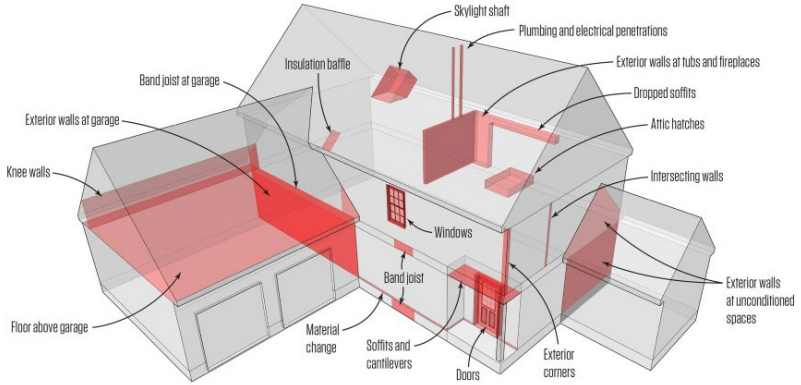
- ❑ Duct Shaft
- ❑ Piping Shaft
- ❑ Flue Shaft

## Attic/Ceiling

- ❑ Attic Access Panel
- ❑ Attic Drop-Down Stair
- ❑ Raised Ceilings
- ❑ Dropped Ceilings
- ❑ Eave Wind Baffles
- ❑ Recessed Lights
- ❑ Whole-House Fan

## Floors

- ❑ Floors Above Garage
- ❑ Cantilevered Floor
- ❑ Unconditioned Space Floor
- ❑ Floor Framing into Garage



# Optimized Air Flow Control: Air Barrier Checklist w/SIPs

## Walls

- ~~❑ Showers and Tubs~~
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# Optimized Air Flow Control: Air Sealing Checklist w/Framing

**Penetrations:**

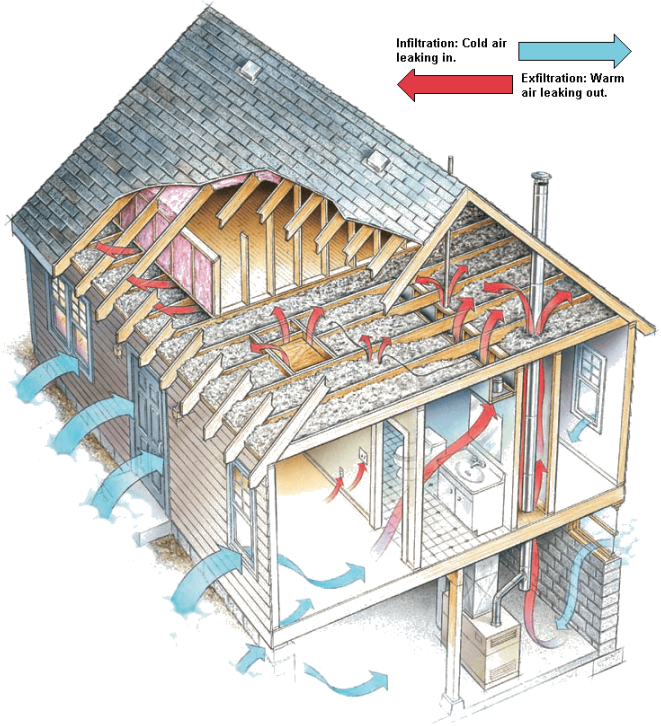
- ❑ Plumbing
- ❑ Wiring
- ❑ Recessed Lights
- ❑ Vents
- ❑ Flues
- ❑ HVAC Duct Boots

**Odd Geometry:**

- ❑ Cantilevers
- ❑ Knee-walls

**Cracks:**

- ❑ Sill Plates
- ❑ Windows & Doors
- ❑ Drywall at Top Plate
- ❑ Access Panels
- ❑ Sheathing Joints
- ❑ Foundation/Framing
- ❑ Air Barriers (see Air Barrier Checklist)



# Optimized Air Flow Control: Air Sealing Checklist w/SIPs

**Penetrations:**

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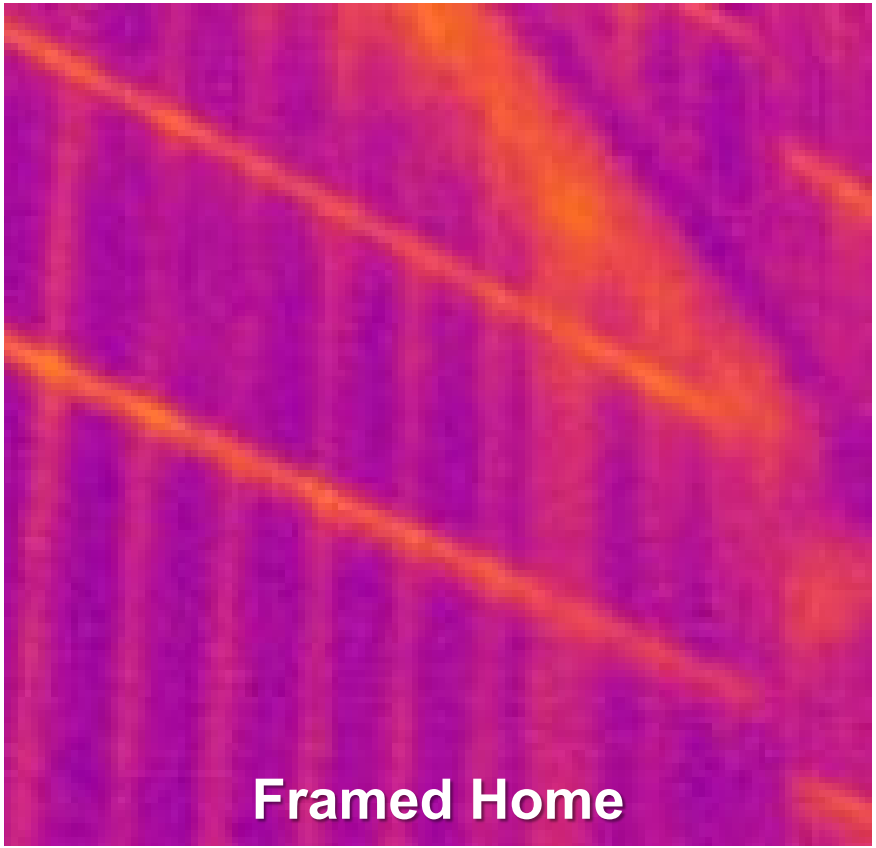
- ❑ Sheathing Joints
- ❑ Foundation/Framing
- ~~❑ Air Barriers (see Air Barrier Checklist)~~

