EEBA

HIGH PERFORMANCE HOME SUMMIT 2023

OCTOBER 10 – 12 I SALT LAKE CITY, UT

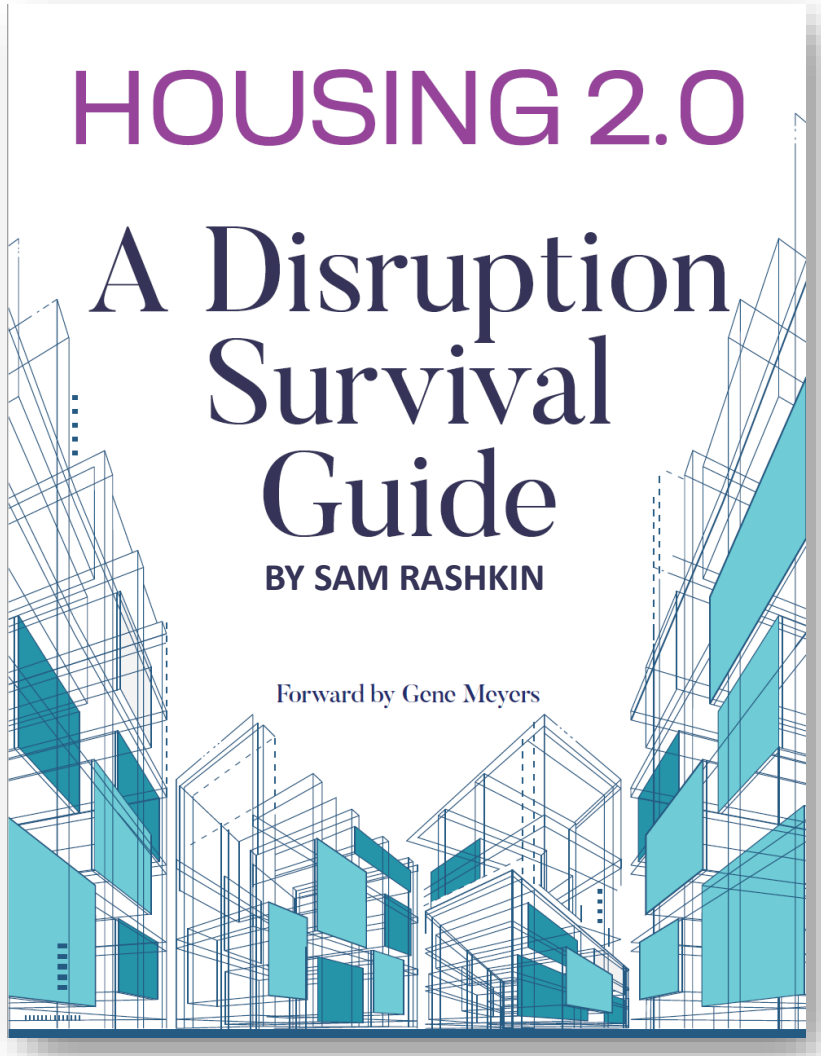
FIVE HIGH-PERFORMANCE INNOVATIONS THAT ARE:

FASTER, BETTER, & CHEAPER

Sam Rashkin and Jack Armstrong

retooling the U.S. Housing Industry

Preparing for the Future of Housing: Resource



Goal:

Prepare high-performance housing professionals to become UX leaders:

- 420+ pages
- 160+ UX optimization best practices
- 100's graphics
- 360+ citations
- 7 guest expert essays
- 8-plus years vetting

Website:

https://www.greenbuildermedia.com/housing-2.0

Preparing for the Future of Housing: A Lot Like Cars

Faster, Better, Cheaper Innovations That Cannot be Limited to Cars

Future Cars: **EV's**

Future Homes: **ZEH's**

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Outline

- The Faster, Better, Cheaper Imperative
- A Word About Getting Innovations to Market
- Five Faster, Better, Cheaper HPH Innovations
- Translating Faster, Better Cheaper
- SIPs Resources

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Faster, Better, Cheaper Imperative

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Why Faster, Better, Cheaper

Housing Problem:

5 Crises Driving Pain

Lack of:

- User X Readiness
- Affordability
- Trades
- Productivity
- Digitization

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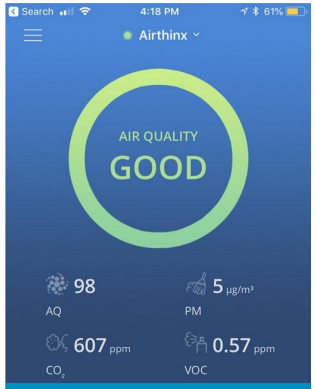
UX Readiness Crisis: Performance a Must-Have but…

Housing Crises | **User X** | Affordability | Trades | Productivity | Digitization

Zero Energy



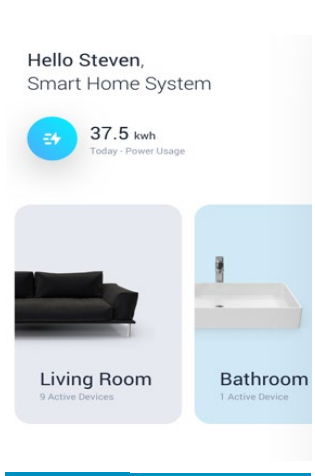
Health

Open Space

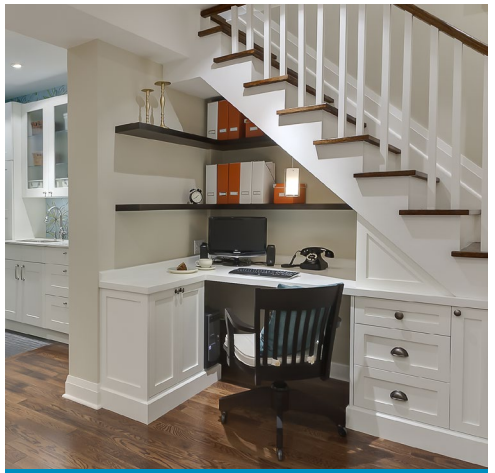
Daylight / Fresh Air

Outdoor Living

Storage



Smart



Work-at-Home

Advanced Lighting

Color

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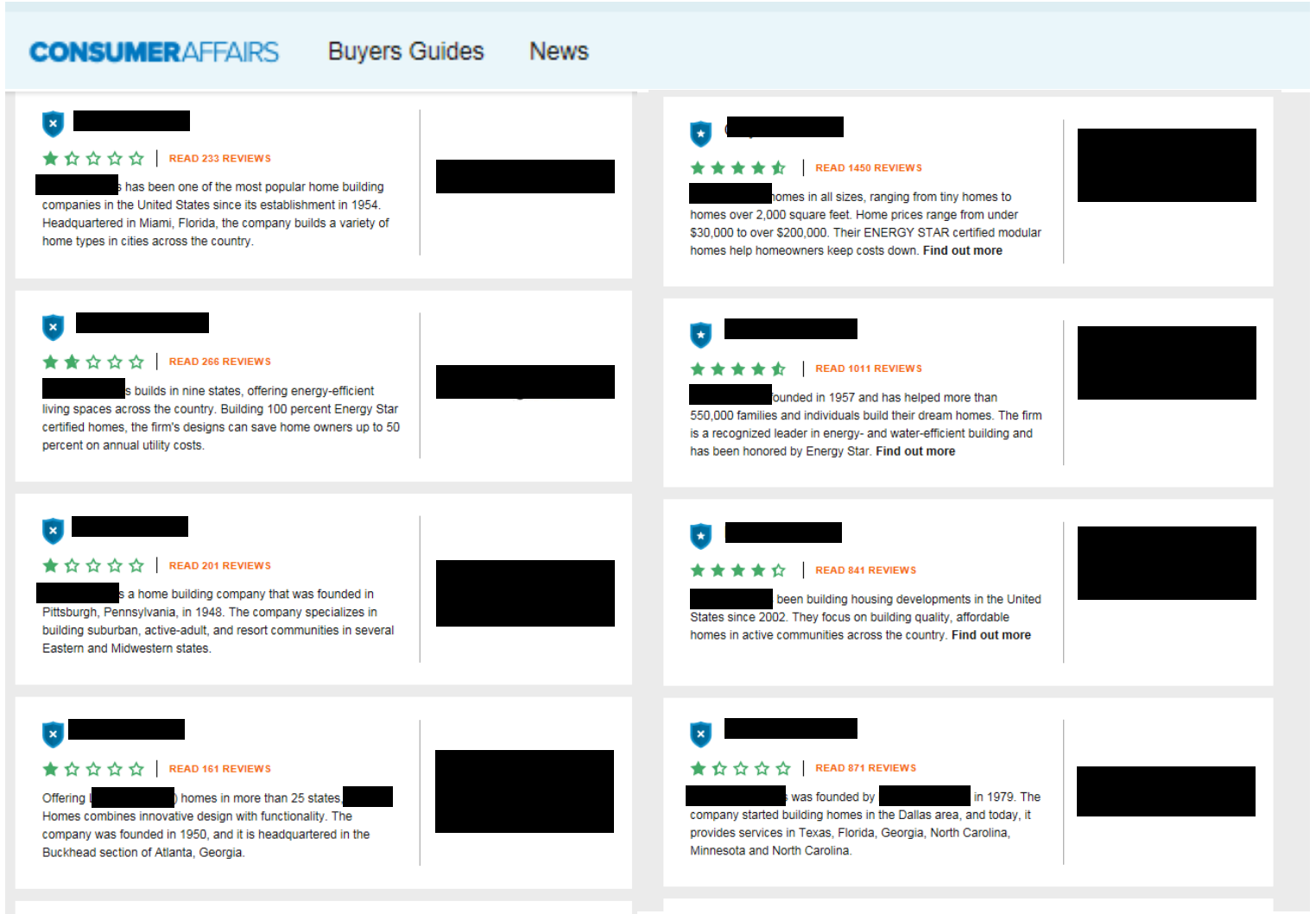
UX Readiness Crisis: 4- and 5-Star Reviews

Housing Crises | **User X** | Affordability | Trades | Productivity | Digitization



<2-Stars

Average star rating for 75+% of listed builders

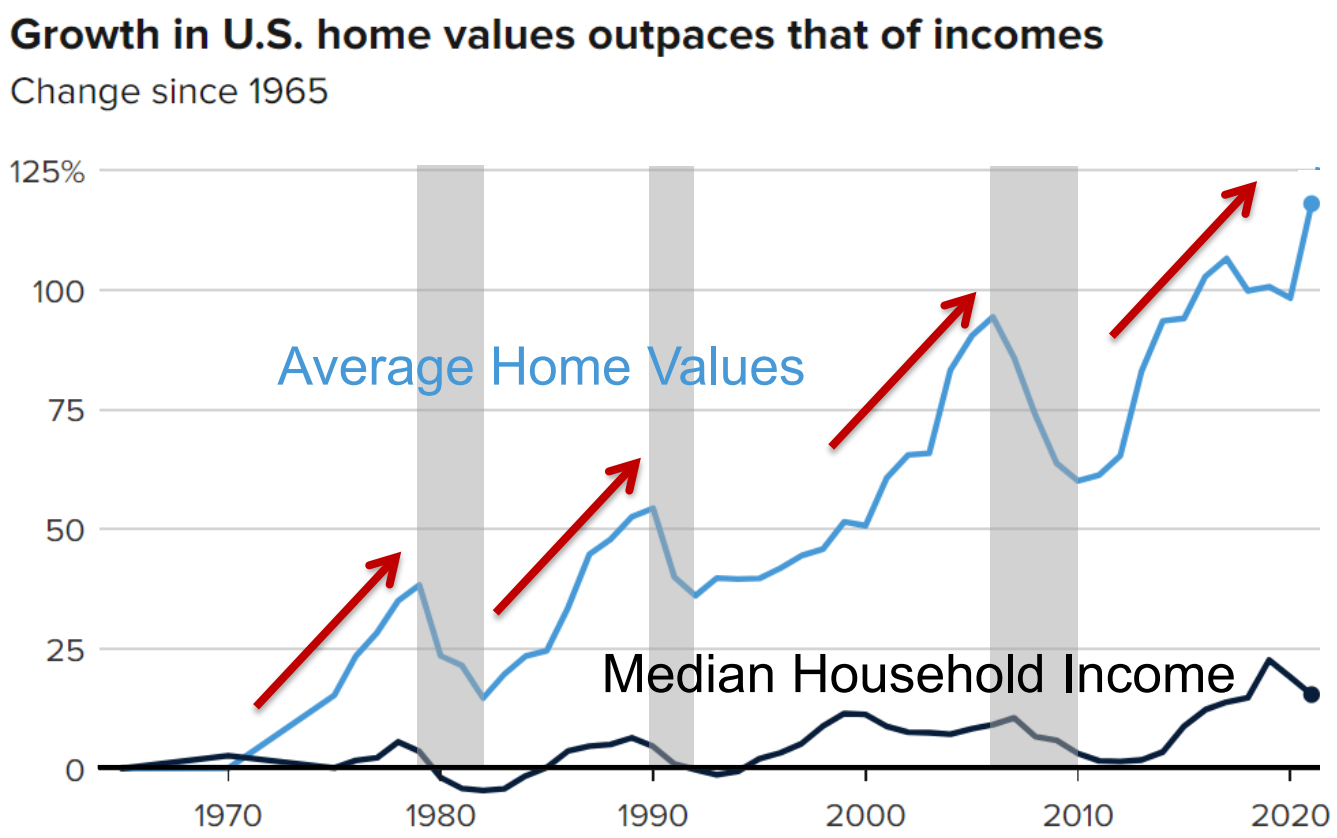
Source: Tabulation of builder reviews at ConsumerAffairs, April 29, 2022

3.4-Stars

Average star rating required for a consumer to consider engaging with a business

Source: "*2021 State of Reviews,*" Podium

Affordability Crisis: Price / Income Disconnect



Source: Real Estate Witch analysis of U.S. Census Bureau data

2X

2021 Price/Income Gap:

- **$144,192**
  Average household income needed to afford a home
- **$69,178**
  median household income

Source: Clever Real Estate

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Affordability Crisis: Americans are House Poor

Housing Crises | User X | **Affordability** | Trades | Productivity | Digitization

9,845 views | May 24, 2018, 08:32am

40% Of Americans Can't Pay $400 Emergency Expense

Zack Friedman Senior Contributor

Photographer: Daniel Tepper/Bloomberg

A new report from the Federal Reserve found that four in 10 Americans don't have the cash to pay for an unexpected expense without selling a belonging or borrowing funds.

FORTUNE

Nearly two-thirds of Americans are living paycheck to paycheck study finds

BY CHRIS MORRIS
August 31, 2023 at 11:58 AM EDT

Nearly two-third of Americans are living paycheck to paycheck.
GETTY IMAGES

Nearly two out of every three adults in the U.S. are just scraping by, due to inflationary pressures, according to a new study.

Research from LendingClub finds that 61% of adults were living paycheck to paycheck as of July 2023, a two-point increase from the previous year. That comes even as inflation rates have dropped from 9.1% last July to 3.2% this year.

THE HILL News Policy Opinion Events Jobs Newsletters

62% of Americans Worried About Paying for Housing in the Next Year

BY CHLOE FOLMAR 08/15/22 7:42 PM ET

Associated Press/Robert F. Bukaty
Builders work on a four-story, 45-unit condominium building under construction May 31, 2022, in Portland, Maine.

Most Americans are worried about paying for housing, according to a survey conducted by market financing company Freddie Mac.

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Trade Crisis: Aging Workforce

42.5

average construction worker age

Source: Bureau of Labor Statistics

2/5

Industry is bringing in only two new workers for every five that age out or retire

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

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Trade Crisis: NOT Going Away

Housing Crises | User X | Affordability | **Trades** | Productivity | Digitization

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

Adobe Stock

The skilled labor shortage remains the key limiting factor to expanding home construction and improving housing inventory and affordability, according to the Home Builders Institute (HBI).

According to the Spring 2023 HBI Construction Labor Market Report, the construction industry needs to add approximately 723,000 new workers each year to meet demand and help combat the nation's estimated 1.5 million home shortage.

