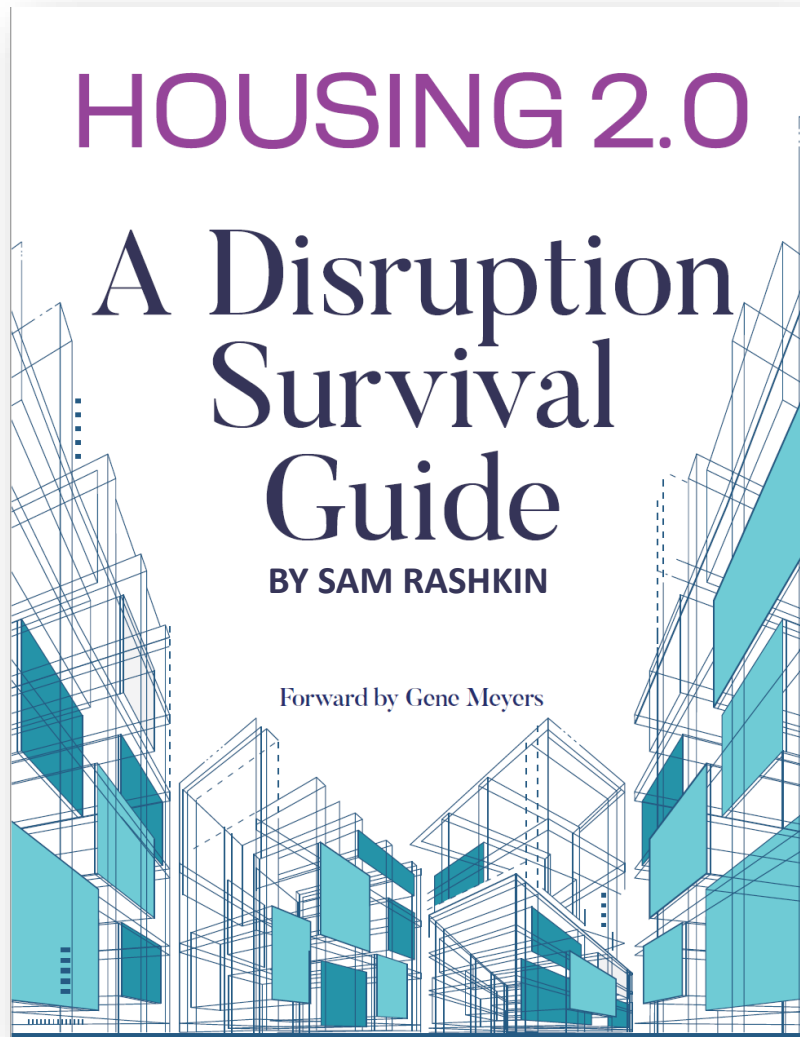




High-Performance Enclosures: Faster, Better and Cheaper

Sam Rashkin

2023 IBS – Systems Building Council Lounge
February 1, 2023



Goal:

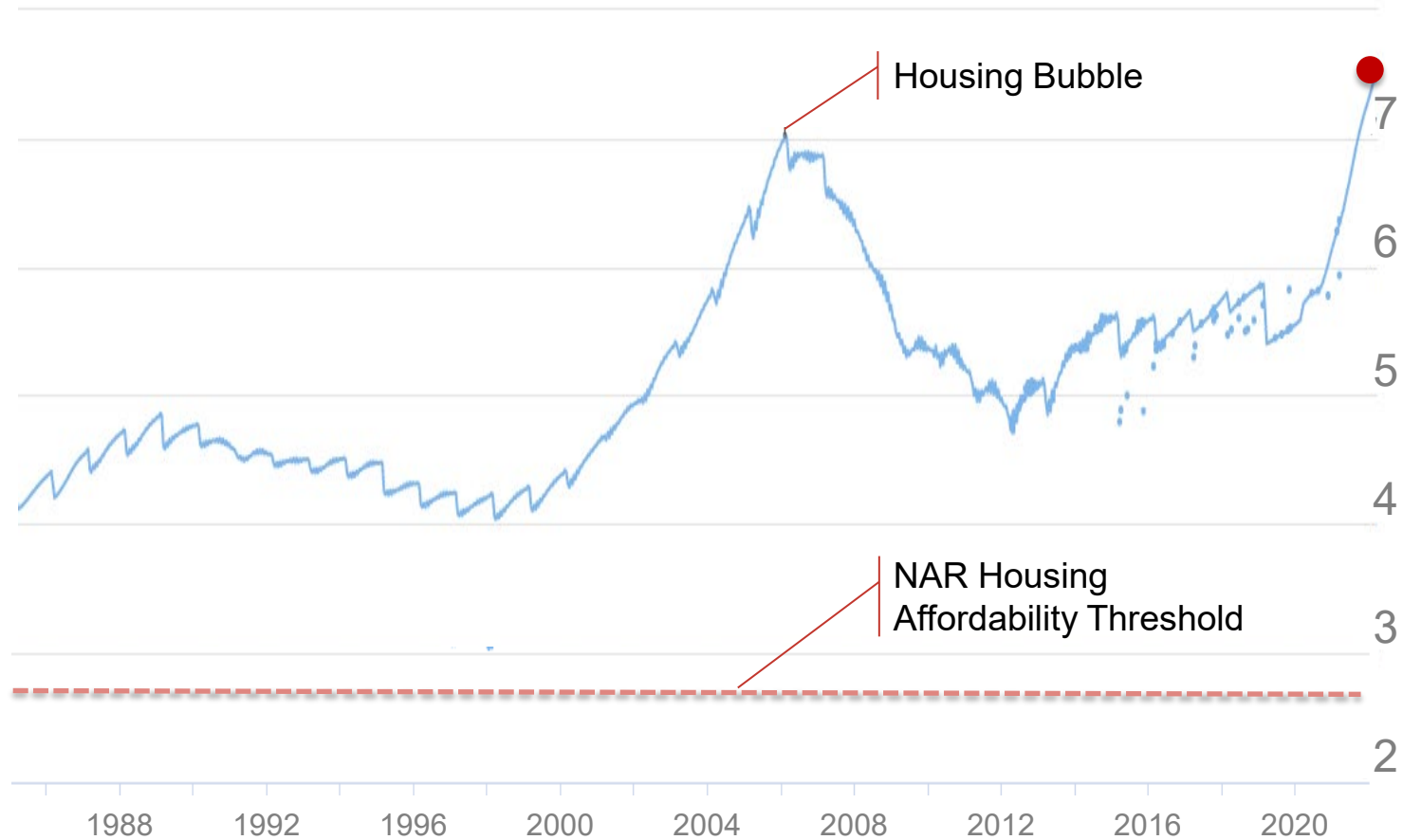
Make high-performance housing professionals UX leaders including:

- 420+ pages
- 150+ UX best practices
- 100's graphics
- 360+ citations
- 7 guest expert essays
- 5-plus years vetting with 100's housing executives

Website:

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

Median Home Price / Median Household Income Ratio

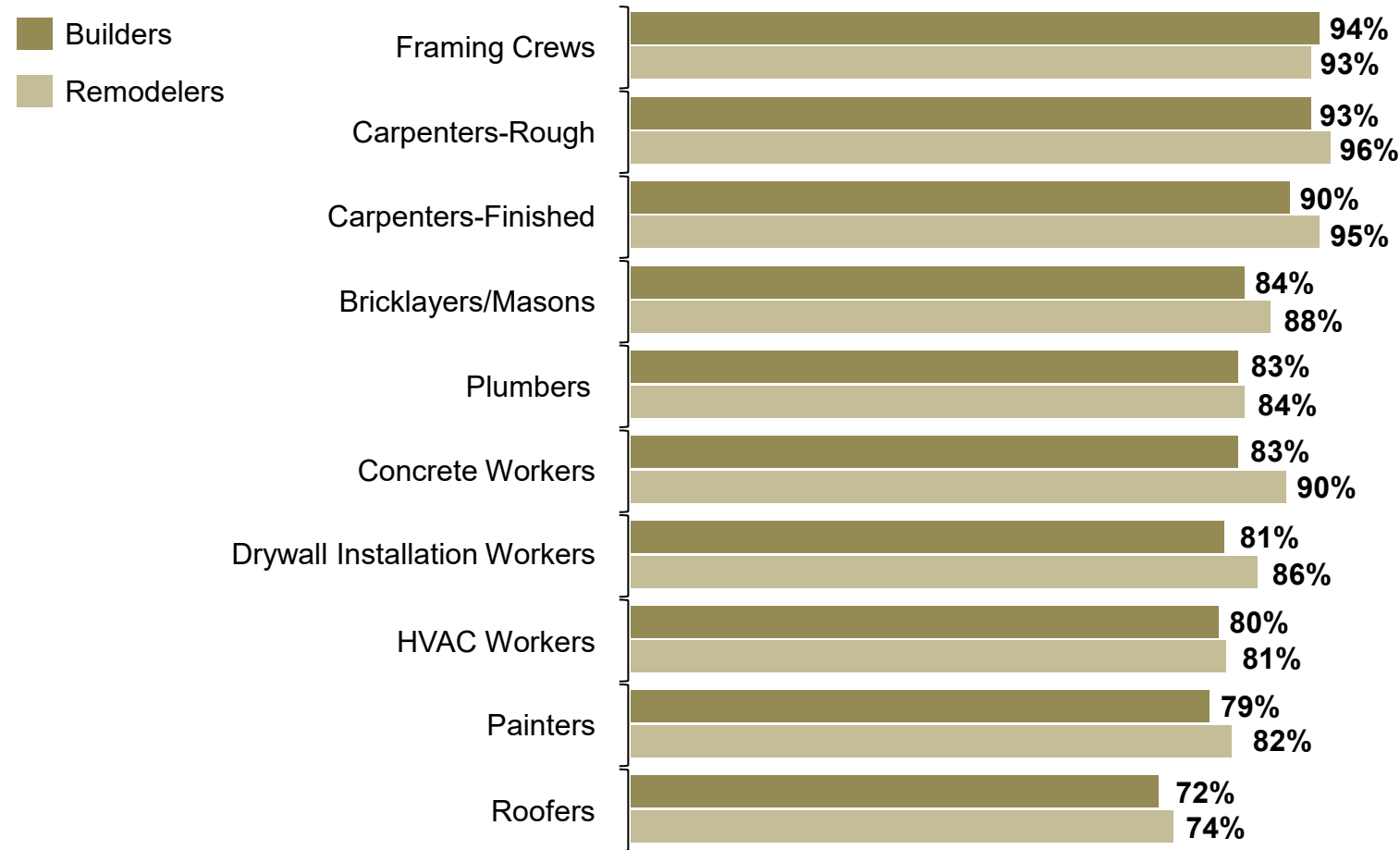


7.4

Median Home Price to
Median Household
Income Ratio (11/21)

Source: Joint Center for Housing
Studies of Harvard University

Percent of Builders & Remodelers Reporting Subcontractor Shortages



90+%
of builders report framing crew and carpenter shortages in 2022

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

Posted on: October 14, 2022



BUILDER

HBI: SLOWDOWN IN HOUSING WILL NOT SOLVE CONSTRUCTION WORKER SHORTAGE



Adobe Stock/Andy Dean Photography

The softening of the U.S. housing market means short-term demand for construction labor will likely also soften, according to a new report from the [Home Builders Institute \(HBI\)](#). As part of the [Fall 2022 HBI Construction Labor Market Report](#), the estimated number of construction worker growth required for the sector is approximately 740,000. This

estimate is level with the figure from the [organization's Spring 2022 report](#).

From 2022 to 2024, the construction industry net new hires needed:

2.2 Million

Source: Spring 2022 HBI Construction Labor Market Report



1877

Source: Wood frame house on a Omaha Reservation in Nebraska, The National Archives, Smithsonian Institution)