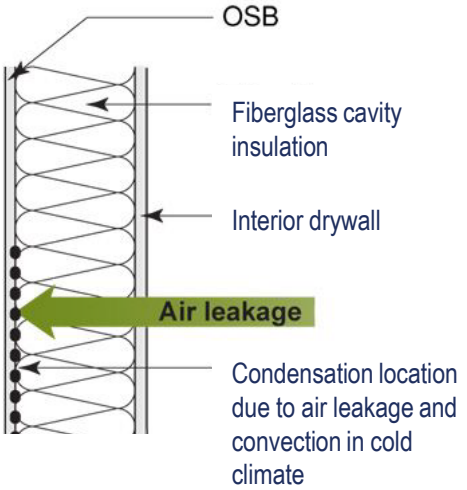
# Optimized Thermal Flow Control

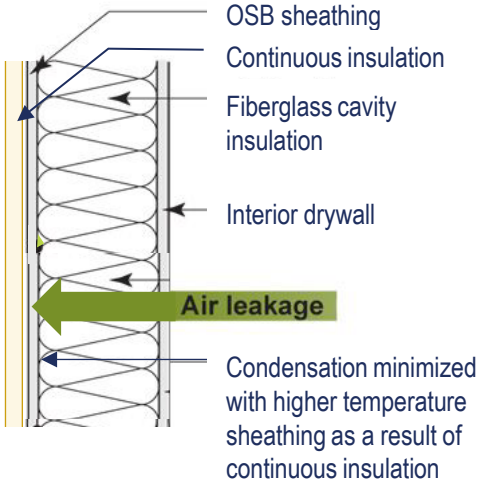
- R-Value
- Quality of Insulation Installation
- Control of Thermal Bridging

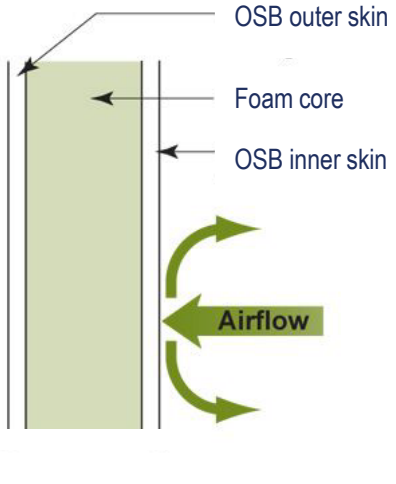
# Optimized Thermal Flow Control with SIPs or CI




# SIPs vs. CI Optimized Moisture, Thermal Flow Control




## Typical Frame Wall

- Prone to airflow & convection
- Condensation can occur at exterior sheathing

## Frame Wall with CI

- Still prone to airflow & convection
- Condensation risk is minimized
- Quality assurance challenges

## SIPs Wall

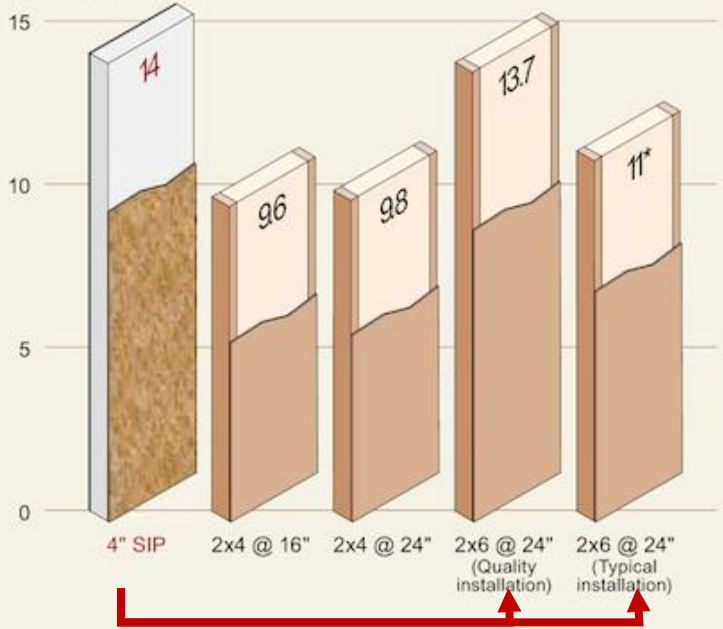
- "Solid" core "homogenous" and "air impermeable"
- No convection and air leakage
- Condensation not possible
- Inherent quality assurance