~723,000

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

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

Productivity Crisis: Visibly Obvious

150+ Years

1877 **2023**

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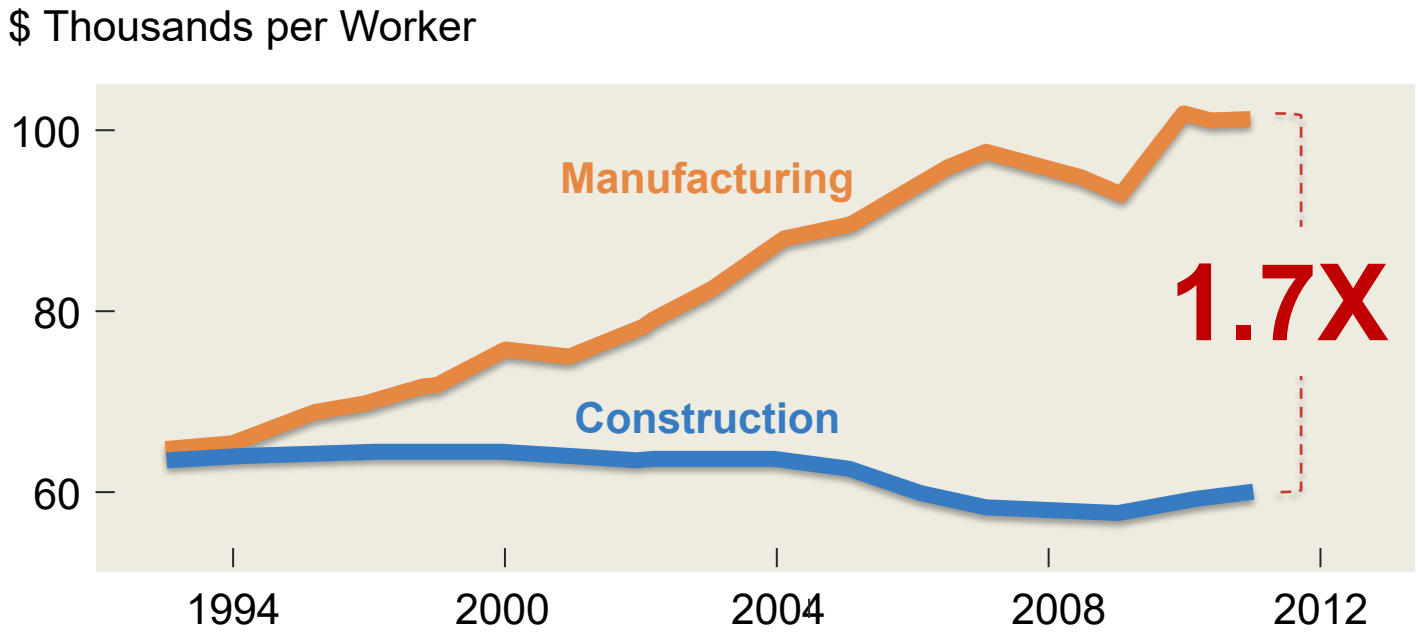
Productivity Crisis: Least Improving Industry

Overview of Productivity Improvement Over Time

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



Source: McKinsey & Company

$200 B

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

Source: McKinsey & Company,

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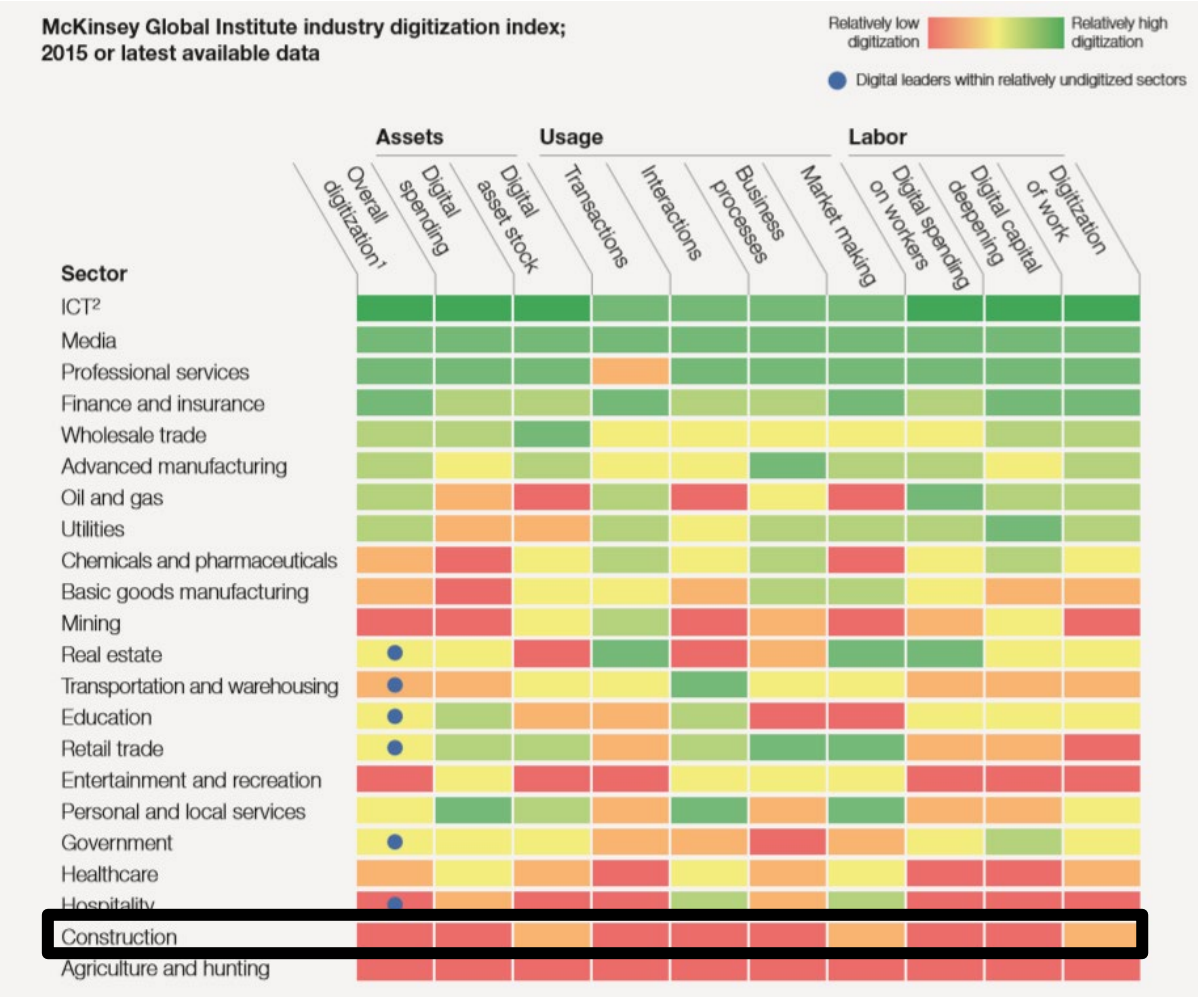
Digitization Crisis: Least Digitized Industry



Housing is the least digitized industry

except for Agriculture/Hunting

Source: *"Imagining* Construction's Digital Future," McKinsey Productivity Sciences Center, Singapore, June 2016

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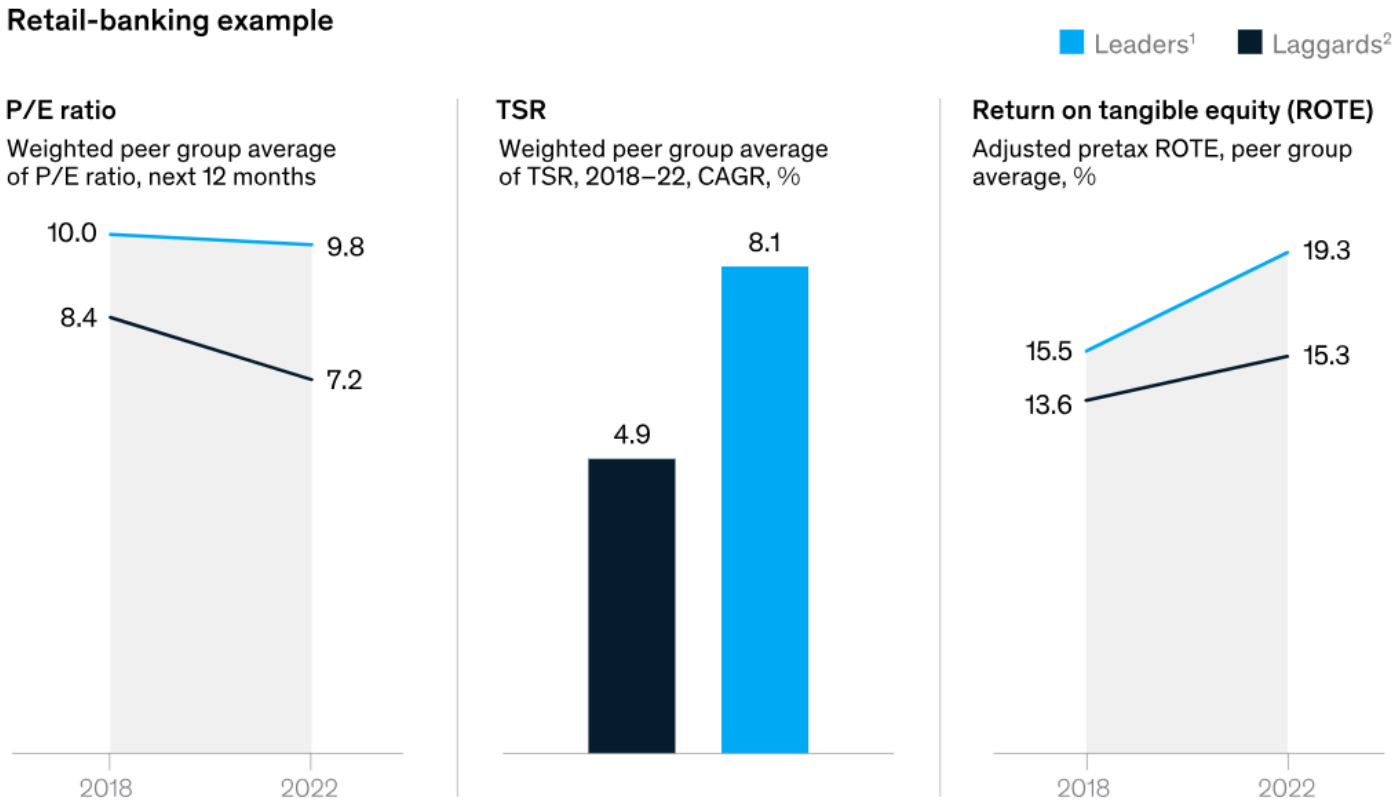
Digitization Crisis: Lagging is Costly



[1]Top 20 retail banks between 2018 and 2022.
[2]Bottom 20 retail banks between 2018 and 2022.
Source: S&P Global; Corporate Performance Analytics by McKinsey

McKinsey & Company

26% – 65%

Outperformance by Digitization Leaders:

- P/E Ratio
- Total Shareholder Returns (TSR)
- Return on Tangible Equity

Source: *"Rewired to Outcompete,"* McKinsey Quarterly, June 20, 2023

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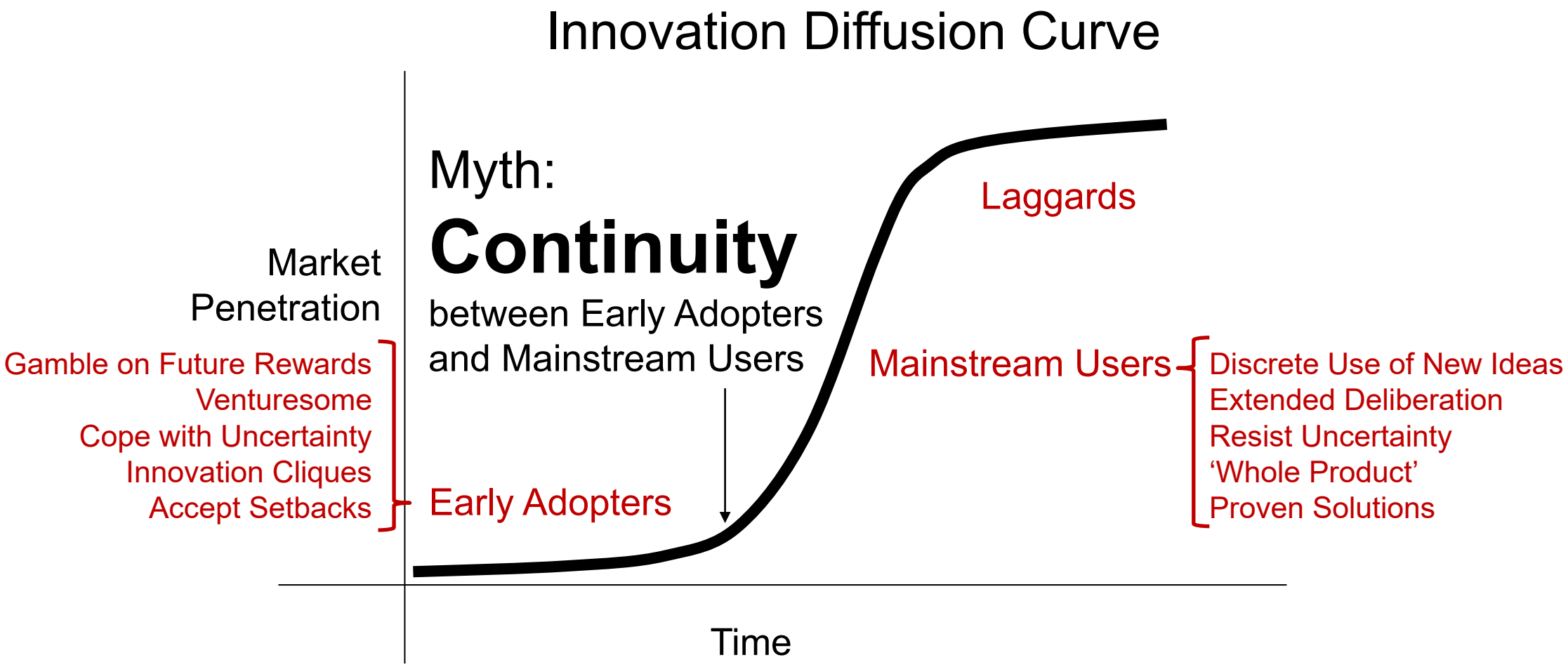
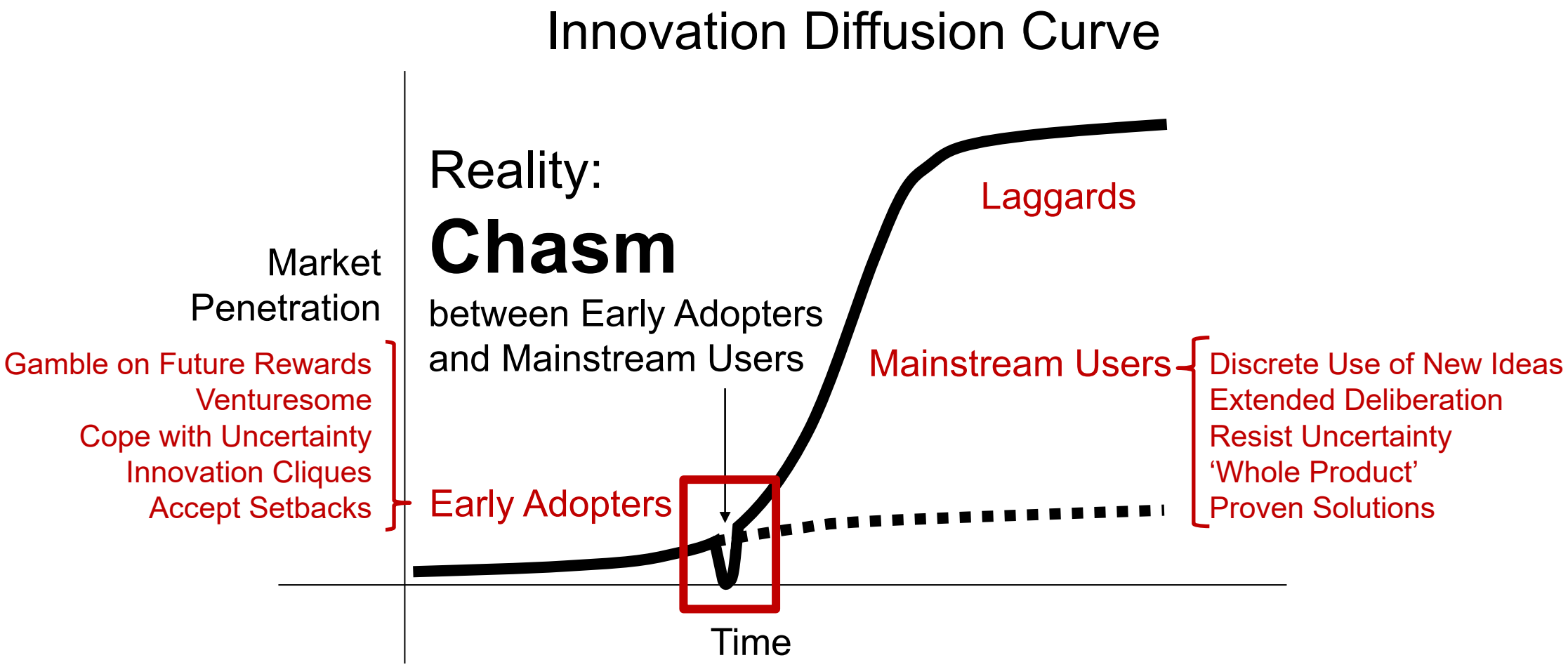
A Word About Getting Innovation to Market

Innovation Market Diffusion Curve: Myth



Source: Inside the Tornado by Geoffrey Moore

Innovation Market Diffusion Curve: Reality



Source: Inside the Tornado by Geoffrey Moore

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Five Faster, Better, Cheaper High-Performance Home Innovations

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Five Faster, Better, Cheaper HPH Innovations

- Unvented Attics
- Plug-and-Play HVAC Ducts
- Aerosol Air Sealing
- Pre-cast Concrete Foundations
- Offsite Construction

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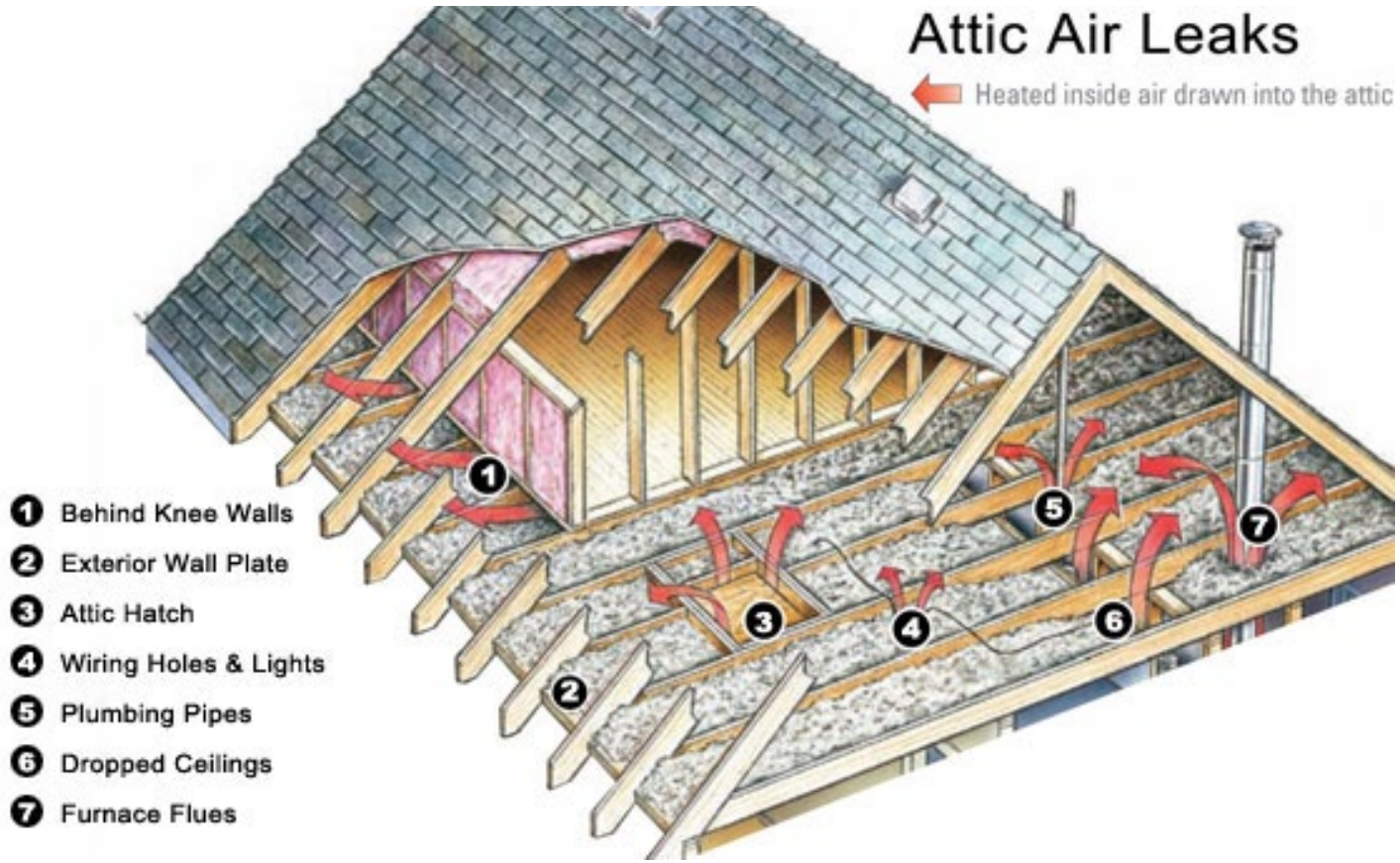
Air Flow Control: Most Egregious Interface

Innovations | **Unvented Attics** | Plug/Play Ducts | Aerosol Air Seal | Pre-cast Found. | Offsite Construc.