**150+
Years**



2021

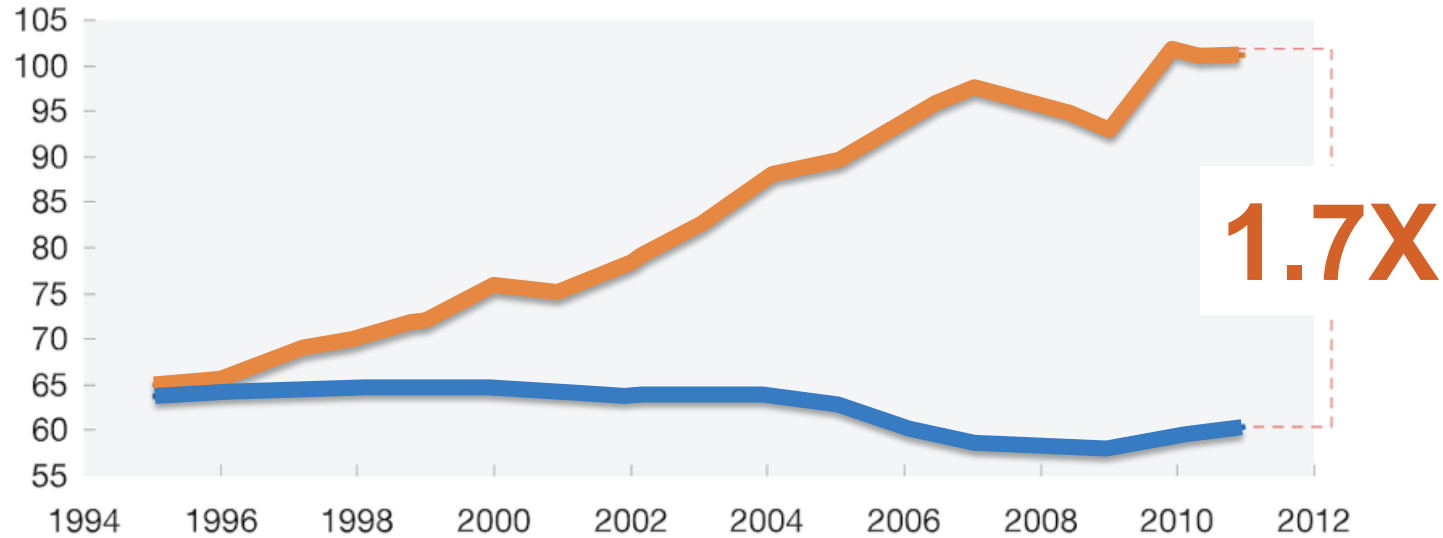
Source: Wall Street Journal, *Construction Workers 'Left the Business and They Didn't Come Back'*, Oct. 13, 2015

Time for Innovation: Glacial Productivity Progress

Overview of productivity improvement over time

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

\$ thousand per worker



Source: Expert interviews; IHS Global Insight (Belgium, France, Germany, Italy, Spain, United Kingdom, United States); World Input-Output Database

McKinsey&Company

Resources Adding Value:

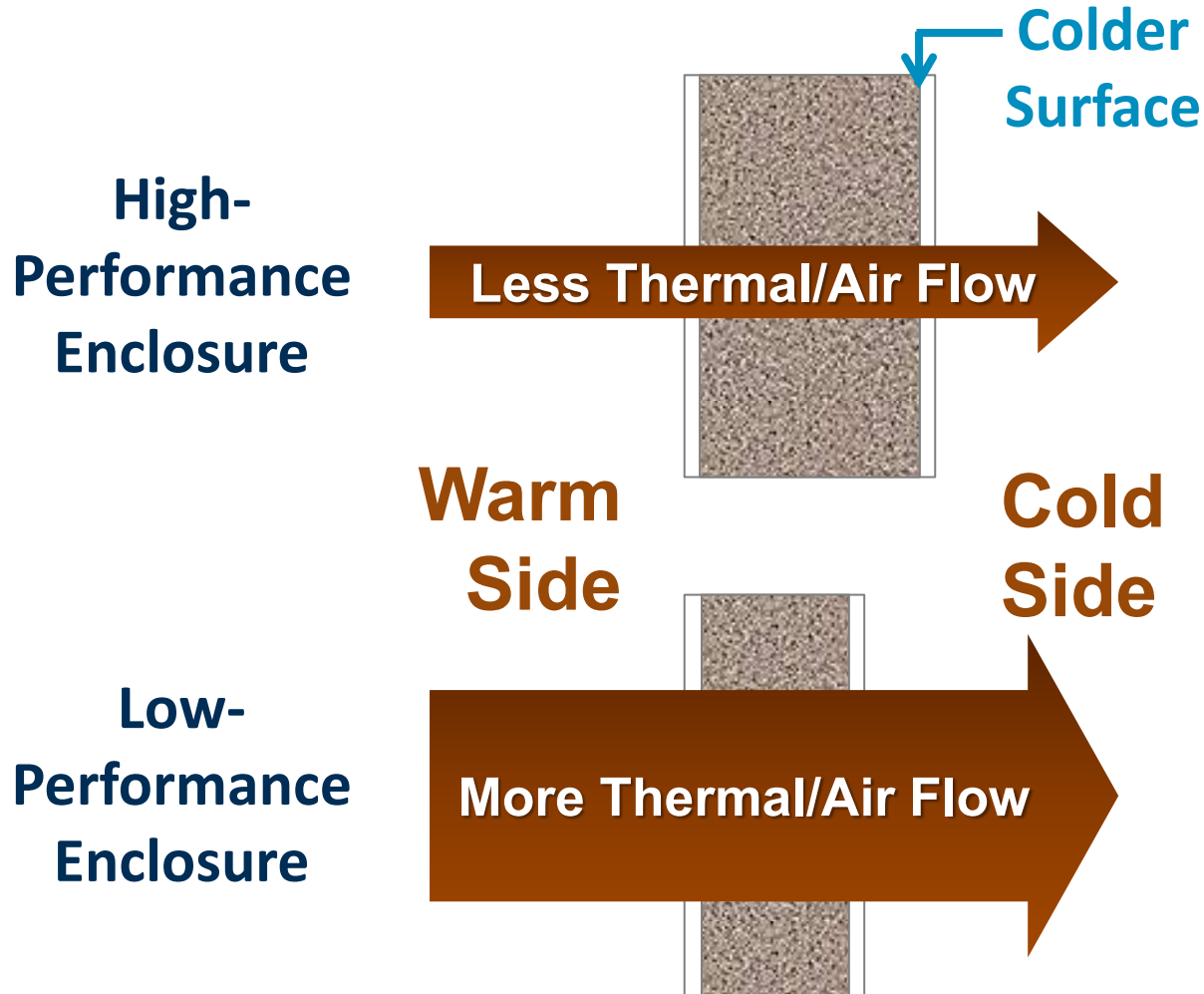
10%

in construction

62%

in manufacturing

Source: "Owners and Contractors – Still Lagging in Construction Productivity and Technology Use," Building Information Management, World Press, March 31, 2015



Moisture Problem:

- More Wetting Potential
- Less Drying Potential

Moisture Solution:

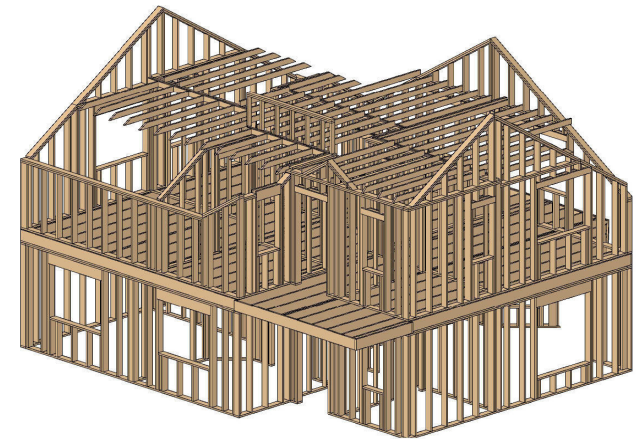
- Bulk Moisture Control
- Quality Installed Insulation
- Ensured Air Tightness

Air Flow Control

Complete
Air Barriers

Comprehensive Air
Sealing

Flashing Large
Openings



Boundaries Between Condition and Unconditioned Spaces

Walls

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

Shafts

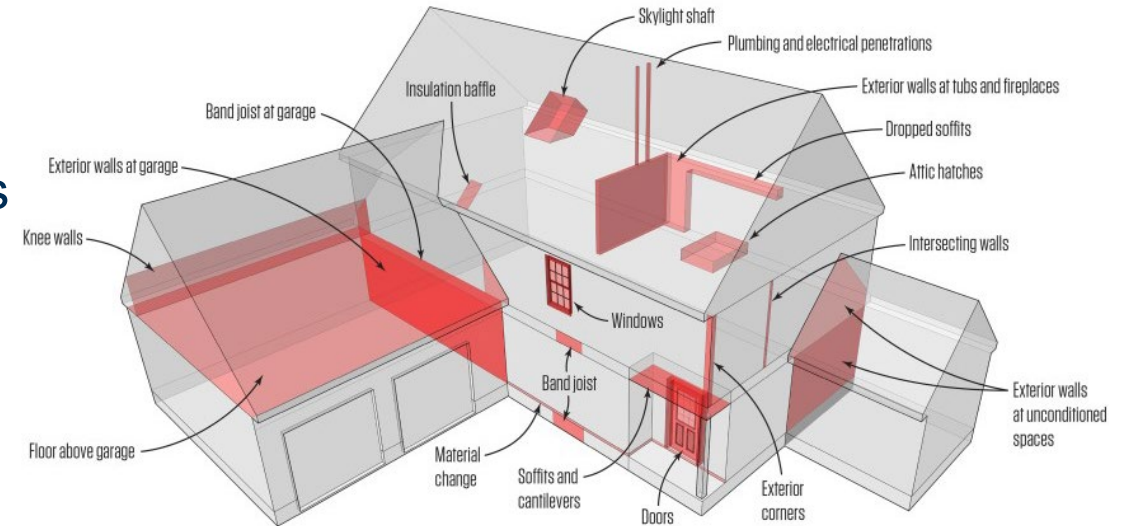
- Duct Shaft
- Piping Shaft
- Flue Shaft