**Source:** Building Science Corporation

# SIPs vs. CI: Faster, Better, Greater Value


- **More Value:**
  - Less Moisture Risk
  - Dimensional Accuracy
  - Enhanced Strength
  - Inherent Quality
  - Added Volume
  - Less Carbon (Wood)
- **Cost Savings:**
  - Cycle Time
  - Inspections
  - Waste
  - Rework
  - Trades

# SIPs vs. Framing: Faster, Better, Greater Value

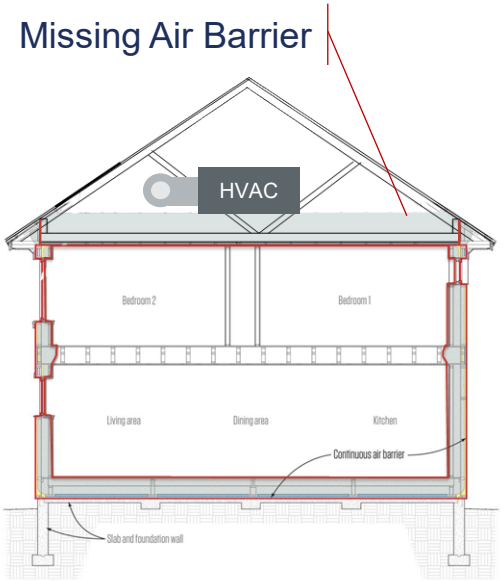



4” SIP wall outperforms 2”x 6” stud wall with R-19

**Source:** Oak Ridge National Laboratory, 2002

| Cost Savings | |
|---|---|
| Grade I Insulation | **$1K - $1.5K** |
| Air Seal/Barriers | **$1K - $2K** |
| Rework | **$1K - $1.5K** |
| Reduced Waste | **$1K - $2K** |
| Time (5 days) | **$2.5K - $4K** |
| **More Value** | |
| 30 SF More Space | **$10K - $15K** |
| Resilience | **$2K - $4K** |
| Quality | **$2K - $4K** |

# SIPs Attic: Faster, Better, Greater Value




Vented Attic Problem

- **More Value:**
  - Added Volume
  - Efficient/Air-Tight
  - Comfort
  - Strength
  - Resilience (Fire/Impact)
- **Cost Savings:**
  - Cycle Time
  - Attic Vents
  - Air Barriers and Sealing

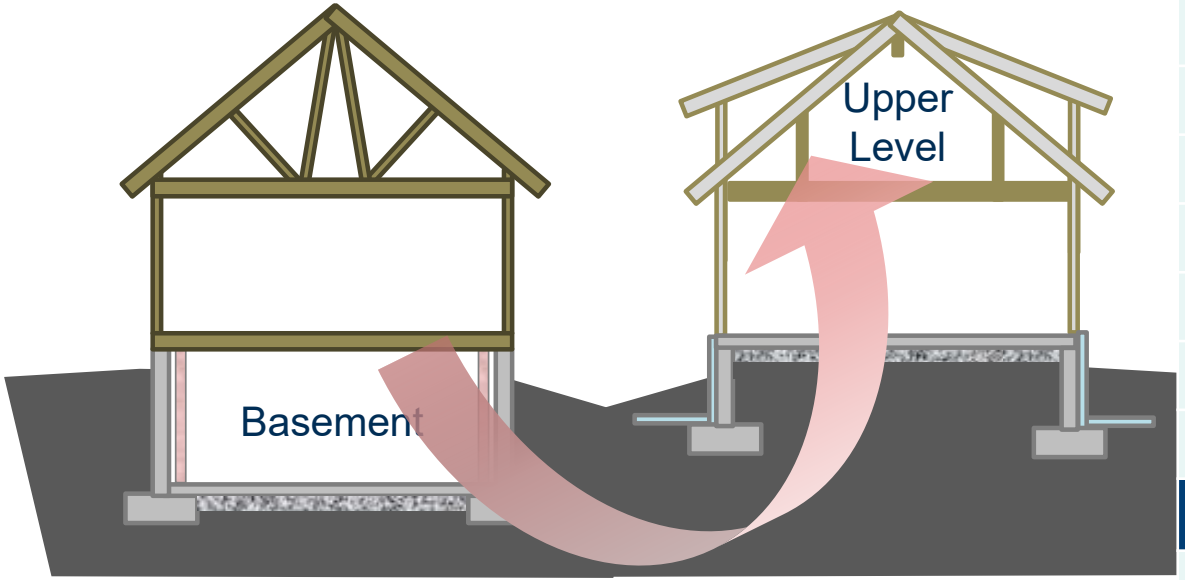
# SIPs Attic: Faster, Better, Greater Value

Vented Attic Problem:
~50% Air Barrier

SIP Unvented Attic Solution:
100% Air Barrier

# SIPs Attic: Faster, Better, Greater Value

# SIPs Attic: Faster, Better, Greater Value




Framed Roof

Trade Basement for Upper Level w/ SIPs

| Cost Savings | |
|---|---|
| FPS Foundation[1] | up to $6K |
| Wall Framing | $1K - $2K |
| Egress Windows | $1K - $2K |
| Air Seal/Barriers | $1K - $2K |
| Attic Venting | $1K - $1.5K |
| Reduced Waste | $1K - $2K |
| Time (5 days) | $2.5K - $4K |
| **More Value** | |
| 2nd Fl. vs. B'ment | $80K - $120K |
| Resilience | $2K - $4K |
| Quality | $2K - $4K |

[1] "Frost-Protected Shallow Foundations, NAHB Research Center, 4/30/04

# SIPs Optimized Productivity: Reduced Trades

- Trades Eliminated
  - Framing
  - Insulation
  - Air Sealing/Air Barriers
- Trades Reduced Scope of Work
  - Drywall
  - Finishes/Trim
  - Inspections/Testing
  - Site Clean-up/Waste Removal