Attic/Ceiling:

- Delta T
- Pressure (Stack Effect)
- Air Barriers
  - Knee Walls
  - Dropped/Raised Ceilings
  - Shafts
  - Wind Baffles
- Air Leakage:
  - Penetrations
  - Duct Boots
  - Access Panels
  - Drywall to Top Plate
- HVAC Location

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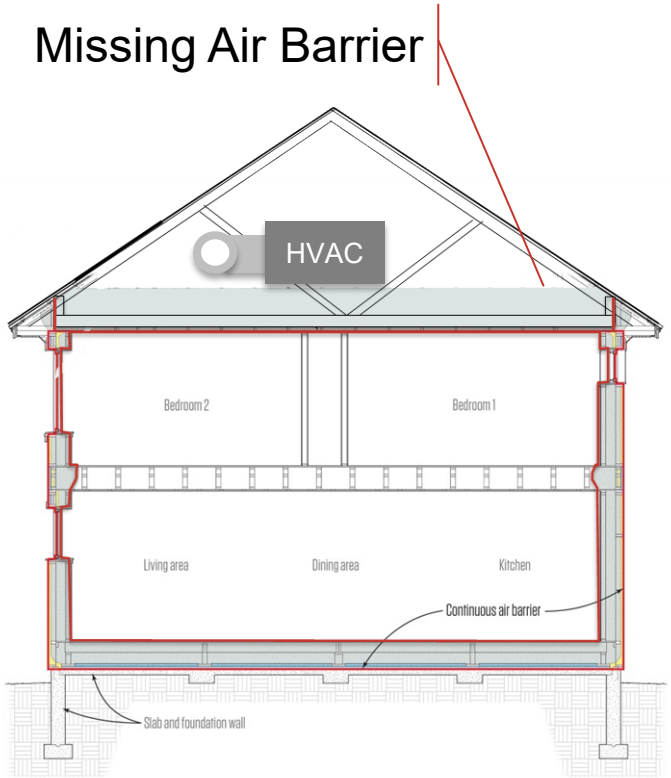
Most Egregious Interface Innovation: Unvented Attic

Innovations | **Unvented Attics** | Plug/Play Ducts | Aerosol Air Seal | Pre-cast Found. | Offsite Construc.



Vented Attic

Faster:

- Reduced Cycle Time

Better:

- More Conditioned Space
- More Efficient
- More Comfort
- More Strength
- More Resilient [Fire/Impact]

Cheaper:

- Cost Savings
  - Vents (ridge, soffit, gable)
  - Air Barriers and Sealing
  - Operations (time)

SIP Roof or Closed Cell Foam Unvented Attic

Most Egregious Interface Innovation: Unvented Attic

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Innovations	**Unvented Attics**	Plug/Play Ducts	Aerosol Air Seal	Pre-cast Found.	Offsite Construc.

Problem: Vented Attic
~50% Air Barrier

Solution: SIP Roof Unvented Attic
100% Air Barrier

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Most Egregious Interface Innovation: Unvented Attic

Innovations | **Unvented Attics** | Plug/Play Ducts | Aerosol Air Seal | Pre-cast Found. | Offsite Construc.

Offsite Construction: Faster, Better, Cheaper

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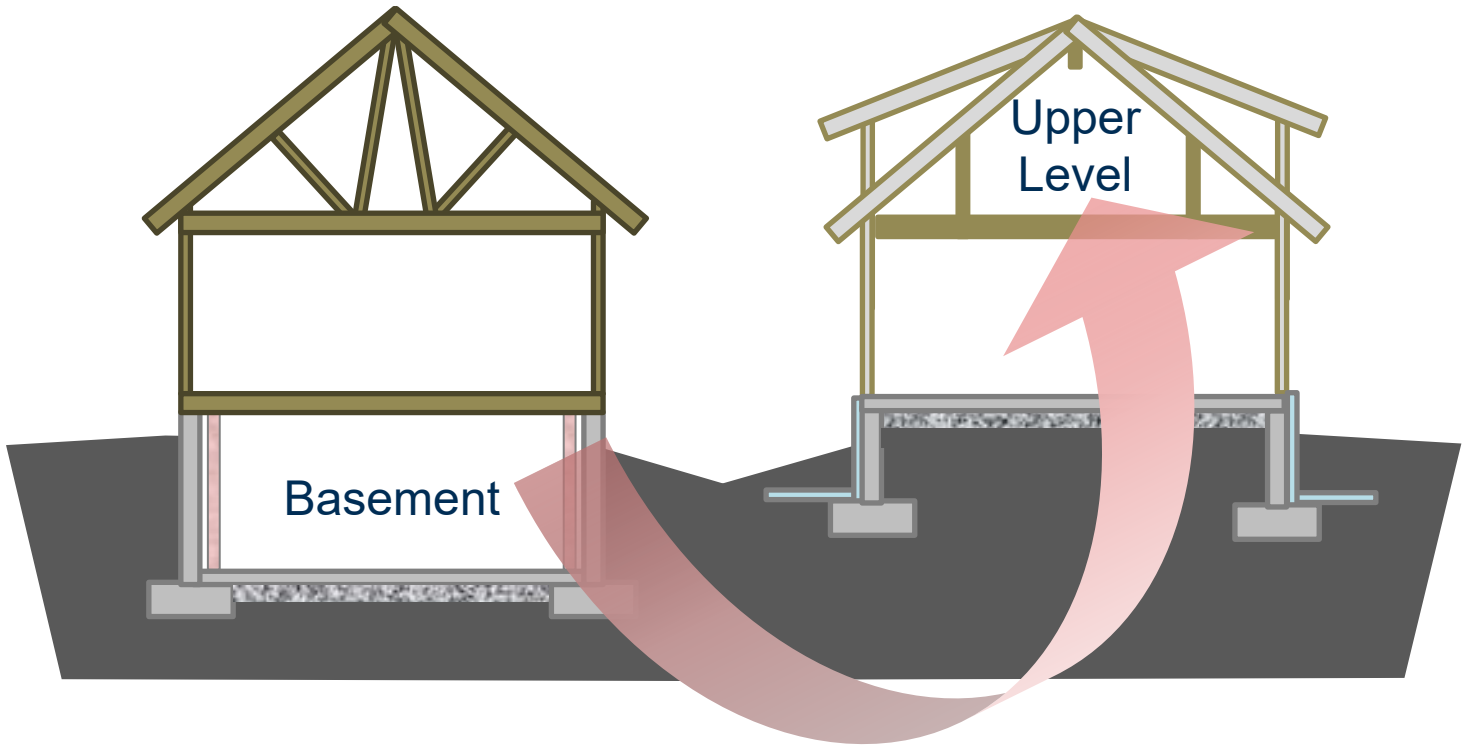

Framed Roof

Trade Basement for Upper Level (e.g., 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 (3 days)	**$1.5K - $2.5K**
Added Value	
2nd Fl. vs. B'ment	**$40K - $60K**

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

Offsite Construction: Faster, Better, Cheaper

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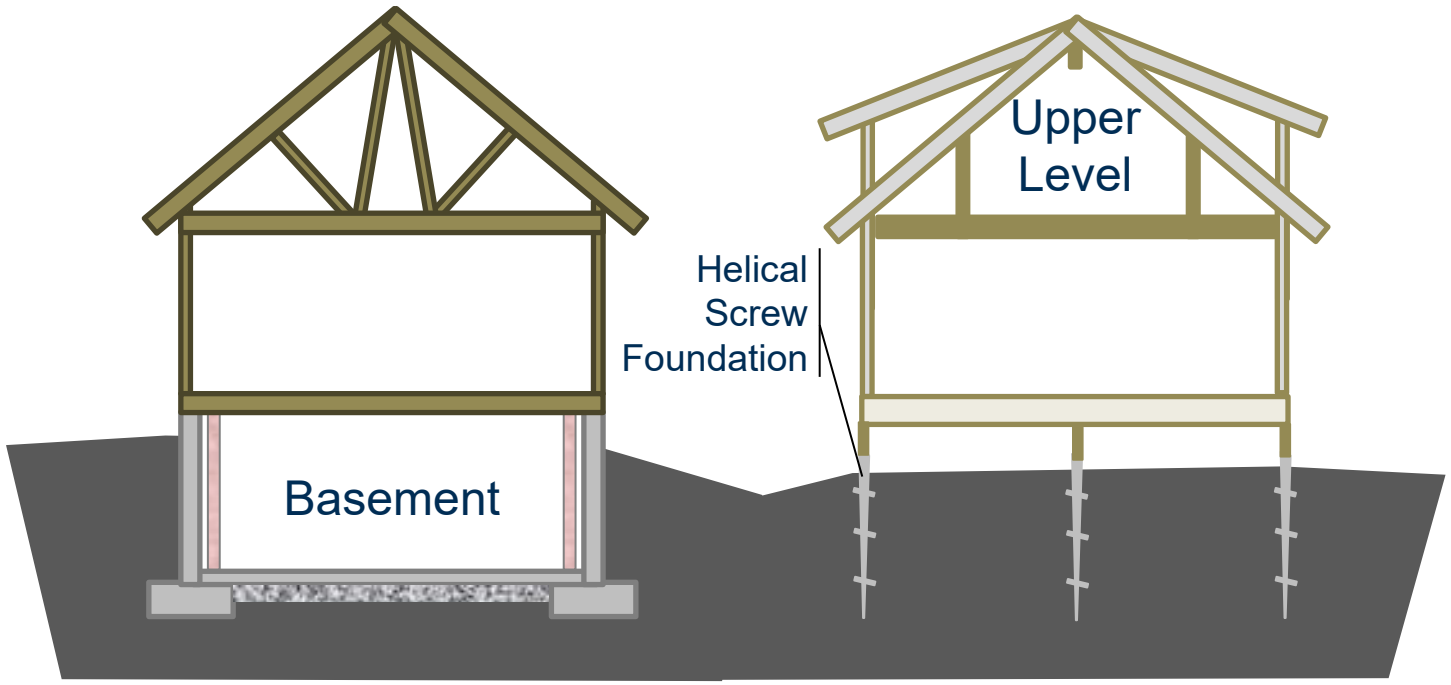

Framed Roof

Trade Basement for Upper Level (e.g., SIPs)

Cost Savings	
Helical Screw Fdn.	?
Wall Framing	**$1K - $2K**
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HVAC Quality Installation Crisis

Fault Type	Testing High	Testing Low
Equipment Sizing	**31 – 93%**	0 – 9%
Refrigerant Charge	4 – 50%	**29 – 78%**
Duct Leakage	**67 – 100%**	N.A.
Air Flow	8 – 29%	**50 – 93%**

70% to 100%

of field measured HVAC systems evidenced at least one performance-compromising fault

Source: U.S. DOE Summary Report on Residential HVAC Installation: www.osti.gov/servlets/purl/1470985

HVAC QI Innovation: Plug-and-Play Ducts

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Innovations | Unvented Attics | **Plug/Play Ducts** | Aerosol Air Seal | Pre-cast Found. | Offsite Construc.

- **Faster:**
  - Cycle Time [up to 50%]
    - Integrated Duct Sealing
    - One-Size Duct Runs
    - Snap-fit Connection System
    - App-Based Balancing
- **Better:**
  - Inherently Air-Tight
  - Ducts in Conditioned Space
  - Greater Comfort
    - Predictive Air Flow
    - More Diffusers/Mixing
- **Cheaper:**
  - Cycle time[up to 50%]
  - Less Waste [up to 75%]

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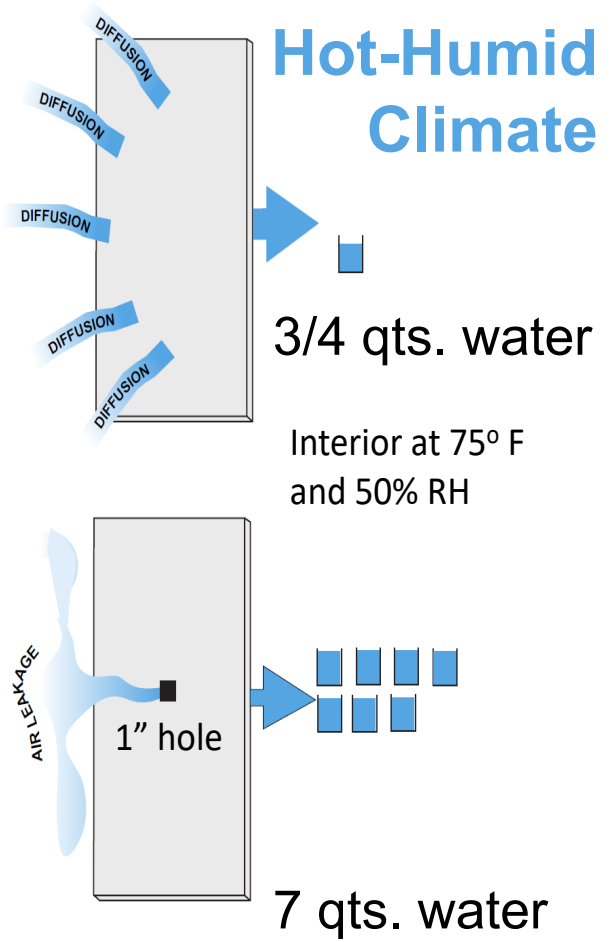
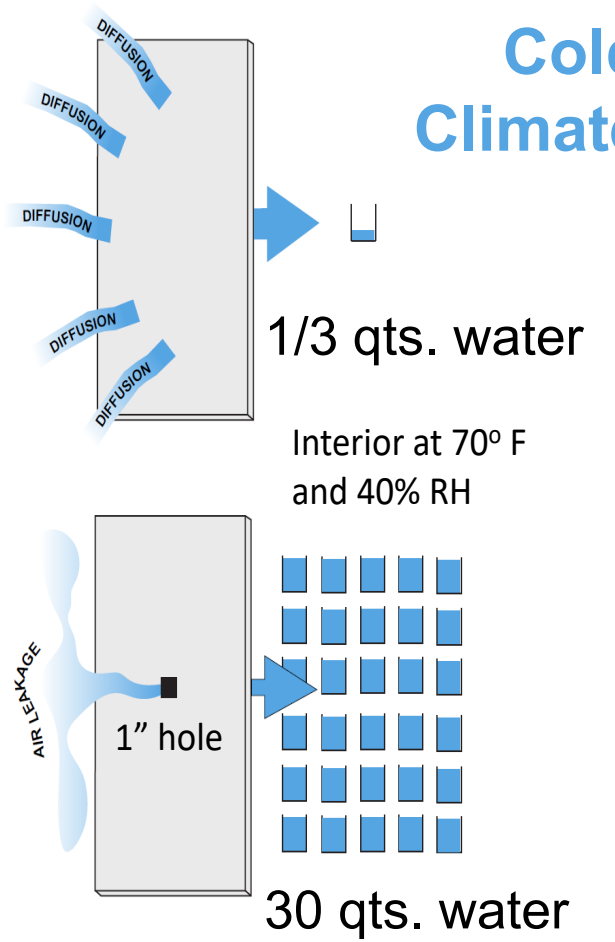
Why Air Sealing Critical

Hot-Humid Climate



Moisture vapor flow over Spring, Summer, and Fall from the exterior to interior

Cold Climate



Moisture vapor flow over Winter from the interior to exterior

Air leakage vs. Diffusion:
Vapor flow with 5 Pascal pressure difference

~10X Greater
in Hot-Humid Climates

~100X Greater
in Cold Climates

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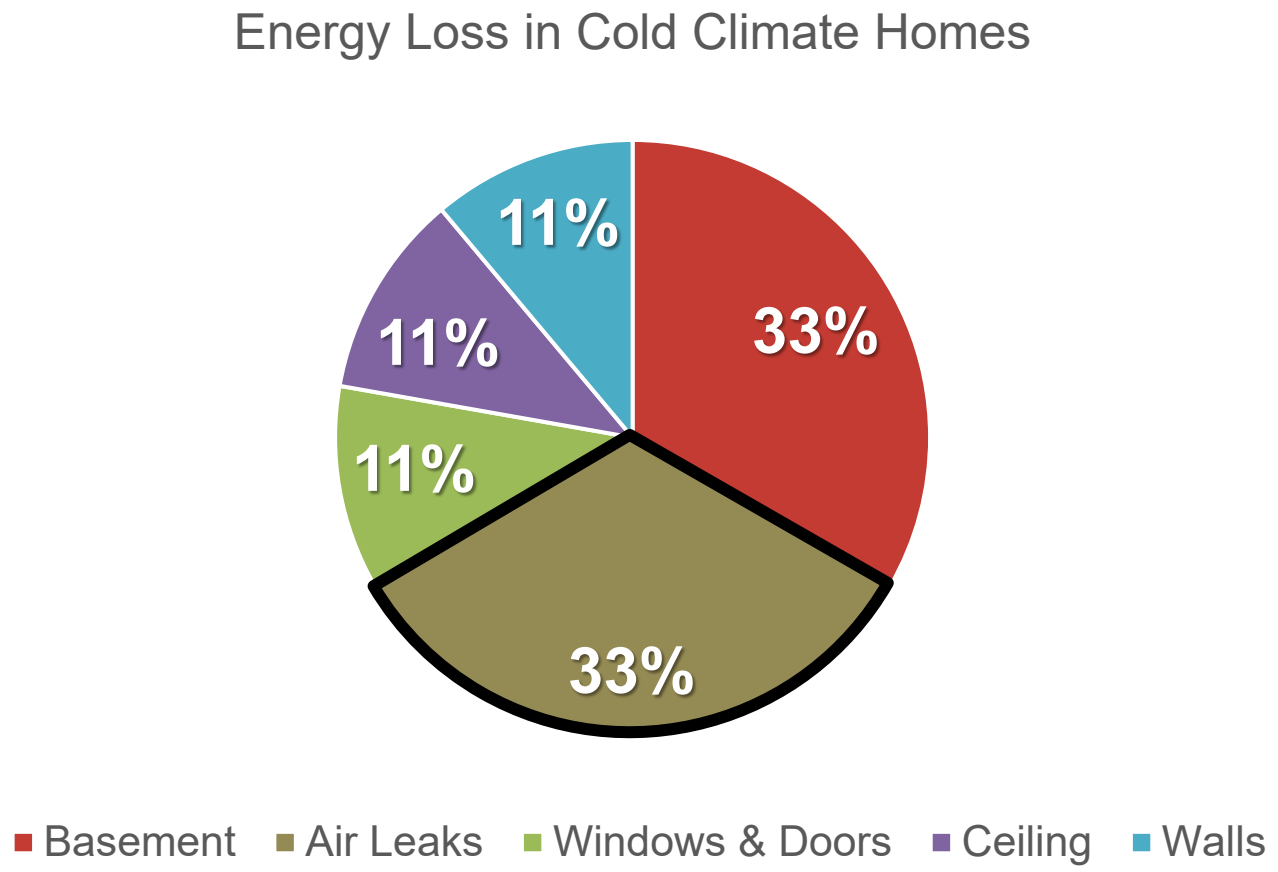
Why Air Sealing Critical