# SIPs Optimized Productivity: Reduced Cycle Time


Total Number of Days on Site

**Source:** Century Homes and Entekra customers

$500 - $800/day = **$12.5K – $20K**

SIPs Cycle Time Value

**Source:** Entekra customers and Glenn Cotrell, “Understanding the Cost of Quality,” Professional Builder

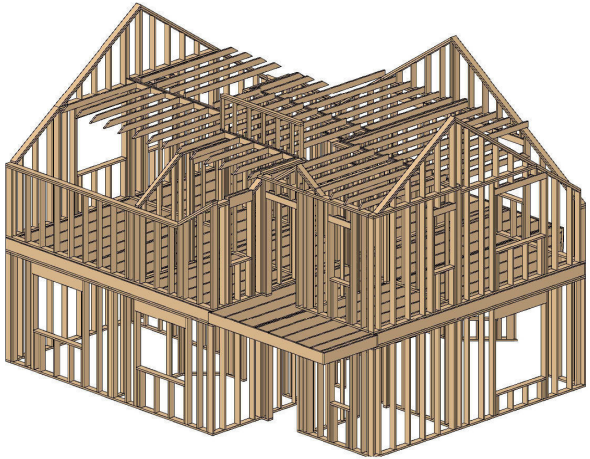
# SIPs Optimized Disaster Resistance

**Enhanced Resistance:**

- Wildfires
- Impact
- Wind
- Snow Load
- Earthquake

# Translating Faster, Better, and Greater Value ZEH Enclosures

# Translating Faster, Better, Greater Value



150-Year-Old
Enclosure Technology

Advanced Enclosure
Technology

# SIPs vs. Framing Cost Savings

| | |
|---|---|
| **Time** | • Framing<br>• Drywall<br>• Trim<br>• Velocity<br>• Inventory Turn |
| **Air Flow** | • Air Sealing<br>• Air Barriers<br>• Attic Venting |
| **Quality** | • Grade 1 Insulation<br>• Rework (framing, finishes)<br>• Risk (reserves, liability)<br>• Inspections (inherent QA)<br>• Training (MEP, insulation, air sealing) |
| **Waste** | • Framing<br>• Drywall<br>• Trim |

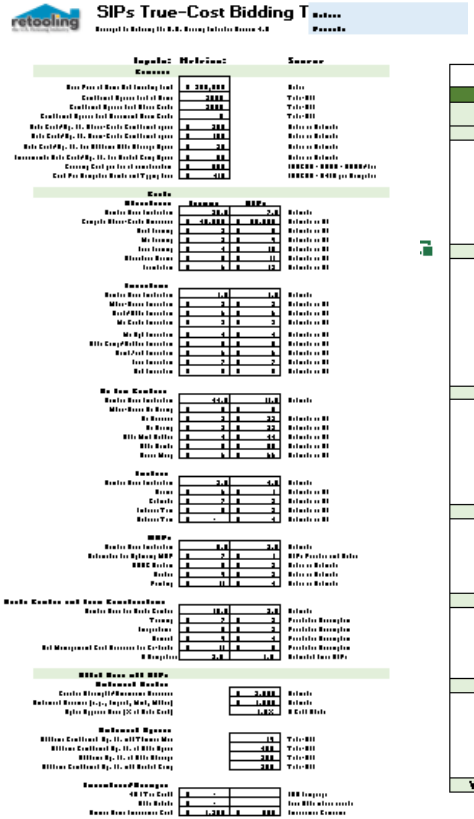
Significant hidden cost savings with SIPs do not show up in the bidding process

# SIPs vs. Framing Added Value

| | |
|---|---|
| **Enhanced Quality** | • Strength/Dimensional Accuracy<br>• Resilience (fire, wind, impact, pests)<br>• Higher Appraisals |
| **Enhanced Space** | • Thinner Walls Added Space<br>• Conditioned Attic Added Space<br>• Conditioned Attic Added Storage<br>• Raised Ceilings Added Volume |
| **Enhanced Incentives** | • 45L Tax Credit<br>• Utility HPH Rebate<br>• Home Insurance Discount |

Significant hidden value with SIPs do not show up in the bidding process

# Translating Value: SIPs True Cost Bidding Tool




| Application: Scope of Work | Costs Framing | Costs SIPs | # Days Framing | # Days SIPs |
|---|---|---|---|---|
| TOTAL COST | $1,359 | $23,497 | 93.5 | 29.0 |
| **Structure** | **$20** | **$55,050** | **30.0** | **7.0** |
| Complete Above Grade Enclosure | $40,000 | $55,000 | | |
| Roof Framing | $2 | $8 | | |
| Wall Framing | $3 | $9 | | |
| Floor Framing | $4 | $10 | | |
| Structural Beams | $5 | $11 | | |
| Foundation | $6 | $12 | | |
| **Insulation** | **$33** | **$33** | **1.0** | **1.0** |
| Whole-House Insulation | $ 2 | $ 2 | | |
| Roof/Attic Insulation | $ 6 | $ 6 | | |
| Wall Cavity Insulation | $ 3 | $ 3 | | |
| Wall Rigid Insulation | $ 4 | $ 4 | | |
| Attic Ceiling/Rafter Insulation | $ 5 | $ 5 | | |
| Band Joist Insulation | $ 6 | $ 6 | | |
| Floor Insulation | $ 7 | $ 7 | | |
| Slab Insulation | $ 8 | $ 8 | | |
| **Air Flow Control** | **$20** | **$220** | **44.0** | **11.0** |
| Whole-House Air Sealing | **$5** | **$5** | | |
| Air Barriers | $2 | $22 | | |
| Air Sealing | $3 | $33 | | |
| Attic Wind Baffles | $4 | $44 | | |
| Attic Vents | $5 | $55 | | |
| House Wrap | $6 | $66 | | |
| **Finishes** | **$21** | **$10** | **3.0** | **4.5** |
| Interior Drywall | $6 | $1 | | |
| Interior Cabinets | $7 | $2 | | |
| Interior Trim | $8 | $3 | | |
| Exterior Trim | $0 | $4 | | |
| **MEP** | **$ 7.00** | **$10** | **5.0** | **3.0** |
| Schematics for Optimizing MEP | $7 | $1 | | |
| HVAC Cost Differential | $8 | $2 | | |
| Electric Cost Differential with Conventional Framing | $9 | $3 | | |
| Plumbing Cost Differential with Conventional Framing | $11 | $4 | | |
| **Quality Control and Lean Construction** | **$1,265** | **$424** | **10.5** | **2.5** |
| Training | $7 | $2 | | |
| Inspections | $8 | $3 | | |
| Rework | $9 | $4 | | |
| Risk (Reserves for Call-Backs) | $11 | $5 | | |
| Waste Removal (Dumpsters) | $1,230 | $410 | | |
| **Value of Construction Time Saved vs. Framing** | | **-$32,250** | | **-64.5** |

| Summary: SIPs True Cost vs. Conventional Framing | | |
|---|---|---|
| Cost Savings | Added Value | True Cost |
| $ (22,138) | $ 152,600 | $ 130,462 |

This cost comparison is based on an actual bid for SIPs and estimated costs for conventional framing based on standard cost data available. Work with your SIPs sales rep to integrate actual bids for conventional framing to get a more precise comparison for your project.

| SIPs Improved User Experience | Value |
|---|---|
| **TOTAL ADDED VALUE** | **$ 152,600** |
| **Enhanced Quality:** | |
| Greater Strength/Dimensional Accuracy | $2,000 |
| Enhanced Resilience (e.g., Impact, Wind, Wildfire) | $1,000 |
| Higher Appraisals to Base Price | $2,500 |
| **Enhanced Space:** | |
| Additional Conditioned Sq.Ft. with Thinner Walls | $5,700 |
| Additional Conditioned Sq. Ft. of Attic Space | $120,000 |
| Additional Sq. Ft. of Attic Storage | $ 6,000 |
| Additional Conditioned Sq. Ft. of Vaulted Ceiling | $ 15,000 |
| **Incentives Savings:** | |
| 45 L Tax Credit | $0 |
| Utility Rebate | $0 |
| Reduced Home Insurance Annual Insurance Cost | $400 |

# Translating Value: True Cost Case Study

Usher Residence

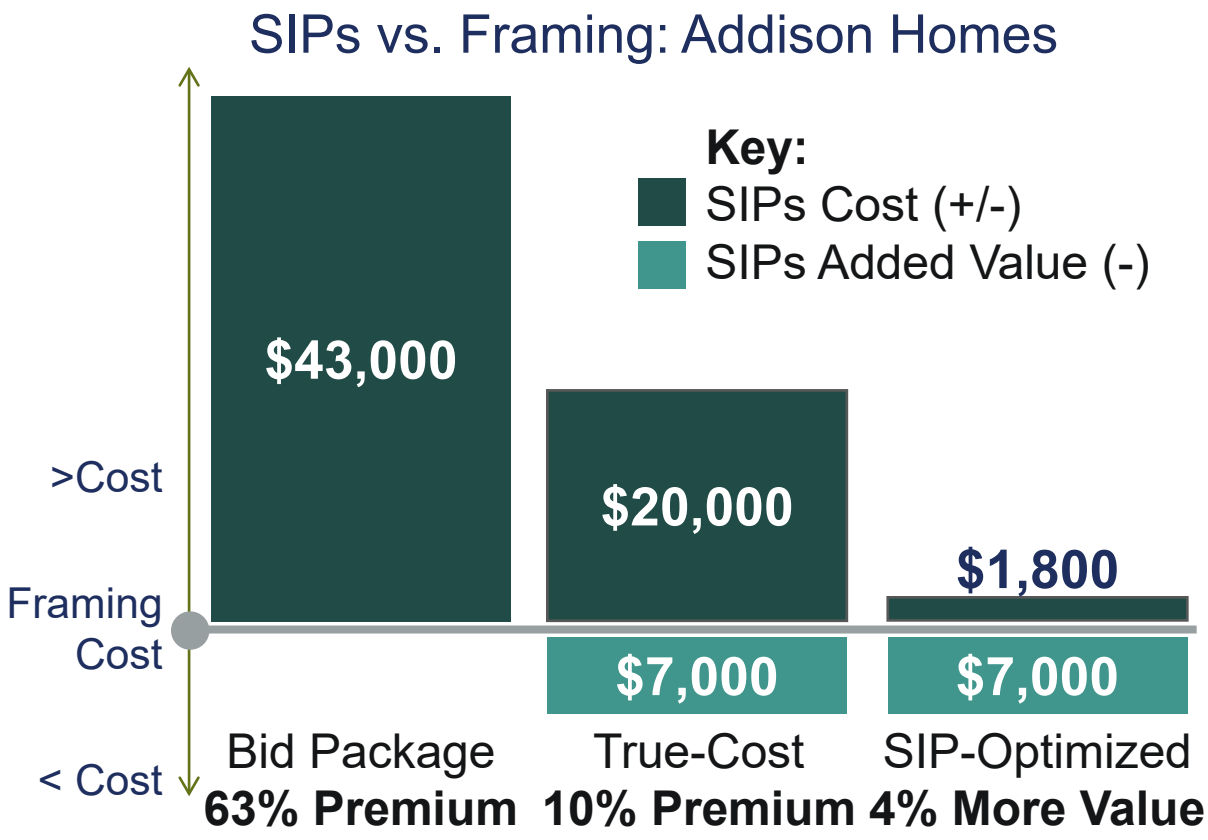
## Addison Homes
## Greenville, SC

- 3BR / 3 Bath
- 2740 SF
- $450,000
- Framed Walls/Roof

Non-SIP-Optimized:

- Can’t Locate Posts for Ridge Beam
- Still Requires Roof Trusses
- No 2 ft. Dimensions

# Translating Value: True Cost Case Study

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# Translating Value: True Cost Case Study

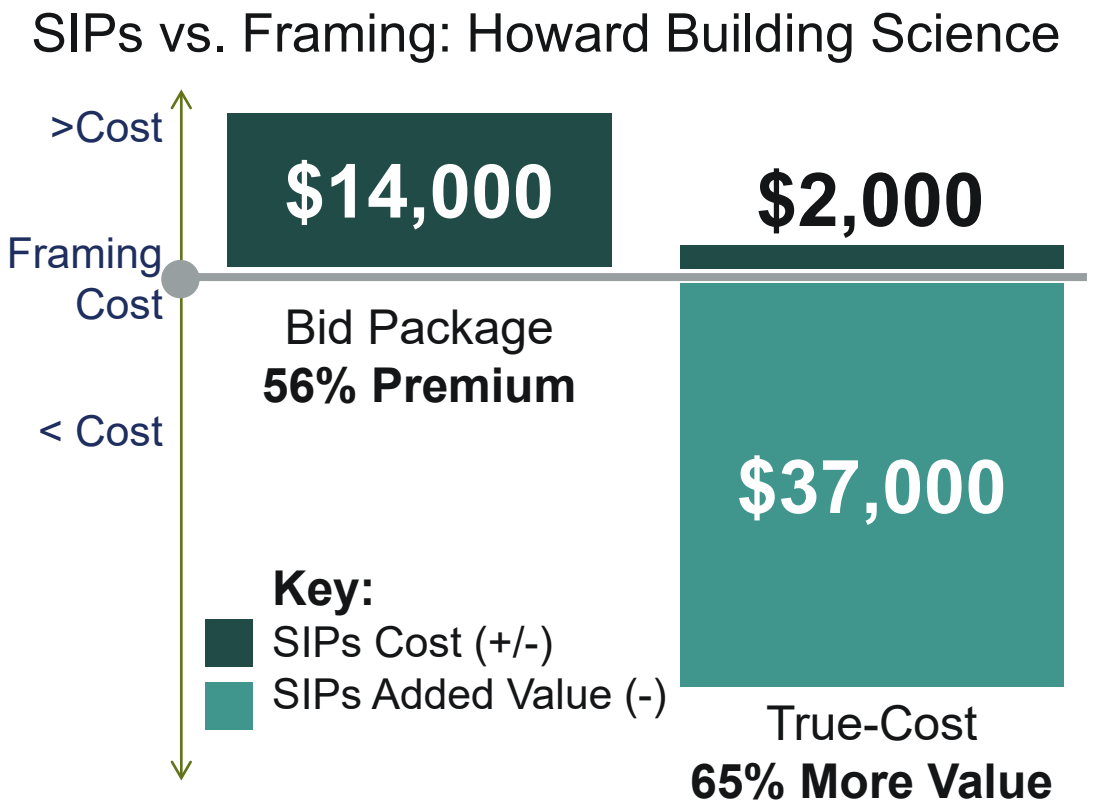

## Howard Bldg. Science
## Granite Falls, NC

- 2BR / 1 Bath
- 1,600 SF
- $199,900
- SIPs Walls/Roof

SIP-Optimized:

- Simple Roof
- ½ Attic Storage
- ½ Sloped Ceilings
- 2 ft. Dimensions
- Ductless Minisplit

# Translating Value: True Cost Case Study

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# Translating Value: True Cost Case Study