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 than walls, ceiling, windows/doors

10X to 100X

greater vapor flow control than diffusion

Up to 60+%

loss of insulation R-value where air can move through wall assemblies

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Air Flow Control: One National Air Sealing Target

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 ACH50 Max Everywhere:

- Moisture Control
- Outdoor Contaminants
- Greater Disaster Risk
- Readily Achievable

Air Flow Innovation: Aerosol Air Sealing

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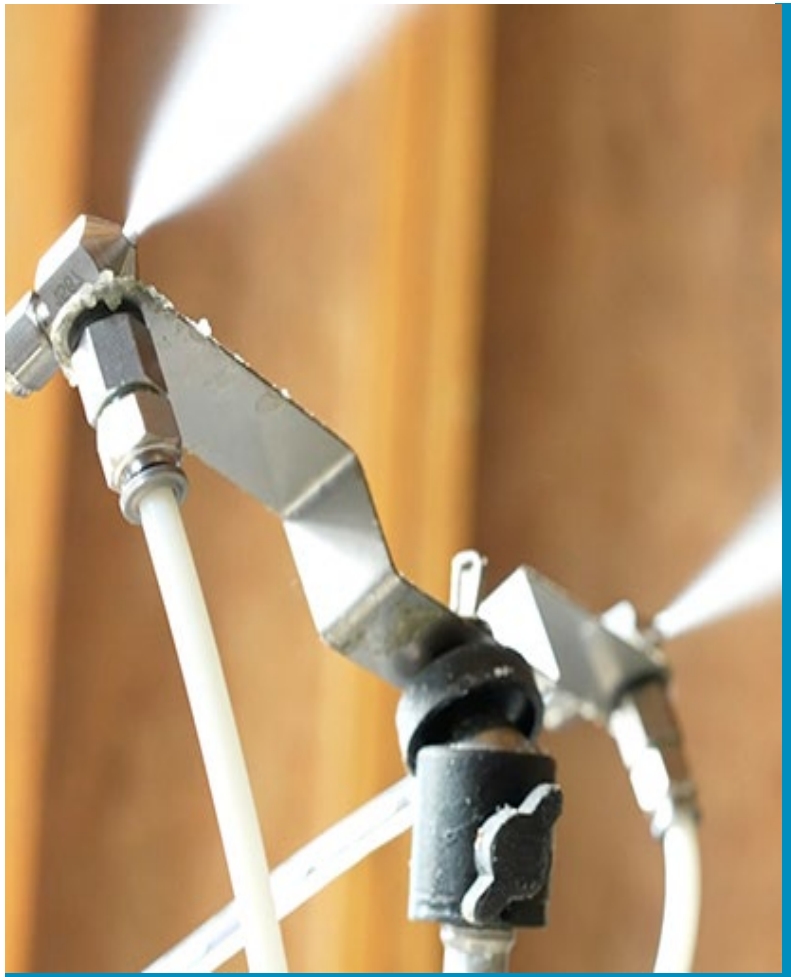
Innovations | Unvented Attics | Plug/Play Ducts | **Aerosol Air Seal** | Pre-cast Found. | Offsite Construc.

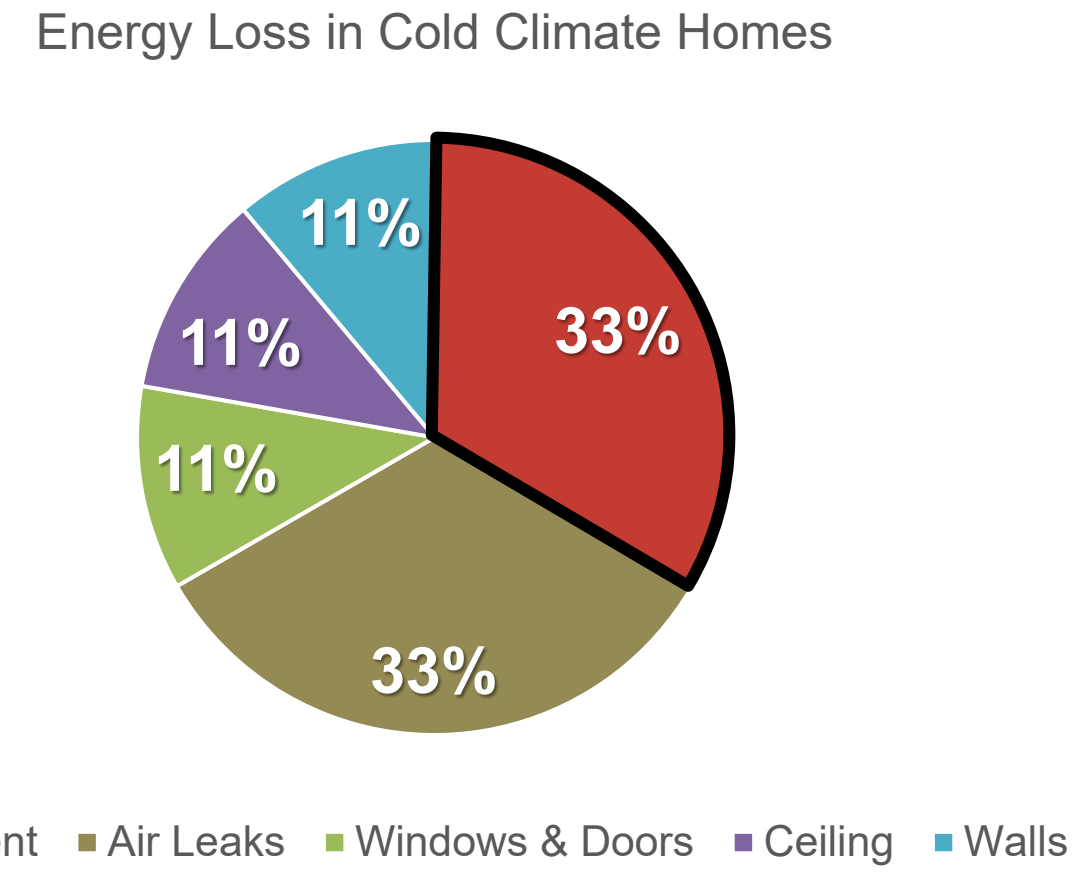
Manual Air Sealing



Aerosol Air Sealing

- **Faster:**
  - Cycle Time
  - Compliance
- **Better:**
  - Digital Precision
  - Guaranteed Targets
  - Reduced Risk
- **Cost Savings:**
  - Operations (Time)
  - Rework
  - Single Solution

Why Basement Thermal Energy Control Critical



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 from basement than walls, ceiling, windows/doors

Best Practices:

- Ultra-Eff. Foundation
- No Basement

Basement Foundation Innovation: Pre-Cast Concrete

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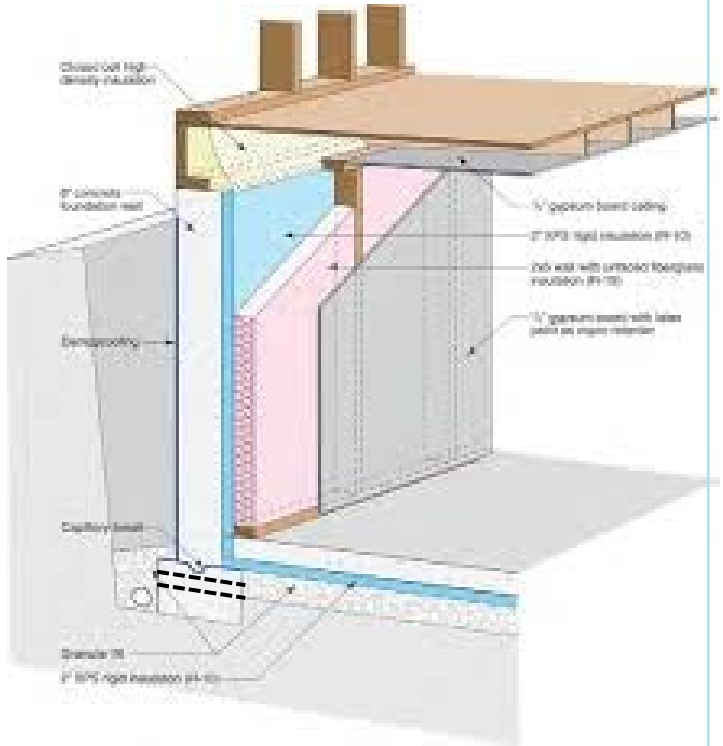

Concrete Foundation

- **Faster:**
  - Cycle Time [approx. 1-day]
- **Better:**
  - Strength
  - Effective Bond Beam
  - Moisture Protection
  - 5,000 psi Concrete
  - Clear Path to Drain Tile
  - Dimensional Accuracy
  - More Usable Space
  - 70% Less Concrete
- **Cheaper**
  - Reduced Cycle Time
  - Integrated Insulation/Furring

Precast Concrete Foundation

Enclosure Lack of Innovation

150+ Years

1877 **2023**

Enclosure Innovation: Offsite Construction

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1. Kits
2. Panels
   - Framed
   - SIPs
   - ICPs
   - Precast Conc.
3. Modular
4. Hybrids
5. 3D Printing

Faster:

- Reduced Cycle Time
- Reduced Trades

Better:

- Improved Quality
- Greater Accuracy
- Stronger

Cost Saving:

- Time
- Less Rework
- Eliminate Waste
- Lower Cost at Scale

Offsite Construction: Faster

← Offsite Construction Schedule

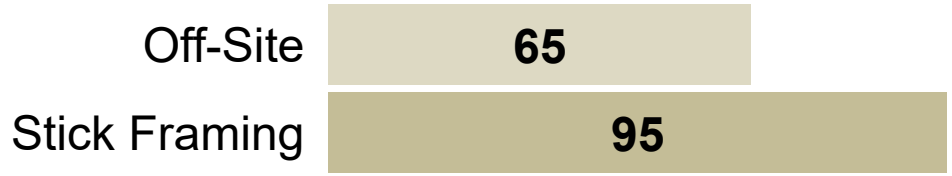
Design Engineering	Permits & Approvals

← Site-Built Construction Schedule

Design Engineering	Permits & Approvals

Source: *'Special Report: Modular Construction and Design Demand Evolved Business Models,'* Joe Bousquin, Building Forward, January 22, 2019

Offsite Construction: Cheaper



Total Number of Days on Site

Source: Century Homes and Entekra customers

Off-Site: $500 - $800/day = **$15K – $24K**

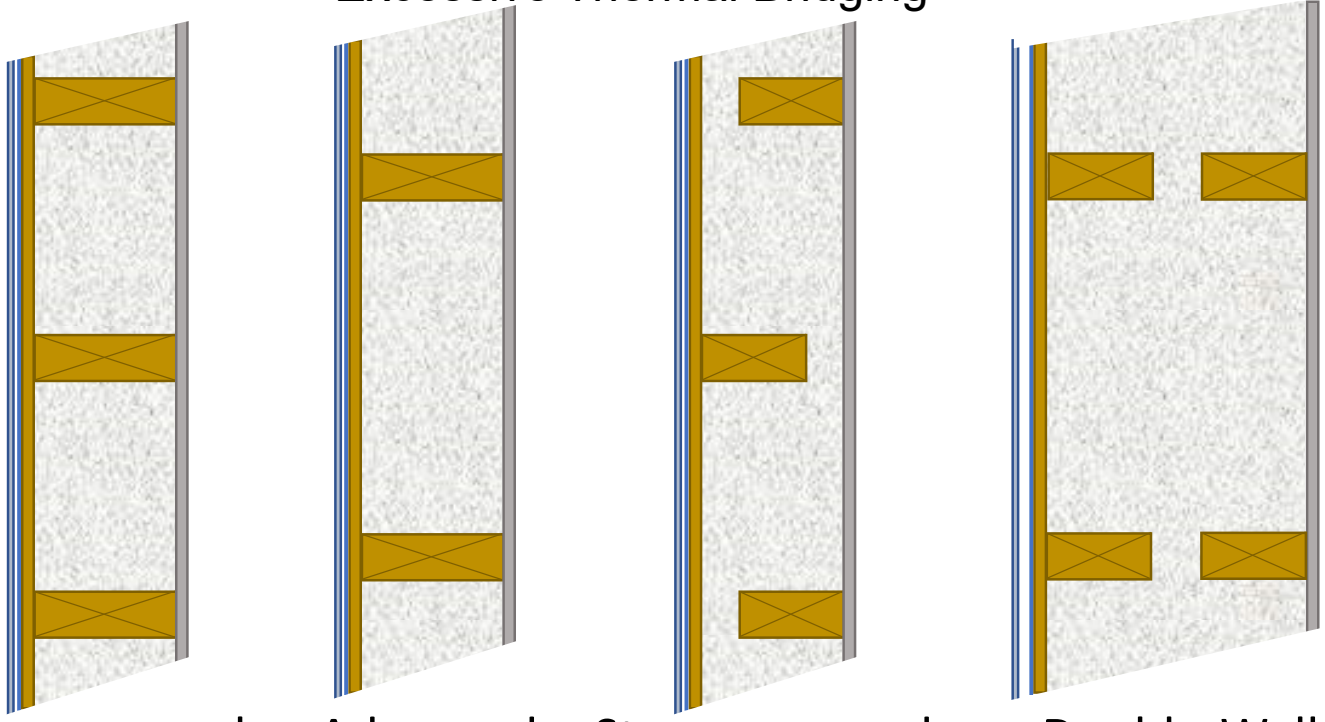
Stick Framing: 30 Days

Value of Number of Days Saved with Off-Site

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

Offsite Construction: Better

Maximum Quality Installed Insulation Risk
Maximum Moisture Control Risk
Excessive Thermal Bridging



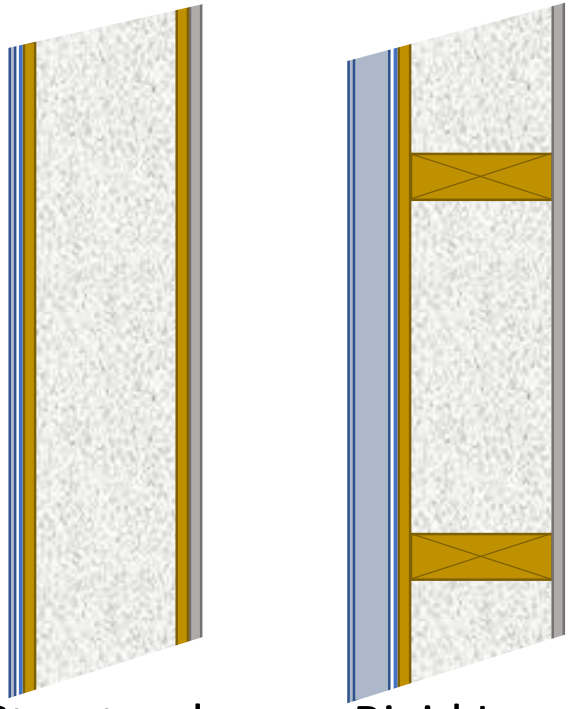
Conventional Framing 25-30% F.F.

Advanced Framing 19% F.F.

Staggered Stud Framing 12% F.F.

Double-Wall Framing 10% F.F.

Ensured Quality Installed Insulation
Minimal Moisture Control Risk
Minimal Thermal Bridging



Structural Insulated Panels 5% F.F.

Rigid Insul. Sheathing 2% F.F.