## GreenSmith Builders Prairie Lofts

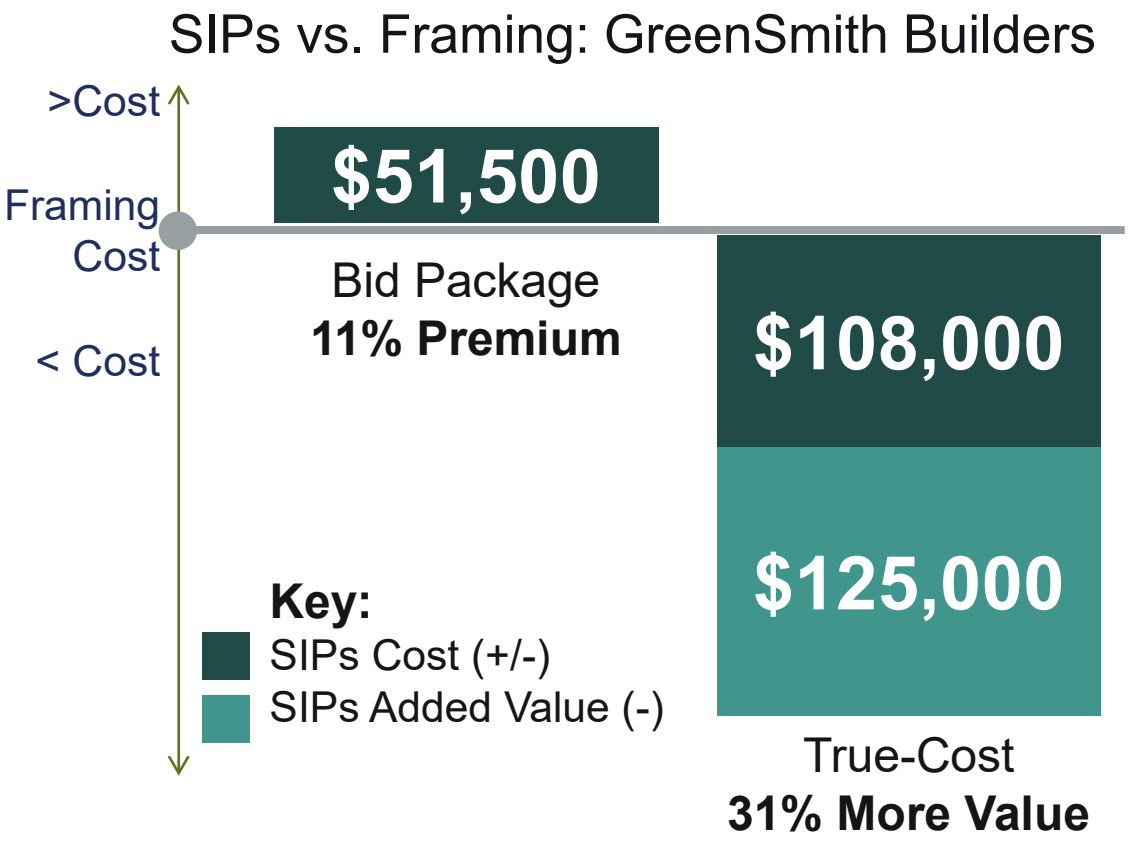
Leverne, MN

- Built 2022
- 2 Buildings/54 Units
- 1BR / 2BR Plans
- HERS 45 without Solar
- 1.35 ACH50
- SIPs Walls (Exterior, Hall, Demising)

SIP-Optimized:

- 1 Hour from Plant
- Simple Design

# Translating Value: True Cost Case Study

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SIP-Optimized:

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# Translating Value: SIPs Results / Actions

## Results:

- 15% to 100+% total costs missing without true-cost comparison
- SIPs is lowest true cost than framing with optimized single- and multi-family homes

## Actions:

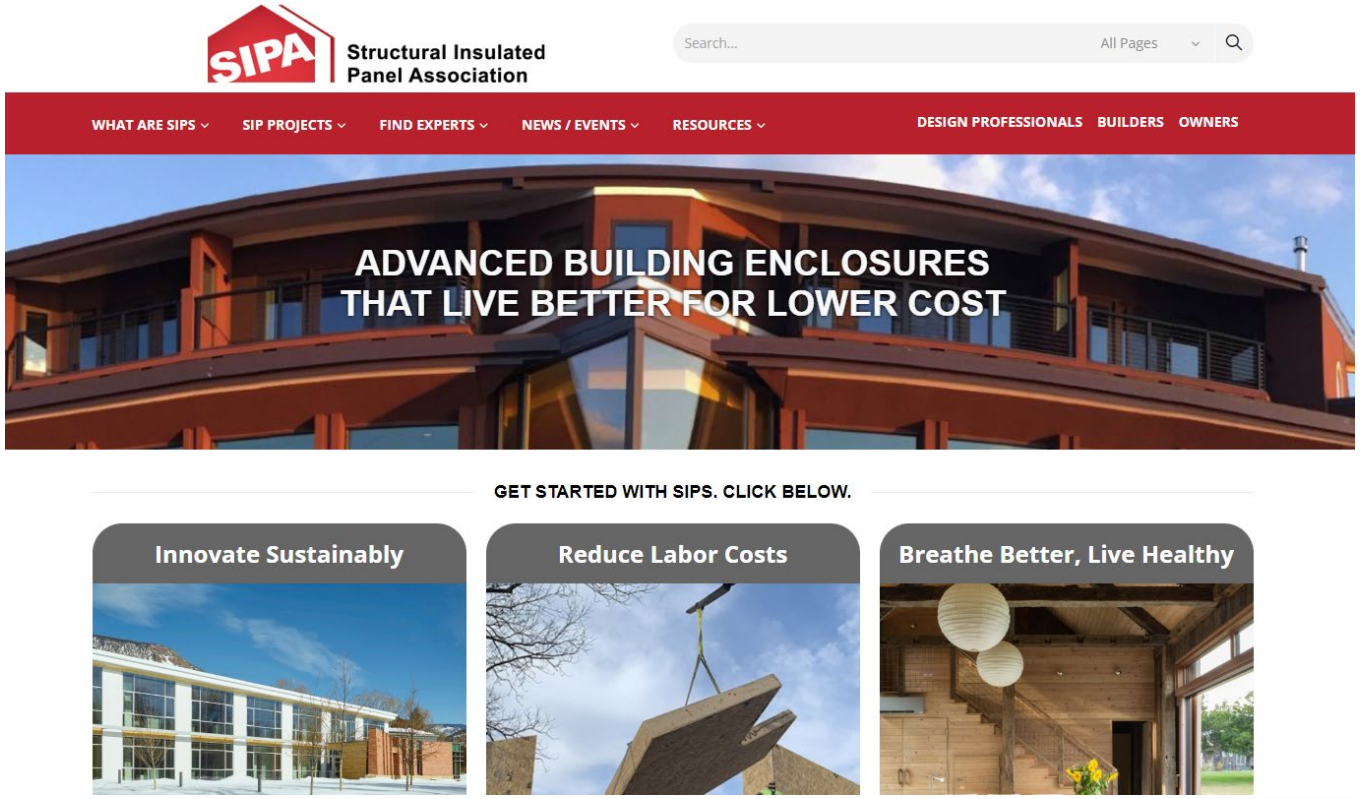
- Always get a true-cost bid for enclosures
- Integrate SIPs optimization with the design process for substantial cost savings
- Develop SIP-optimized house plans with UX optimized expert designs