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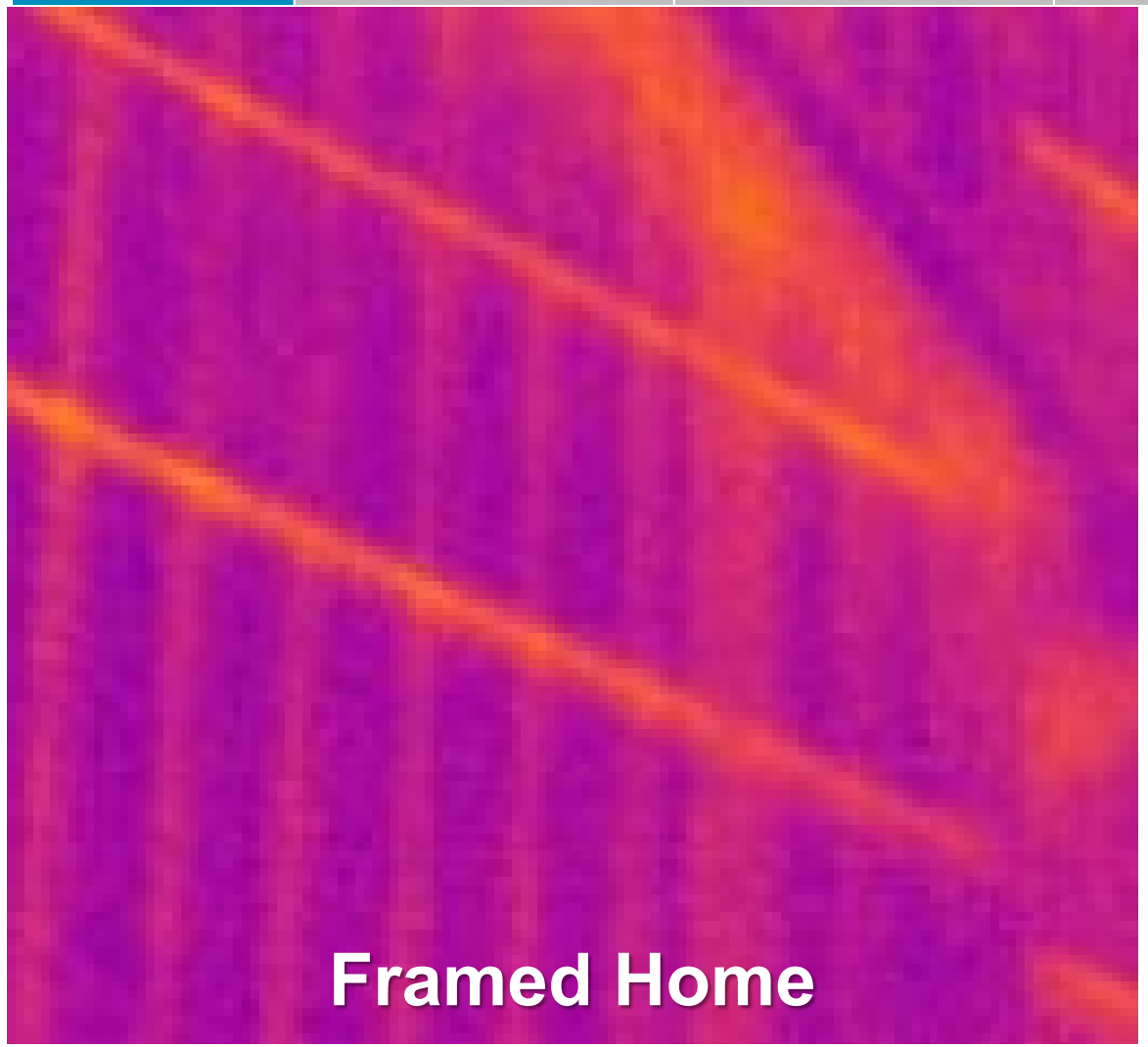
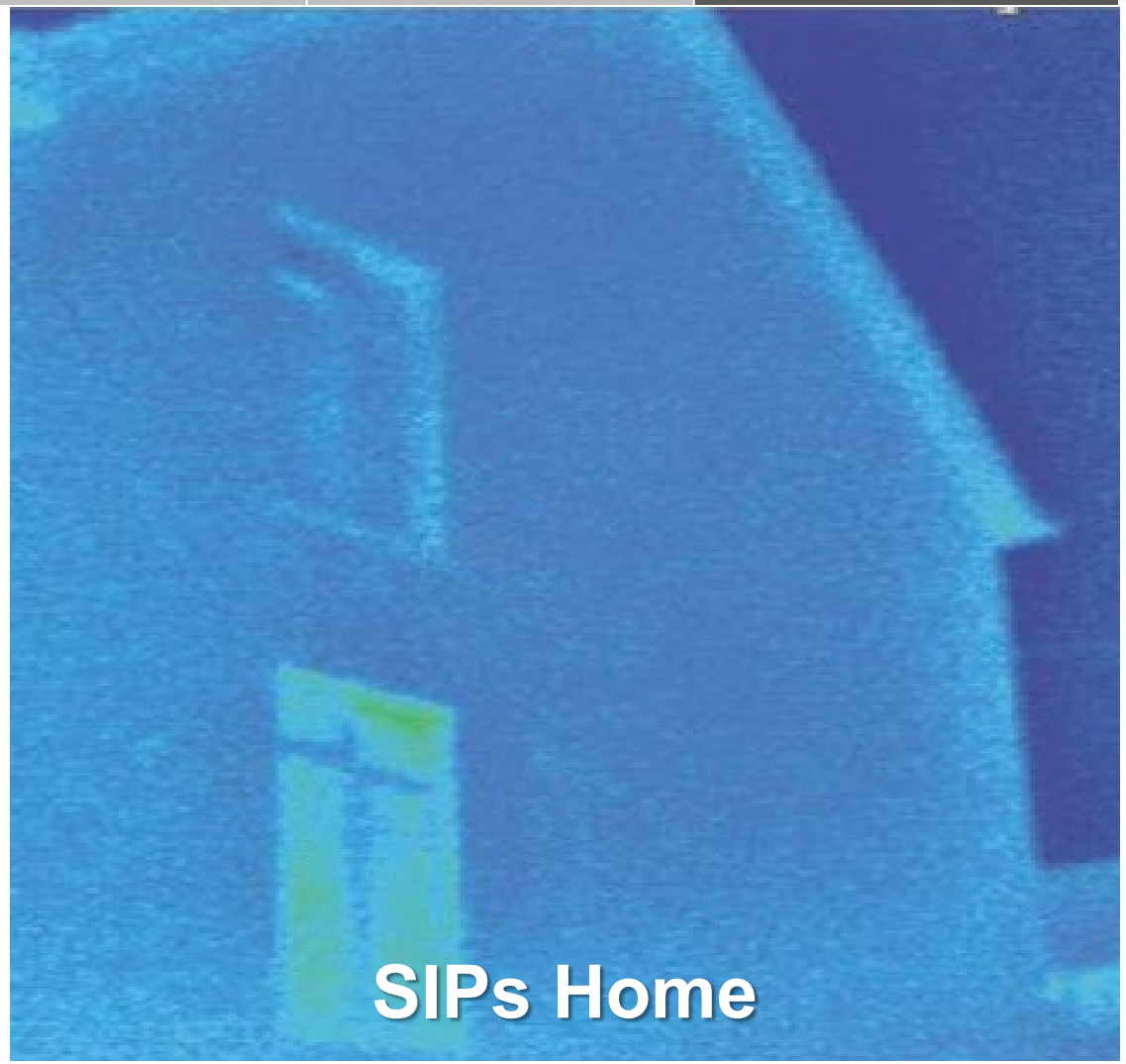
Offsite Construction: Better

Innovations | Unvented Attics | Plug/Play Ducts | Aerosol Air Seal | Pre-cast Found. | **Offsite Construc.**

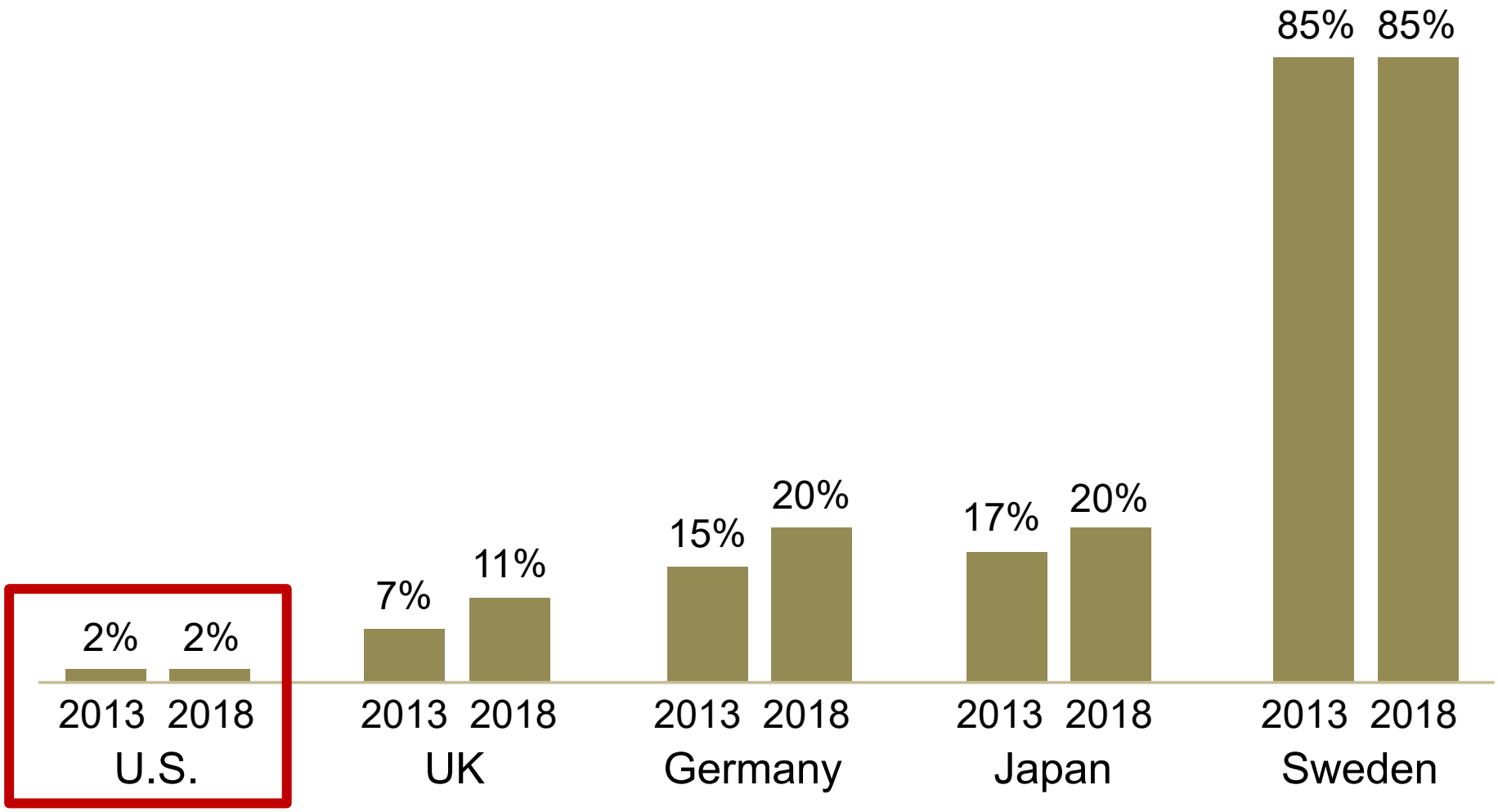




Offsite Construction: Huge Opportunity in the U.S.

retooling the U.S. Housing Industry

Innovations | Unvented Attics | Plug/Play Ducts | Aerosol Air Seal | Pre-cast Found. | **Offsite Construc.**



Source: *'The Offsite Revolution in Construction,'* Romain de Laubier, Boston Consulting Group, May 6, 2019

retooling
the U.S. Housing Industry

Translating Faster, Better, Cheaper: SIPs True Cost Bidding Tool (STCBT)

retooling the U.S. Housing Industry

SIPs vs. Framing Cost Savings

Time	• Framing • Drywall • Trim
Air Flow	• Air Sealing • Air Barriers • Attic Venting
Quality	• Rework (framing, finishes) • Risk (reserves for callbacks) • Inspections (inherent QA) • Training (MEP, insulation, air sealing)
Waste	• Framing • Drywall • Trim

Significant cost savings identified building with SIPs

retooling the U.S. Housing Industry

SIPs Added Value

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

Significant added value identified for SIPs homeowners

STCBT: Translate Savings & Value - Hypothetical

Cost Assumptions:	Metrics:	Source
Carrying Cost per day of construction	$ 400	Cost of Quality, Glenn Cottrell w/IBACOS - $500 - $800/day
Percent Cost Savings Installing Drywall w/SIPS	2%	Estimate
Pecent Cost Savings Installing Cabinets w/SIPs	1%	Estimate
Percent Cost Savings Installing Trim w/SIPS	1%	Estimate
Framing Waste in # Dumpsters Per 1,000 Sq. ft.	2.0	Cost of Quality, Glenn Cottrell w/IBACOS - $500 - $800/day
SIPs Waste in # Dumpsters Per 1,000 Sq. ft.	0.67	SIPA Meeting
Cost Per Dumpster	$ 500	Cost of Quality, Glenn Cottrell w/IBACOS - $500 - $800/day
Cost of Schematics for Optimizing MEP with SIPs	$ 1,000	

SIPs Added Value Assumptions:	Metrics:	Source
Base Price of Home	$ 450,000	Builder
Conditioned Square Feet of Home	2000	Builder
Retail Cost per Sq. Ft. Above-Grade Condtioned space	$ 250	Builder
Retail Cost per Sq. Ft. Below-Grade Condtioned space	$ 130	Builder
Additional Conditioned Square Feet with Thinner Walls	25	Take-Off
Sq. Ft. of SIP Attic Traded Off for Basement	0	Take-Off
Additional Conditioned Square Feet with SIP Attic	0	Take-Off
Annual Home Insurance Cost	$ 1,200	Insurance Company

Summary: SIPs Savings/Value vs. Conventional Framing

Cost Savings	Added Value	Total
$ 13,175	$ 13,000	$ 26,175

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.

Stairs	$950	$950		
Attic Venting	$750	$750		
Concrete Foundation - Material and Labor	$12,000	$12,000		
Insulation	**$7,304**	**$0.00**	**4.0**	**0.0**
Wall - Cavity	$7,304	$0		
Wall - Rigid	$0	$0		
Attic Ceiling	$0	$0		
Band Joists	$0	$0		
Air Flow Control	**$2,750**	**$1,350**	**3.0**	**1.0**
Air Barriers	$1,000	$700		
Air Sealing	$1,500	$400		

Higher Appraisals to Base Price	$ 450,000	$0
Reduced Home Insurance Annual Insurance Cost	$ 1,200	$0
Additional Square Footage with Thinner Walls	25	$6,250
Sq. Ft. of SIP Attic Traded Off for Basement	0	$0
Additional Conditioned Space with SIP Attic	0	$0
45 L Tax Credit		$0
Utility Rebate		$0
30-year Energy Savings		$0

STCBT: Non-SIPs Builder Focus Group

Key Criteria Scores [Non-SIPs Builders]		
Understandable	**Credible**	**Actionable**
3.8	**4.4**	**4.8**

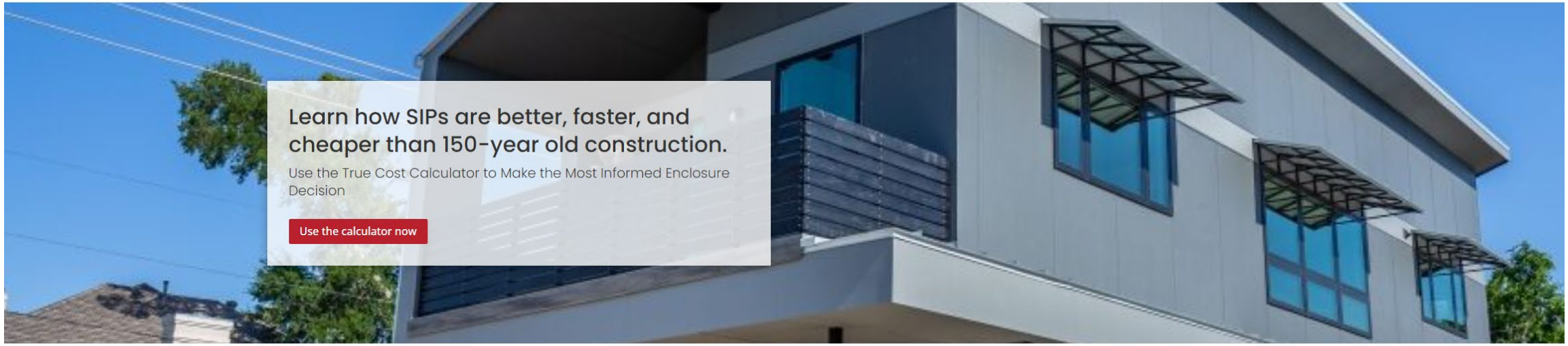
Results:

Tool output is understandable, credible, and actionable making high-performance enclosure decisions.

STCBT: Website Resource

Structural Insulated Panel Association

SIPA TrueBid Calculator Sample Project



Choose how to interact.

Start from scratch.
Are you prepared with bids? Use our calculator to compare the true benefits (value + cost savings) of using SIPs vs. conventional framing.

Use the calculator.

Start on a sample project.
Not ready to input your own project? Use our sample project to experiment with how simple changes can affect the bottom line.

View a sample project.

STCBT: Website Resource

Project Information | Cost Assumptions | Home Details | Bid Information: Structure | Bid Information: Insulation | Bid Information: Air Flow Control | Bid Information: Interior Finishes | Bid Information: MEP | Bid Information: QC Control and Lean Construction | Summary

PROJECT DASHBOARD: Willows Creek

Cost Comparison	SIPs Improved User Experience	Value of Time Saved	Total SIPs Savings + Value
$ 4,590	$ 133,650	$ 5,640	$ 143,880

Bid Information: Air Flow Control

Please enter the following information based on the bids you received. Include both materials and labor costs in the estimate.

Bid Cost Details

	Cost with Traditional Framing (USD)	Cost Using SIPs (USD)
Air Barriers	1,000	700
Air Sealing	1,500	400
Wind Baffles	250	250

Total Air Flow Costs	Total Cost with Traditional Framing	Total Cost Using SIPs
	$ 2,750	$ 1,350

STCBT: Website Resource

Structural Insulated Panel Association

Project: Willows Creek

SIPs Savings/Value vs. Conventional Framing

The following details outline the potential cost savings using SIPs

Total SIPs Saving + Value Over Conventional Framing:	**$ 143,880**
Details: Total Cost Comparison	$ 4,590
Total Costs with Traditional Framing	$ 185,395
Total Cost Using SIPs	$ 180,805
Total Cost Savings (Framing Cost - SIPS Cost)	$ 4,590
Details: SIPs Improved User Experience	$ 133,650
Stronger/More Dimensionally Accurate Enclosure	$ 3,750
Greater Resilience to Fire, Wind, Impact, Pests	$ 7,500
High Appraisals to Base Price	$ 0
Reduced Home Insurance Annual Insurance Cost	$ 0
Additional Square Footage with Thinner Walls	$ 7,200
Sq. Ft. of SIP Attic Traded Off for Basement	$ 115,200
Additional Conditioned Space with SIP Attic	$ 0
45L Tax Credit	$ 0
Utility Rebate	$ 0
30-year Energy Savings	$ 0
Total Added Value	$ 133,650

Details: Value of Construction Time Saved vs. Framing

Total Number of Construction Days	Conventional Framing	29.0
	Using SIPs	14.9
Value of Saved Days		$ 5,640

Input Information

The following is the information input into the SIPS TrueCost Tool

Project Information

Name	Sam Rashkin
Email	sam@truhomefacts.com
Company Name	Retooling the U.S. Housing Ind
Project Name	Willows Creek
Builder	Live Better Homes
SIP Provider	ACME SIPs
Sales Rep	Joe Smith

Cost Assumptions

Carrying Costs Per Day of Construction (USD)	$ 400 USD
Percent Cost Savings Installing Drywall with SIPS	2 %
Percent Cost Savings Installing Cabinets with SIPS	1 %
Percent Cost Savings Installing Trim with SIPS	1 %
Framing Waste in # of Dumpsters Per 1,000 Sq. Ft.	2.0
SIPs Waste in # of Dumpsters Per 1,000 Sq. Ft.	0.7
Cost Per Dumpster (USD)	$ 500 USD
Cost of Schematics for Optimizing MEP with SIPs	$ 1,000 USD
HVAC Cost Difference for SIPs vs Conventional Framing	$ 0 USD
Electric Cost Difference for SIPs vs Conventional Framing	$ 0 USD
Plumbing Cost Difference for SIPs vs Conventional Framing	$ 0 USD
Training Cost with Framing (% of Home Base Price)	0.35 %
SIPs % Training Cost Savings Compared to Conventional Framing	20 %
Inspection Cost with Framing (% of Home Base Price)	0.30 %
SIPS Inspection Cost Savings Compared to Conventional Framing	40 %
Framing Rework Cost (% of Home Base Price)	0.35 %
SIPs % Cost Rework Savings Compared to Conventional Framing	50 %
Framing Risk Management Reserves (% of Home Base Price)	0.50 %
SIPs % Risk Management Reserves Savings Compared to Conventional Framing	50 %