## Key Finding:

Faster, better, and greater value high-performance home decisions are not being made in absence of true cost assessment and optimized designs

# SIPs High-Performance Resources

# SIPs Resources: www.SIPs.org



# SIPs Resources: www.SIPs.org

- Free online *Builder Education with SIPs Training* (BEST) 10 videos (or YouTube)
- SIPA Master Builder Program
- *SIPschool* hands on training events
- *Builder's Guide to SIPs* by Joe Lstiburek
- AIA & GBCI Continuing Education courses
- Find a supplier in your area
- Case studies /tech briefs /project maps
- *Builder Need to Know* guide & checklists
- In depth *Best Practices* and *Connection Details*

# SIPs Resources: www.SIPs.org

## Building with SIPs – Need to Know

**BUILDING CONSIDERATIONS**

- High-performance building envelopes use SIPs
- SIP performance is based on more than its stated R-value
- HVAC system rightsizing reduces costs and enhances comfort and performance
- SIP structural capabilities cater well to virtually any design
- SIPs are typically factory cut for accuracy, quality and reduced onsi
- SIPs are manufactured using "SIP shop (or panelized) drawings"
- SIPs are customized to varying levels depending on client needs
- Roof and wall assemblies
- Factory cut electrical chases reduce electrician time in the field
- Design plumbing into interior walls
- Resource to better understand the science of building with SIPs


**CHECKLIST**

- High-Performance Building Envelope
- HVAC Systems
- Structural Capabilities
- SIP Sizes
- Shop Drawings
- SIP Fabrication
- SIP Installation
- Roof and Wall Assemblies
- Electrical
- Plumbing

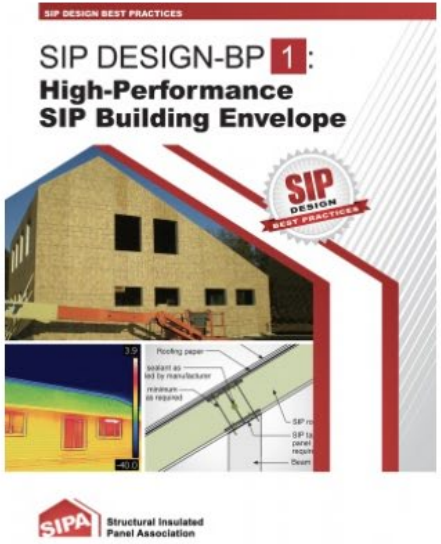
Free copies available to download @ www.SIPs.org!

# SIPs Resources: www.SIPs.org

## SIP DESIGN Best Practices Series

SIPA is publishing a series of "deeper-dive" explorations of the core topics summarized in DESIGN CONSIDERATIONS. The SIP DESIGN BEST PRACTICES series provides the engineering analysis and explanation behind the essential aspects of SIP design.

- SIP DESIGN BP-1: High-Performance SIP Building Envelope
- SIP DESIGN BP-2: HVAC Systems with SIPs
- SIP DESIGN BP-3: SIP Structural Capabilities
- SIP DESIGN BP-4: SIP Sizes
- SIP DESIGN BP-5: SIP Shop Drawings
- SIP DESIGN BP-6: Fabrication/Manufacturing
- SIP DESIGN BP-7: SIP Installation
- SIP DESIGN BP-8: SIP Roof and Wall Assemblies
- SIP DESIGN BP-9: SIP Electrical
- SIP DESIGN BP-10: Plumbing




https://www.sips.org/resources/design#section414

# SIPs Resources: www.SIPs.org

WHAT ARE SIPS | SIP PROJECTS | FIND EXPERTS | NEWS / EVENTS | RESOURCES | DESIGN PROFESSIONALS | BUILDERS | OWNERS

Start the the BEST program at any time by selecting a chapter title below. SIPA will track your progress through the 10 lessons. You must complete all units with an 80% passing score on the tests that follow each video presentation. Once you've completed the program, scroll down the page to learn more about the Registered SIP Builder and Master SIP Builder programs.

Lesson 1 - **Introduction to SIPs**

Lesson 2 - **Basic SIP Design and Engineering**

Lesson 3 - **SIP Order Process**

Lesson 4 - **SIP Building Science**

Lesson 5 - **SIP Layout Drawings**

Lesson 6 - **SIP Site Planning and Coordination**

Lesson 7 - **SIP Layout and Panel Installation**

Lesson 8 - **Integrating Mechanical Systems with SIPs**

Lesson 9 - **SIP Finish Materials and Detailing**

Lesson 10 - **Common Objections for SIP Designs**

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**Take for free at: https://www.sips.org/resources/bestprogram**

# SIPs Resources: www.SIPs.org

## Introduction & Deep-dive Tools

- ✓Industry SIP Specification
- ✓SIP *Design Consideration* and SIP Builder *Need to Know* guides & checklists
- ✓10 ‘Deep Dive’ SIP Best Practices completed


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