Home Details

Base Price of the Home (USD)	$ 750,000 USD
Total Conditioned Square Feet of Home (Sq. Ft.)	3,000 Sq. Ft.
Conditioned Square Feet Above Grade (Sq. Ft.)	2,200 Sq. Ft.
Conditioned Square Feet Below Grade (Sq. Ft.)	800 Sq. Ft.
Additional Conditioned Square Feet with Thinner Walls (Sq. Ft.)	25 Sq. Ft.
Retail Cost Per Sq. Ft. Above-Grade Conditioned Space (USD)	$ 288 USD
Retail Cost Per Sq. Ft. Below-Grade Conditioned Space (USD)	$ 144 USD
Square Feet of Attic Traded Off for Basement (Sq. Ft.)	0 Sq. Ft.
Additional Conditioned Sq. Ft. with SIP Attic (Sq. Ft.)	0 Sq. Ft.
Annual Home Insurance Cost (USD)	$ 1,200 USD
Discounted Home Insurance with SIPs (%)	0 %
Higher Appraisal Value (%)	0 %
Value of Greater Resilience (eg. Impact, Wind, Earthquake) (%)	1.0 %
Value of Greater Strength/ Dimensional Accuracy (%)	0.5 %
45 L Tax Credit (USD)	$ 0 USD
Utility Rebate (USD)	$ 0
30 Year Energy Savings (USD)	$ 0

Expected Timeline

	Days with Conventional Framing	Days Using SIPs
Bid Information: Structure		
Time (Days) for Structure	10.0	5.0
Bid Information: Insulation		
Time (Days) for Insulation	4.0	0.0
Bid Information: Air Flow		
Time (Days) for Air Flow	3.0	1.0
Bid Information: Interior Finishes		
Time (Days) for Drywall	3.0	2.9
Time (Days) for Cabinets	2.0	2.0
Time (Days) for Interior Trim	3.0	3.0
Bid Information: MEP		
Time (Days) for Electric	0.0	0.0
Time (Days) for Plumbing	0.0	0.0
Time (Days) for HVAC	0.0	0.0
Bid Information: Quality Control and Lean Construction		
Time (Days) for QC and Lean Construction	4.0	1.0
	Days with Conv. Framing	**Days Using SIPS**
Total	29.0	14.9

Bid Cost Details

	Cost with Conventional Framing	Cost Using SIPS
Bid Information: Structure		
SIPS Panels	n/a	$ 34,121 USD
Wall Framing	$ 66,086 USD	$ 41,821 USD
Floor Framing	$ 6,000 USD	$ 6,000 USD
Roof Framing	$ 8,400 USD	$ 8,400 USD
Structural Beams	$ 4,981 USD	$ 4,981 USD
Exterior Trim	$ 20,924 USD	$ 20,924 USD
Stair Framing	$ 950 USD	$ 950 USD
Attic Venting	$ 750 USD	$ 750 USD
Concrete Foundation	$ 12,000 USD	$ 12,000 USD
Bid Information: Insulation		
Wall Cavity Insulation	$ 5,804 USD	$ 0 USD
Exterior Rigid Insulation	$ 0 USD	$ 0 USD
Attic Insulation	$ 1,500 USD	$ 1,500 USD
Band Joist Insulation	$ 0 USD	$ 0 USD
Floor Insulation	$ 0 USD	$ 0 USD
Basement Insulation	$ 0 USD	$ 0 USD
Bid Information: Air Flow Control		
Air Barriers	$ 1,000 USD	$ 700 USD
Air Sealing	$ 1,500 USD	$ 400 USD
Wind Baffles	$ 250 USD	$ 250 USD
Bid Information: Interior Finishes		
Drywall	$ 12,000 USD	$ 11,760 USD
Cabinets	$ 21,000 USD	$ 20,790 USD
Interior Trim	$ 8,000 USD	$ 7,920 USD
Bid Information: MEP		
Cost of Schematics for Optimizing MEP with SIPs		$ 1,000
HVAC Cost Difference for SIPS vs Conventional Framing		$ 0
Electric Cost Difference for SIPS vs Conventional Framing		$ 0
Plumbing Cost Difference for SIPS vs Conventional Framing		$ 0
Bid Information: Quality Control and Lean Construction		
Training	$ 2,625	$ 2,100
Inspections	$ 2,250	$ 1,350
Rework	$ 2,625	$ 1,313
Reserves for Call Backs	$ 3,750	$ 1,875
Waste Removal (Dumpsters)	$ 3,000	$ 900
	Cost with Conv. Framing	**Cost Using SIPS**
Total	$ 185,395	$ 180,805

STCBT Real Project Piot Test

- **Goal:**

  Apply true cost bidding to diverse array of actual projects based on actual bids and estimates to better understand market growth opportunities
- **Targeted Projects / Status:**
  - Custom Home Non-SIP-Optimized / Complete
  - Production Home SIP-Optimized / Complete
  - Multi-family Building SIP-Optimized / Complete
  - Production Home SIP-Plant Integrated / In Progress

STCBT Pilot Test: Addison Homes

Addison Homes

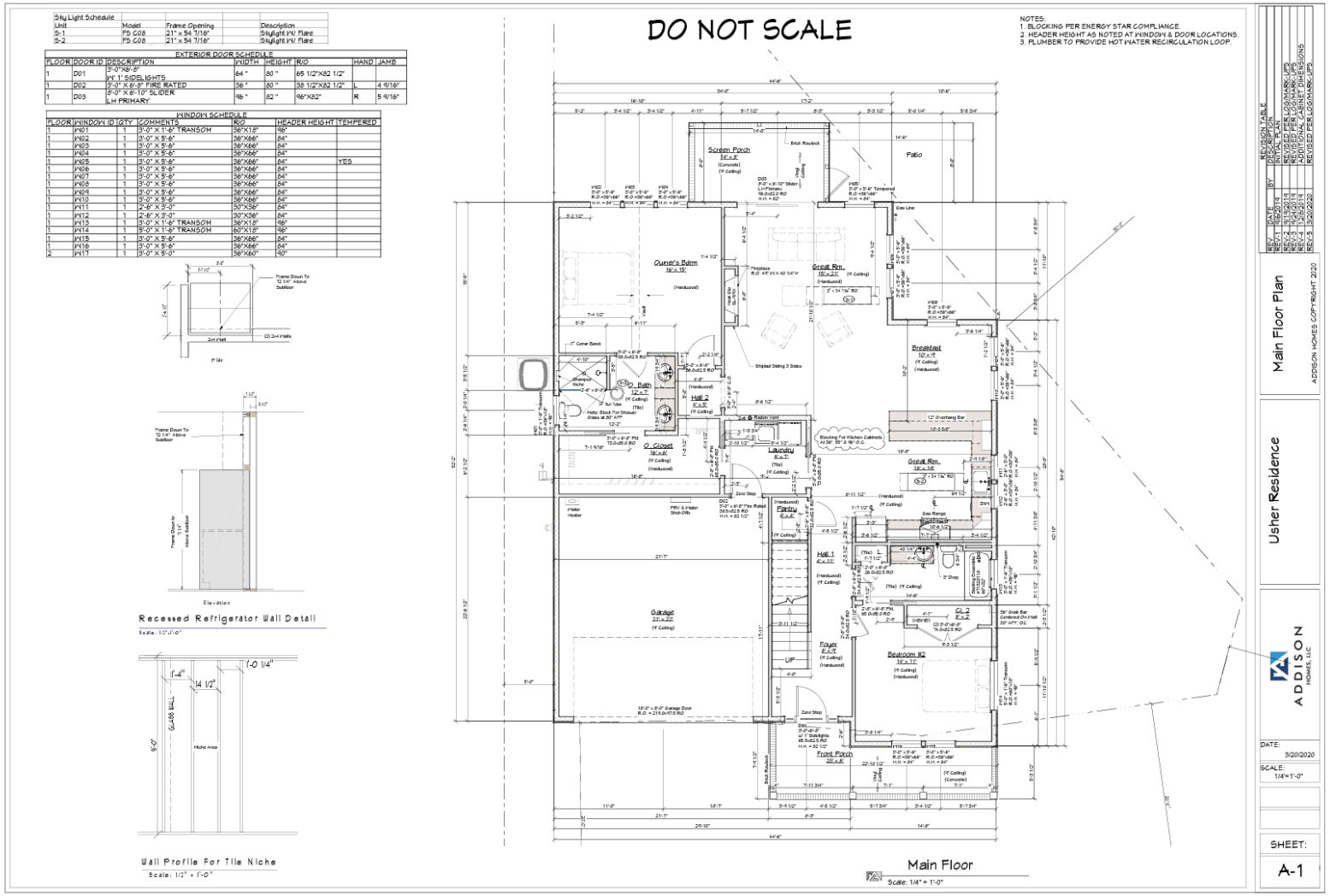
Greenville, SC

- 3BR / 3 Bath
- ~2,740 SF
- $450,000
- Framed Walls/Roof

Non-SIP-Optimized:

- No Ridge Beam Column Location with Open Space
- SIP Roof Requires Truss Framing
- No 2 Ft. Dimensions

STCBT Pilot Test: Addison Homes



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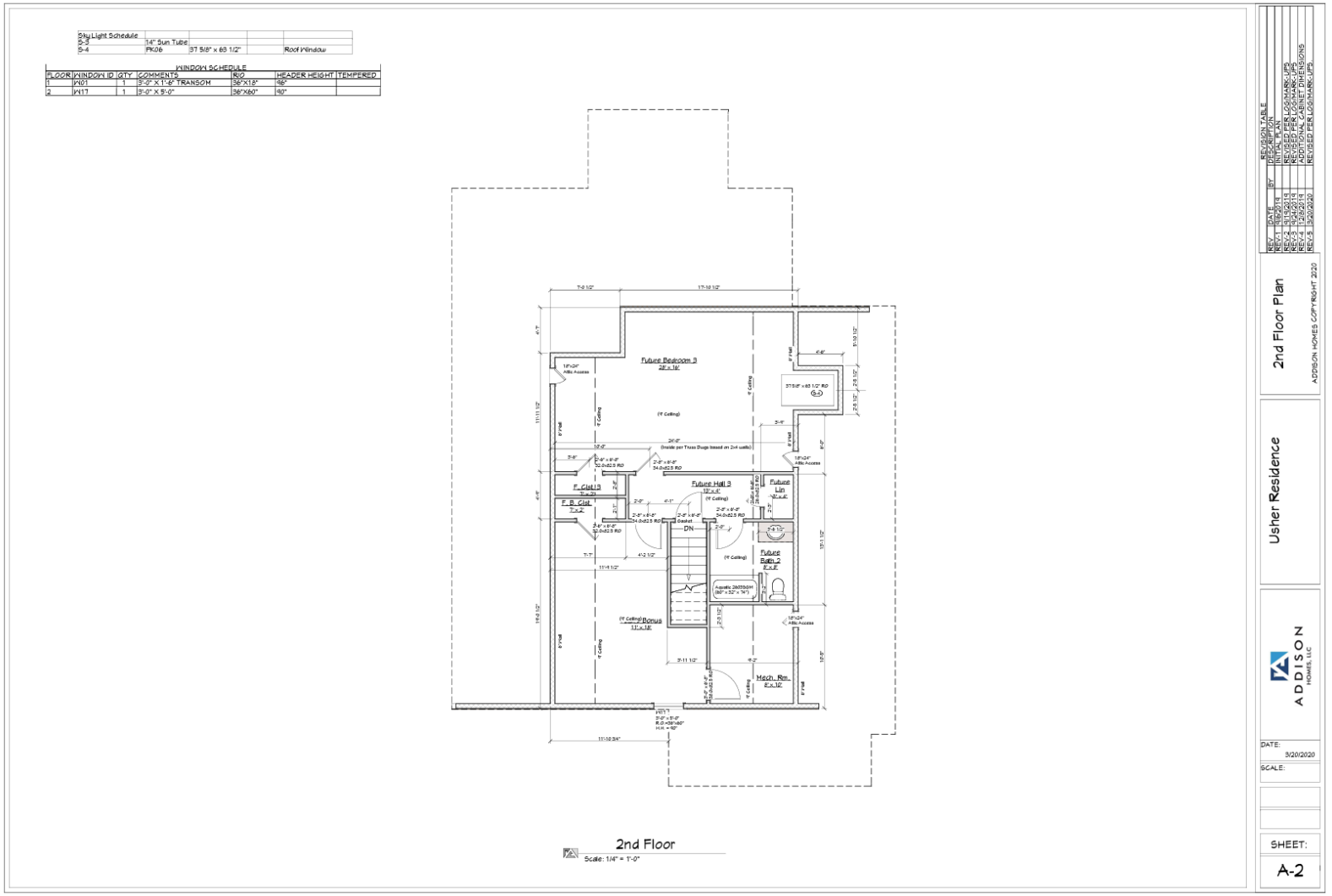

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STCBT Pilot Test: Addison Homes

SIPs True-Cost Bidding Tool

Developed by Retooling the U.S. Housing Industry: Version 3.6 - 3/17/23

Baseline SIPs vs. Framing Bid Comparison

Summary: SIPs Savings/Value vs. Conventional Framing

Cost Savings	Added Value	Total
$ (42,868)	$ -	$ (42,868)

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.

True Cost SIPs vs. Framing Bid Comparison

Summary: SIPs Savings/Value vs. Conventional Framing

Cost Savings	Added Value	Total
$ (19,763)	$ 6,750	$ (13,013)

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.

Addison Homes
Greenville, SC

Non-SIP-Optimized STCBT Results:

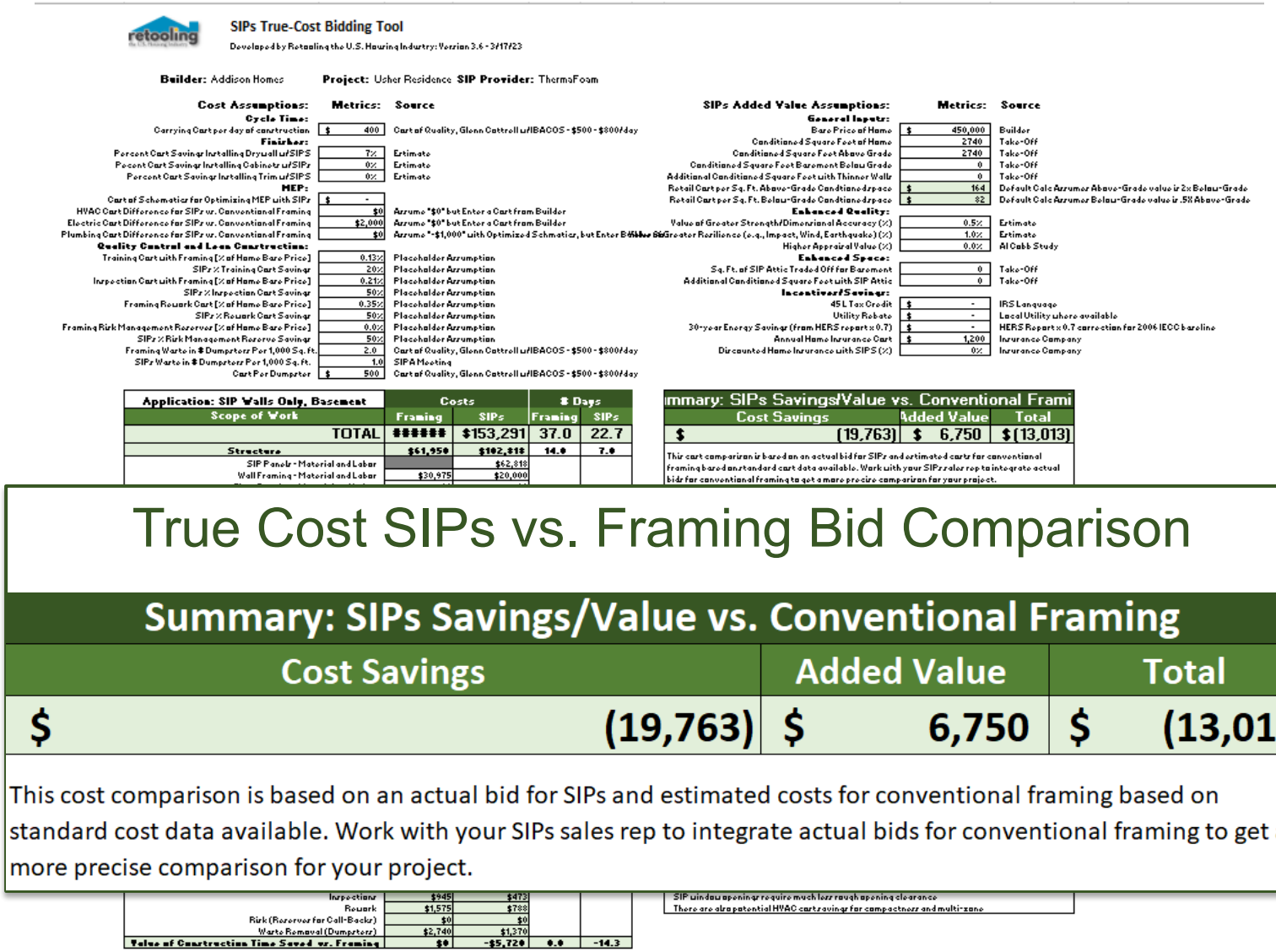
60%

Lower SIPs Premium

Baseline: **70%**

STCBT: **10%**

STCBT Pilot Test: Addison Homes



SIPs True-Cost Bidding Tool

Developed by Retooling the U.S. Housing Industry: Version 3.6 - 3/17/23

Builder: Addison Homes **Project:** Usher Residence **SIP Provider:** ThermaFoam

Cost Assumptions:	Metrics:	Source
Cycle Time:		
Carrying Cost per day of construction	$ 400	Cost of Quality, Glenn Cottrell of IBACOS - $500 - $800/day
Finishes:		
Percent Cost Savings Installing Drywall of SIPS	7%	Estimate
Percent Cost Savings Installing Cabinetry of SIPs	0%	Estimate
Percent Cost Savings Installing Trim of SIPS	0%	Estimate
MEP:		
Cost of Schematics for Optimizing MEP with SIPs	$ -	
HVAC Cost Difference for SIPs vs. Conventional Framing	$0	Assume "$0" but Enter a Cost from Builder
Electric Cost Difference for SIPs vs. Conventional Framing	$2,000	Assume "$0" but Enter a Cost from Builder
Plumbing Cost Difference for SIPs vs. Conventional Framing	$0	Assume "-$1,000" with Optimized Schematics, but Enter Builder Cost
Quality Control and Less Construction:		
Training Cost with Framing [% of Home Base Price]	0.13%	Placeholder Assumption
SIPs % Training Cost Savings	20%	Placeholder Assumption
Inspection Cost with Framing [% of Home Base Price]	0.21%	Placeholder Assumption
SIPs % Inspection Cost Savings	50%	Placeholder Assumption
Framing Rework Cost [% of Home Base Price]	0.35%	Placeholder Assumption
SIPs % Rework Cost Savings	50%	Placeholder Assumption
Framing Risk Management Reserves [% of Home Base Price]	0.0%	Placeholder Assumption
SIPs % Risk Management Reserve Savings	50%	Placeholder Assumption
Framing Waste in $ Dumpsters Per 1,000 Sq. Ft.	2.0	Cost of Quality, Glenn Cottrell of IBACOS - $500 - $800/day
SIPs Waste in $ Dumpsters Per 1,000 Sq. Ft.	1.0	SIPA Meeting
Cost Per Dumpster	$ 500	Cost of Quality, Glenn Cottrell of IBACOS - $500 - $800/day

SIPs Added Value Assumptions:	Metrics:	Source
General Inputs:		
Base Price of Home	$ 450,000	Builder
Conditioned Square Feet of Home	2740	Take-Off
Conditioned Square Feet Above Grade	2740	Take-Off
Conditioned Square Feet Basement Below Grade	0	Take-Off
Additional Conditioned Square Feet with Thinner Walls	0	Take-Off
Retail Cost per Sq. Ft. Above-Grade Conditioned Space	$ 164	Default Calc Assumes Above-Grade value is 2x Below-Grade
Retail Cost per Sq. Ft. Below-Grade Conditioned Space	$ 82	Default Calc Assumes Below-Grade value is .5X Above-Grade
Enhanced Quality:		
Value of Greater Strength/Dimensional Accuracy (%)	0.5%	Estimate
Value of Greater Resilience (e.g., Impact, Wind, Earthquake) (%)	1.0%	Estimate
Higher Appraisal Value (%)	0.0%	Al Cobb Study
Enhanced Space:		
Sq. Ft. of SIP Attic Traded Off for Basement	0	Take-Off
Additional Conditioned Square Feet with SIP Attic	0	Take-Off
Incentives/Savings:		
45 L Tax Credit	$ -	IRS Language
Utility Rebate	$ -	Local Utility where available
30-year Energy Savings (from HERS report x 0.7)	$ -	HERS Report x 0.7 correction for 2006 IECC baseline
Annual Home Insurance Cost	$ 1,200	Insurance Company
Discounted Home Insurance with SIPS (%)	0%	Insurance Company

Application: SIP Walls Only, Basement	Costs		# Days	
Scope of Work	Framing	SIPs	Framing	SIPs
TOTAL	######	$153,291	37.0	22.7
Structure	$61,950	$102,818	14.0	7.0
SIP Panels - Material and Labor		$62,818		
Wall Framing - Material and Labor	$30,975	$20,000		
Inspections	$945	$473		
Rework	$1,575	$788		
Risk (Reserves for Call-Backs)	$0	$0		
Waste Removal (Dumpsters)	$2,740	$1,370		
Value of Construction Time Saved vs. Framing	$0	-$5,720	0.0	-14.3

Summary: SIPs Savings/Value vs. Conventional Frami		
Cost Savings	Added Value	Total
$ (19,763)	$ 6,750	$ (13,013)

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.

SIP window opening require much less rough opening clearance

There are also potential HVAC cost savings for compactness and multi-zone

True Cost SIPs vs. Framing Bid Comparison

Summary: SIPs Savings/Value vs. Conventional Framing

Cost Savings	Added Value	Total
$ (19,763)	$ 6,750	$ (13,013)

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Addison Homes

Greenville, SC

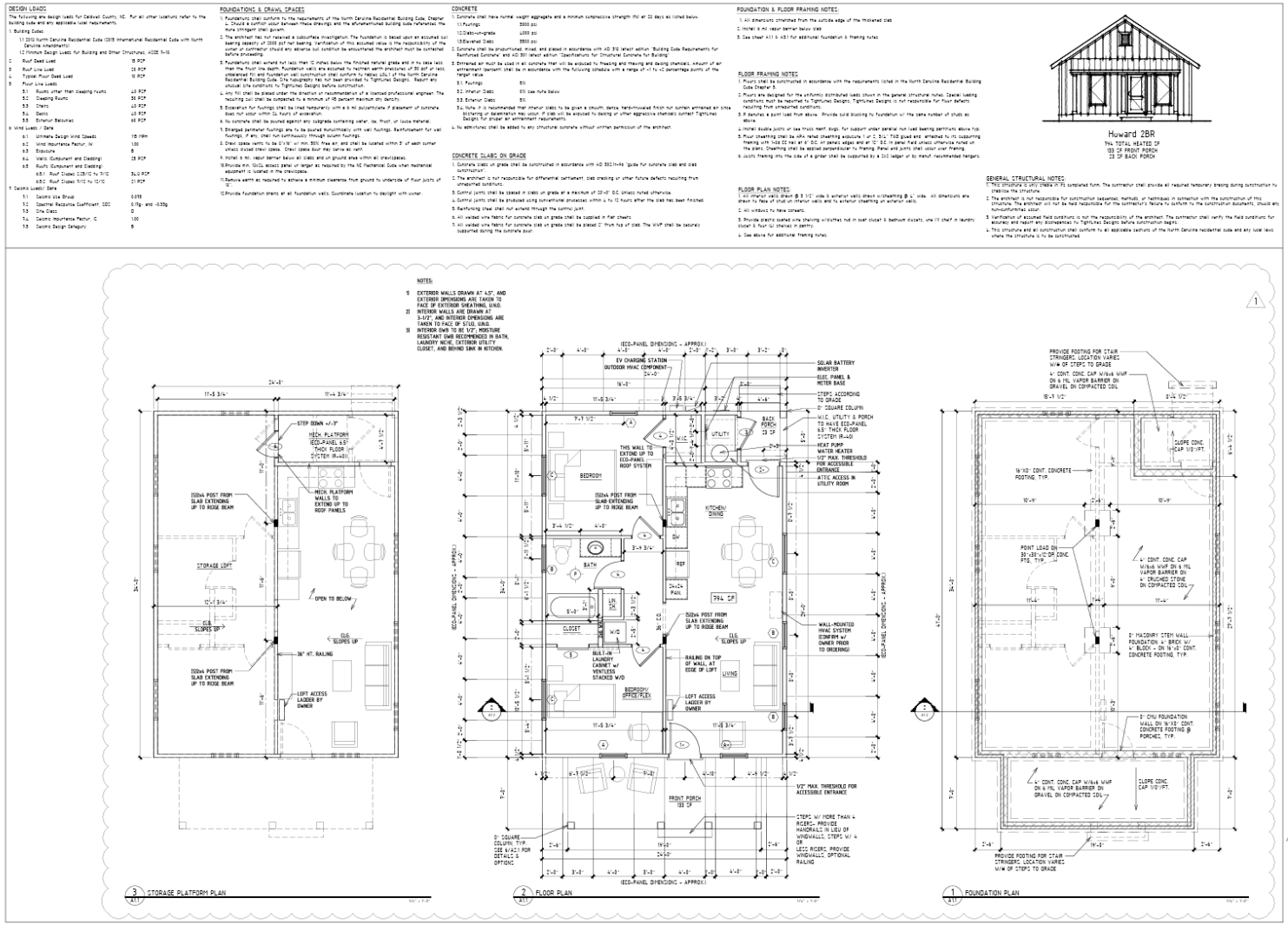
Non-SIP-Optimized STCBT Results:

Significant Premium:

15% higher cost only provides

5% more value

STCBT Pilot Test: Howard Building Science



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Granite Falls, NC

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Granite Falls
The Howard

date 10.29.21
drafter R.L.H.
checked by C.L.B.
proj. no. T-20013.3
revisions date
Owner Rev. 05.02.22

Floor Plan, Foundation Plan & Notes

A1.1

Duke St. Cottages

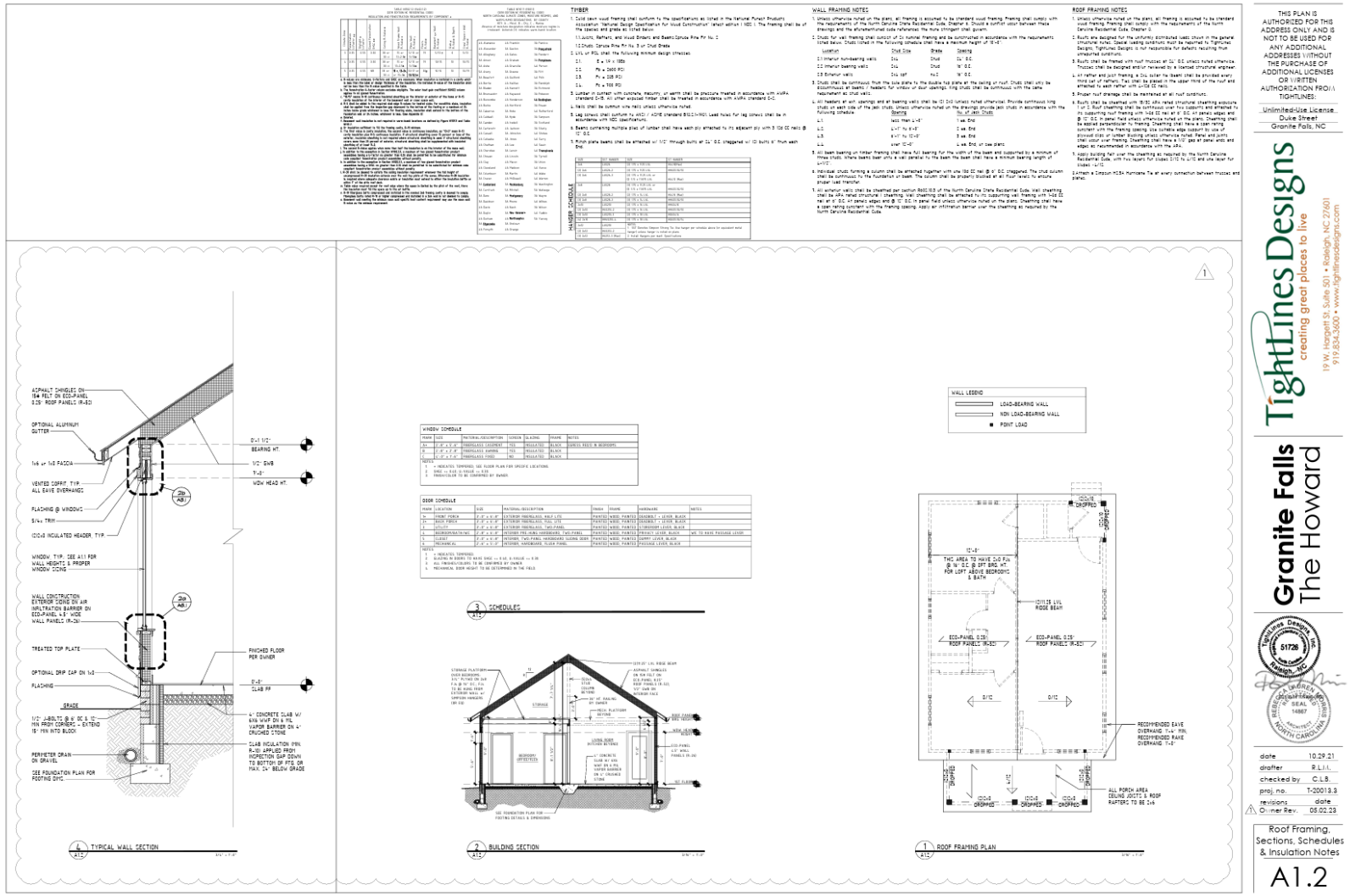
Granite Falls, NC

- 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 High-Efficiency HP

STCBT Pilot Test: Howard Building Science



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STCBT Pilot Test: Howard Building Science

SIPs True-Cost Bidding Tool

Baseline SIPs vs. Framing Bid Comparison

Summary: SIPs Savings/Value vs. Conventional Framing		
Cost Savings	Added Value	Total
$ (15,500)	$ -	$ (15,500)

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.

True Cost SIPs vs. Framing Bid Comparison

Summary: SIPs Savings/Value vs. Conventional Framing		
Cost Savings	Added Value	Total
$ (1,950)	$ 37,241	$ 35,291

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.

Duke Street Cottages

Granite Falls, NC

SIP-Optimized STCBT Results:

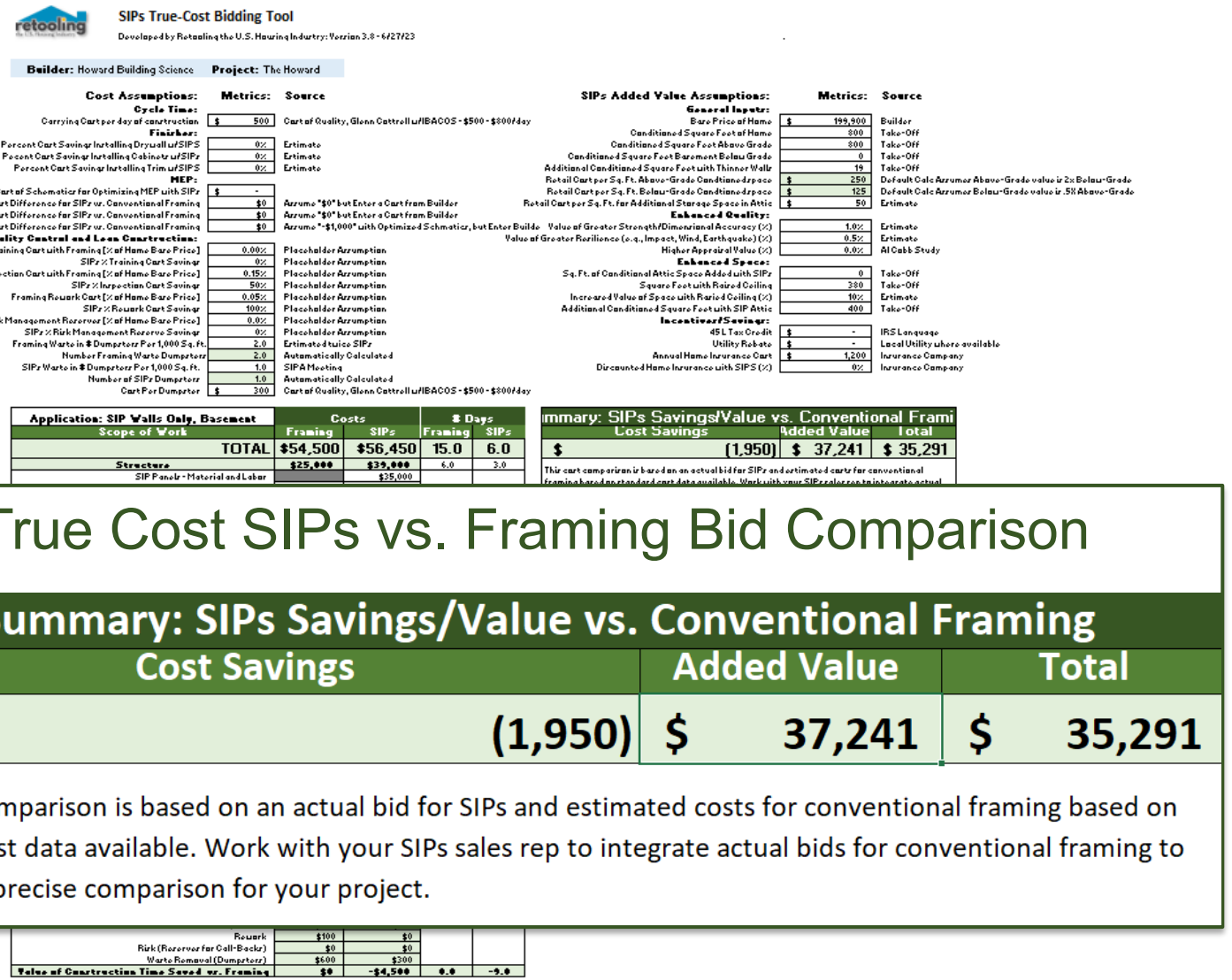
127%

SIPs Cost Advantage

Baseline: **-62%**

True Cost: **+65%**

STCBT Pilot Test: Howard Building Science



SIPs True-Cost Bidding Tool

Developed by Retooling the U.S. Housing Industry: Version 3.8 - 6/27/23

Builder: Howard Building Science **Project:** The Howard

Cost Assumptions:	Metrics:	Source
Cycle Time:		
Carrying Cost per day of construction	$ 500	Cost of Quality, Glenn Cottrell w/IBACOS - $500 - $800/day
Finishes:		
Percent Cost Savings Installing Drywall w/SIPS	0%	Estimate
Percent Cost Savings Installing Cabinetry w/SIPs	0%	Estimate
Percent Cost Savings Installing Trim w/SIPS	0%	Estimate
MEP:		
Cost of Schematics for Optimizing MEP with SIPs	$ -	
HVAC Cost Difference for SIPs vs. Conventional Framing	$0	Assume "$0" but Enter a Cost from Builder
Electric Cost Difference for SIPs vs. Conventional Framing	$0	Assume "$0" but Enter a Cost from Builder
Plumbing Cost Difference for SIPs vs. Conventional Framing	$0	Assume "-$1,000" with Optimized Schematics, but Enter Builde
Quality Control and Lean Construction:		
Training Cost with Framing [% of Home Base Price]	0.00%	Placeholder Assumption
SIPs % Training Cost Savings	0%	Placeholder Assumption
Inspection Cost with Framing [% of Home Base Price]	0.15%	Placeholder Assumption
SIPs % Inspection Cost Savings	50%	Placeholder Assumption
Framing Rework Cost [% of Home Base Price]	0.05%	Placeholder Assumption
SIPs % Rework Cost Savings	100%	Placeholder Assumption
Framing Risk Management Reserves [% of Home Base Price]	0.0%	Placeholder Assumption
SIPs % Risk Management Reserves Savings	0%	Placeholder Assumption
Framing Waste in $ Dumpsters Per 1,000 Sq. ft.	2.0	Estimated twice SIPs
Number Framing Waste Dumpsters	2.0	Automatically Calculated
SIPs Waste in $ Dumpsters Per 1,000 Sq. ft.	1.0	SIPA Meeting
Number of SIPs Dumpsters	1.0	Automatically Calculated
Cost Per Dumpster	$ 300	Cost of Quality, Glenn Cottrell w/IBACOS - $500 - $800/day

SIPs Added Value Assumptions:	Metrics:	Source
General Inputs:		
Base Price of Home	$ 199,900	Builder
Conditioned Square Feet of Home	800	Take-Off
Conditioned Square Feet Above Grade	800	Take-Off
Conditioned Square Feet Basement Below Grade	0	Take-Off
Additional Conditioned Square Feet with Thinner Walls	19	Take-Off
Retail Cost per Sq. Ft. Above-Grade Conditioned Space	$ 250	Default Calc Assumes Above-Grade value is 2x Below-Grade
Retail Cost per Sq. Ft. Below-Grade Conditioned Space	$ 125	Default Calc Assumes Below-Grade value is .5X Above-Grade
Retail Cost per Sq. Ft. for Additional Storage Space in Attic	$ 50	Estimate
Enhanced Quality:		
Value of Greater Strength/Dimensional Accuracy (%)	1.0%	Estimate
Value of Greater Resilience (e.g., Impact, Wind, Earthquake) (%)	0.5%	Estimate
Higher Appraisal Value (%)	0.0%	Al Cobb Study
Enhanced Space:		
Sq. Ft. of Conditioned Attic Space Added with SIPs	0	Take-Off
Square Feet with Raised Ceiling	380	Take-Off
Increased Value of Space with Raised Ceiling (%)	10%	Estimate
Additional Conditioned Square Feet with SIP Attic	400	Take-Off
Incentives/Savings:		
45L Tax Credit	$ -	IRS Language
Utility Rebate	$ -	Local Utility where available
Annual Home Insurance Cost	$ 1,200	Insurance Company
Discounted Home Insurance with SIPS (%)	0%	Insurance Company

Application: SIP Walls Only, Basement	Costs		# Days	
Scope of Work	Framing	SIPs	Framing	SIPs
TOTAL	$54,500	$56,450	15.0	6.0
Structure	$25,000	$39,000	6.0	3.0
SIP Panels - Material and Labor		$35,000		
Rework	$100	$0		
Risk (Reserves for Call-Backs)	$0	$0		
Waste Removal (Dumpsters)	$600	$300		
Value of Construction Time Saved vs. Framing	$0	-$4,500	0.0	-9.0

Summary: SIPs Savings/Value vs. Conventional Framing			
Cost Savings		Added Value	Total
$	(1,950)	$ 37,241	$ 35,291

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.

True Cost SIPs vs. Framing Bid Comparison

Duke Street Cottages

Granite Falls, NC

SIP-Optimized STCBT Results:

Small SIPs Premium

3.5% higher cost provides

68% more value

STCBT Pilot Test: Greensmith Builders Multi-Family

Prairie Lofts

Leverne, MN

- Built 2022
- 2 Bldgs./54 Units
- 1BR/2BR Plans
- HERS 45 w/o Solar
- 1.35 ACH50
- SIPs Walls:
  - Exterior
  - Hall
  - Demising

SIP-Optimized:

- 1 Hour from Plant
- Simple Design

STCBT Pilot Test: Prairie Lofts

2 Bedroom
1 Bathroom
790 - 824 SF

1 Bedroom
1 Bathroom
556 SF

STCBT Pilot Test: Prairie Lofts

STCBT Pilot Test: Prairie Lofts

SIPs True-Cost Bidding Tool
Developed by Retooling the U.S. Housing Industry: Version 3.6 - 3/17/23

Baseline SIPs vs. Framing Bid Comparison

Summary: SIPs Savings/Value vs. Conventional Framing		
Cost Savings	Added Value	Total
$ (51,485)	$ -	$ (51,485)

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.

True Cost SIPs vs. Framing Bid Comparison

Summary: SIPs Savings/Value vs. Conventional Framing		
Cost Savings	Added Value	Total
$ 108,424	$ 124,800	$ 233,224

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 - Material and Labor for exterior, hallway, demising walls		$436,712		
Framing - Material and Labor for exterior, hallway, demising walls	$454,712			
Floor Framing - Material and Labor				
Roof Framing - Material and Labor				
Risk (Reserves for Call-Backs)				
Waste Removal (8 Dumpsters for framing vs. 4 for SIPs)	$5,200	$2,600		
Value of Construction Time Saved vs. Framing	**$0**	**-$34,000**	**0.0**	**-85.0**

Prairie Lofts
Leverne, MN

SIP-Optimized MF STCBT Results per Building:

62%

SIPs Cost Advantage

Baseline: **-11%**

True Cost: **+51%**

STCBT Pilot Test: Prairie Lofts

SIPs True-Cost Bidding Tool

Developed by Retooling the U.S. Housing Industry: Version 3.6 - 3/17/23

Builder: Addison Homes **Project:** Usher Residence **SIP Provider:** ThermaFoam

Cost Assumptions:	Metrics:	Source
Cycle Time:		
Carrying Cost per day of construction	$ 400	Cost of Quality, Glenn Cottrell w/IBACOS - $500 - $800/day
Finishes:		
Percent Cost Savings Installing Dryw all w/SIPS	7%	Estimate
Pecent Cost Savings Installing Cabinets w/SIPs	0%	Estimate
Percent Cost Savings Installing Trim w/SIPS	0%	Estimate
MEP:		
Cost of Schematics for Optimizing MEP with SIPs	$ -	
HVAC Cost Difference for SIPs vs. Conventional Framing	$0	Assume "$0" but Enter a Cost from Builder
Electric Cost Difference for SIPs vs. Conventional Framing	$0	Assume "$0" but Enter a Cost from Builder
Plumbing Cost Difference for SIPs vs. Conventional Framing	$0	Assume "-$1,000" with Optimized Schmatics, but Enter Builder Value
Quality Control and Lean Construction:		
Training Cost with Framing [% of Home Base Price]		Placeholder Assumption
SIPs % Training Cost Savings		Placeholder Assumption
Inspection Cost with Framing [% of Home Base Price]		Placeholder Assumption
SIPs % Inspection Cost Savings		Placeholder Assumption
Framing Rework Cost [% of Home Base Price]		Placeholder Assumption
SIPs % Rework Cost Savings		Placeholder Assumption
Framing Risk Management Reserves [% of Home Base Price]		Placeholder Assumption
SIPs % Risk Management Reserve Savings		Placeholder Assumption
Framing Waste in # Dumpsters Per 1,000 Sq. ft.		Cost of Quality, Glenn Cottrell w/IBACOS - $500 - $800/day
SIPs Waste in # Dumpsters Per 1,000 Sq. ft.		SIPA Meeting
Cost Per Dumpster	$ 650	Cost of Quality, Glenn Cottrell w/IBACOS - $500 - $800/day

SIPs Added Value Assumptions:	Metrics:	Source
General Inputs:		
Base Price of Home	$ 3,840,000	Builder
Conditioned Square Feet of Home	24836	Take-Off
Conditioned Square Feet Above Grade	24836	Take-Off
Conditioned Square Feet Basement Below Grade	0	Take-Off
Additional Conditioned Square Feet with Thinner Walls	0	Take-Off
Retail Cost per Sq. Ft. Above-Grade Condtioned space	$ 155	Default Calc Assumes Above-Grade value is 2x Below-Grade
Retail Cost per Sq. Ft. Below-Grade Condtioned space	$ 77	Default Calc Assumes Below-Grade value is .5X Above-Grade
Enhanced Quality:		
Value of Greater Strength/Dimensional Accuracy (%)	0.8%	Estimate
Value of Greater Resilience (e.g., Impact, Wind, Earthquake) (%)	1.5%	Estimate
Higher Appraisal Value (%)	1.0%	Al Cobb Study
Enhanced Space:		
Sq. Ft. of SIP Attic Traded Off for Basement	0	Take-Off
Additional Conditioned Square Feet with SIP Attic	0	Take-Off
Incentives/Savings:		
45 L Tax Credit	$ -	IRS Language
Utility Rebate	$ -	Local Utility where available
30-year Energy Savings (from HERS report x 0.7)	$ -	HERS Report x 0.7 correction for 2006 IECC baseline
Annual Home Insurance Cost		Insurance Company
Discounted Home Insurance with SIPS (%)	0%	Insurance Company

Application: SIP Walls Only, Basement	Costs		# Days	
Scope of Work	Framing	SIPs	Framing	SIPs
TOTAL	$763,062	$654,638	156.0	71.0
Structure	**$454,712**	**$498,712**	**80.0**	**37.0**
SIPs - Material and Labor for exterior, hallway, demising walls		$498,712		
Framing - Material and Labor for exterior, hallway, demising walls	$454,712			
Floor Framing - Material and Labor				
Roof Framing - Material and Labor				
Risk (Reserves for Call-Backs)				
Waste Removal (8 Dumpsters for framing vs. 4 for SIPs)	$5,200	$2,600		
Value of Construction Time Saved vs. Framing	**$0**	**-$34,000**	**0.0**	**-85.0**

Summary: SIPs Savings/Value vs. Conventional Framing		
Cost Savings	Added Value	Total
$ 108,424	$ 124,800	$ 233,224

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.

True Cost SIPs vs. Framing Bid Comparison

Summary: SIPs Savings/Value vs. Conventional Framing		
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$ 108,424	$ 124,800	$ 233,224

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Prairie Lofts
Leverne, MN

SIP-Optimized MF STCBT Results per Building:
Small SIPs Premium

24% lower cost

and

27% more value

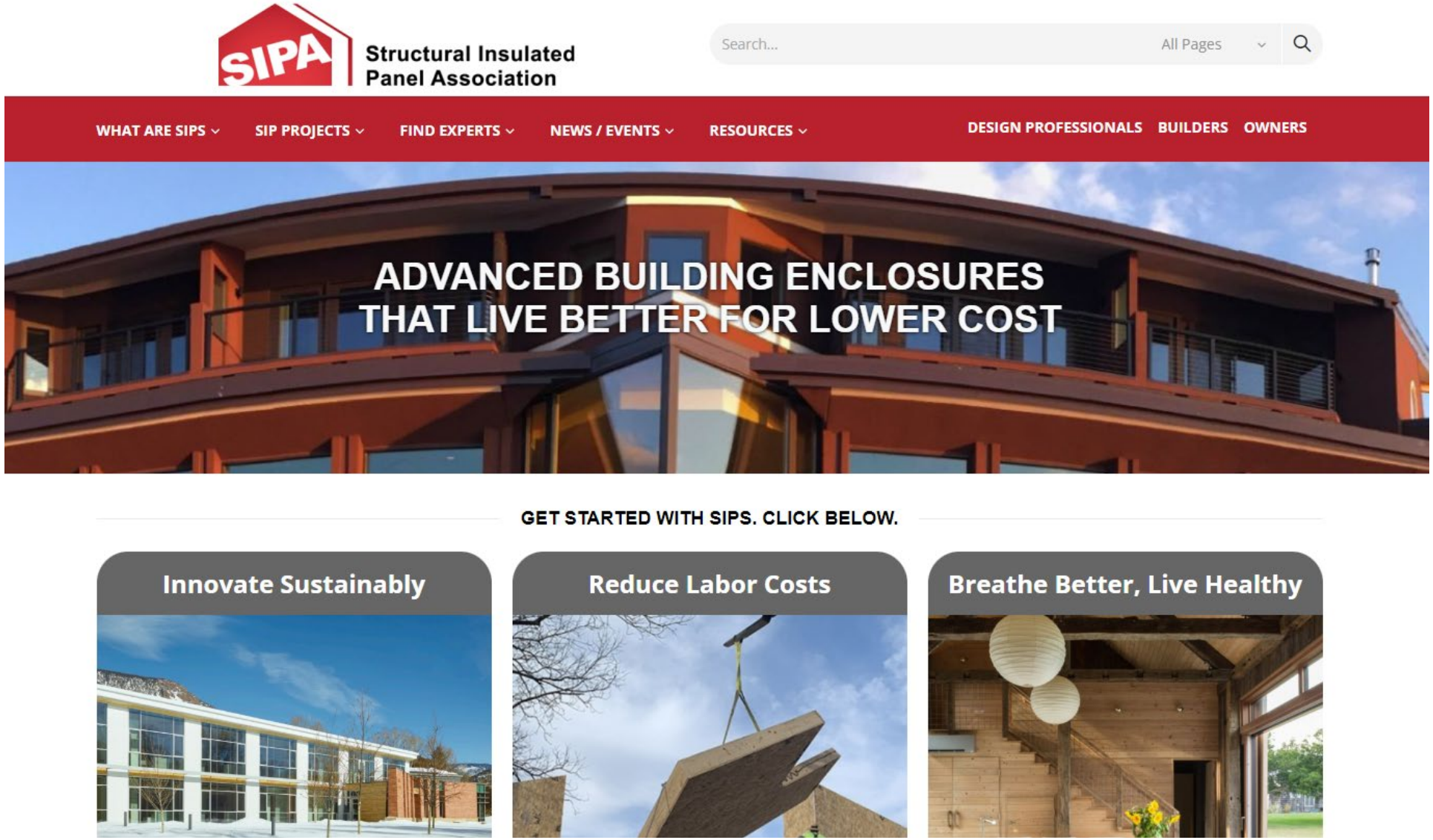
STCBT Pilot Test: Results

STCBT Savings/Added Value:

- Always substantially reduce cost premium
- Not enough to offset cost premium for non-SIP optimize designs
- Substantially offset cost premium with SIPs optimized SF and MF designs

Observation:
Optimized enclosure decisions are not being made in absence of true cost bid assessments

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*

retooling the U.S. Housing Industry

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 onsite labor
- 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

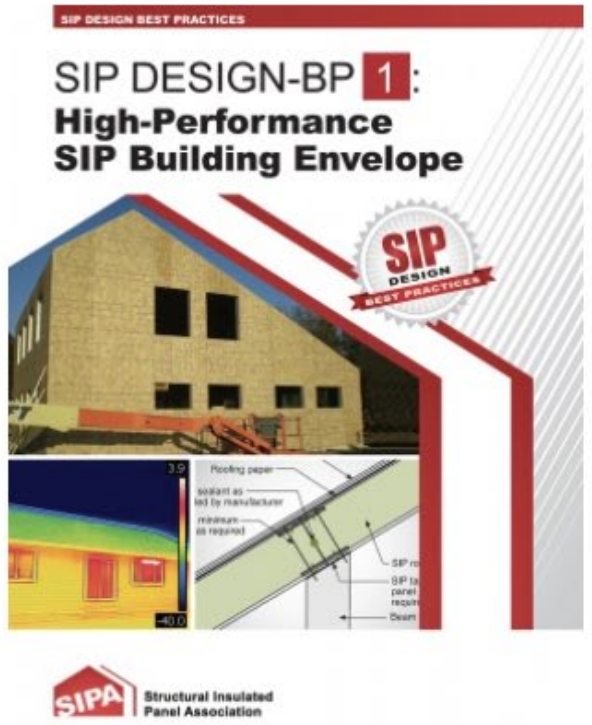
Free copies available to download @ www.SIPs.org!

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**

Complete the series and each test to join SIPA at a $50 discount. Membership provides a company profile on our highly-trafficked, #1 website for SIPs.

BUILDING EDUCATION WITH SIPA BEST SIPs TRAINING

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

Thank You and Questions

Sam Rashkin Info:

Phone: 703-618-1932

email: sam.rashkin@truhomefacts.com

Housing 2.0 Resources:

https://www.greenbuildermedia.com/housing-2.0

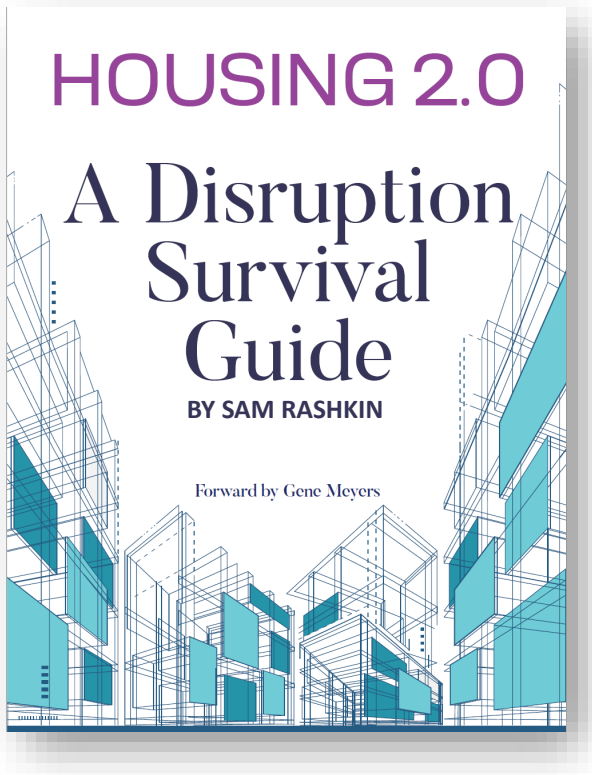
Jack Armstrong Info:

Phone: +1-551-208-8302

email: jack@sips.org

SIPs Resources:

https://www.sips.org/



STCBT: Website Resource

Project Information | Cost Assumptions | Home Details | Bid Information: Structure | Bid Information: Insulation | Bid Information: Air Flow Control | Bid Information: Interior Finishes | Bid Information: MEP | Bid Information: QC Control and Lean Construction | Summary

Project Information

Please provide the following information.

Your Information

Name *

Sam Rashkin

Email Address *

sam@truhomefacts.com

Company Name

Retooling the U.S. Housing Ind

Project Information

Project Name

Willows Creek

Builder

Live Better Homes

SIP Provider

ACME SIPs

STCBT: Website Resource

Project Information | Cost Assumptions | Home Details | Bid Information: Structure | Bid Information: Insulation | Bid Information: Air Flow Control | Bid Information: Interior Finishes | Bid Information: MEP | Bid Information: QC Control and Lean Construction | Summary

PROJECT DASHBOARD: Willows Creek

Cost Comparison	SIPs Improved User Experience	Value of Time Saved	Total SIPs Savings + Value
$ 4,590	$ 133,650	$ 5,640	$ 143,880

Bid Information: Air Flow Control

Please enter the following information based on the bids you received. Include both materials and labor costs in the estimate.

Bid Cost Details

	Cost with Traditional Framing (USD)	Cost Using SIPs (USD)
Air Barriers	1,000	700
Air Sealing	1,500	400
Wind Baffles	250	250

Total Air Flow Costs	Total Cost with Traditional Framing	Total Cost Using SIPs
	$ 2,750	$ 1,350

STCBT: Website Resource

Project Information | Cost Assumptions | Home Details | Bid Information: Structure | Bid Information: Insulation | Bid Information: Air Flow Control | Bid Information: Interior Finishes | Bid Information: MEP | Bid Information: QC Control and Lean Construction | Summary

PROJECT DASHBOARD: Willows Creek

Cost Comparison	SIPs Improved User Experience	Value of Time Saved	Total SIPs Savings + Value
$ 4,590	$ 133,650	$ 5,640	$ 143,880

Summary: SIPs Savings/Value vs. Conventional Framing

The following are your results for cost savings and added value by using SIPS

Total SIPs Saving + Value Over Conventional Framing — **$ 143,880**

Details: Total Cost Comparison — $ 4,590

Total Costs with Traditional Framing: $185,395

Costs for Structure, Insulation, Air Flow, Finishes, MEP, Quality Control and Lean Construction with Framing

Total Costs Using SIPs: $180,805

Costs for Structure, Insulation, Air Flow, Finishes, MEP, Quality Control and Lean Construction in a SIPS build

Total Cost Savings (Framing Cost - SIPS Cost) $4,590

Total Costs with Traditional Framing - Total Cost Using SIPs

Details: SIPS Improved User Experience — $ 133,650