Attic/Ceiling

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

Floors

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



ACH50 Requirements/Targets					
Climate Zones	Zero Energy Ready	ENERGY STAR V3	2012 IECC	Passive House	
1-2	3.0	6.0	5.0	0.6	
3-4	2.5	5.0	3.0	0.6	
5-7	2.0	4.0	3.0	0.6	
8	1.5	3.0	3.0	0.6	

Penetrations:

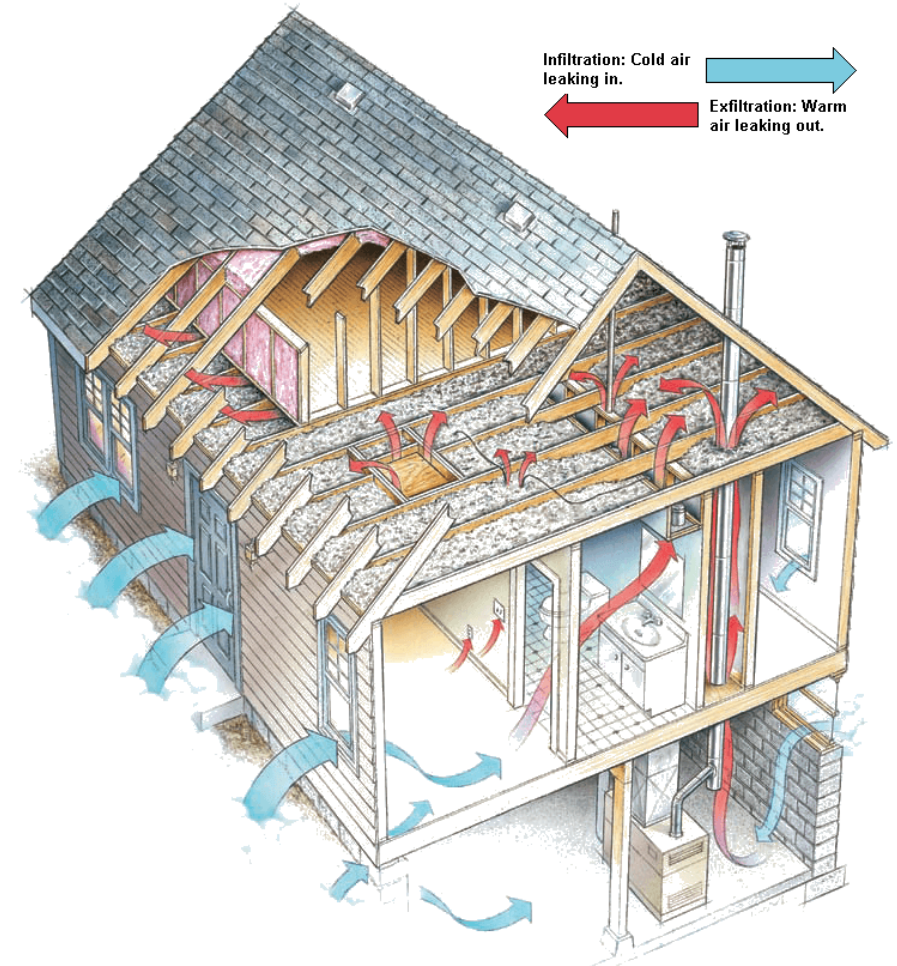
- Plumbing
- Wiring
- Recessed Lights
- Vents
- Flues
- HVAC Duct Boots

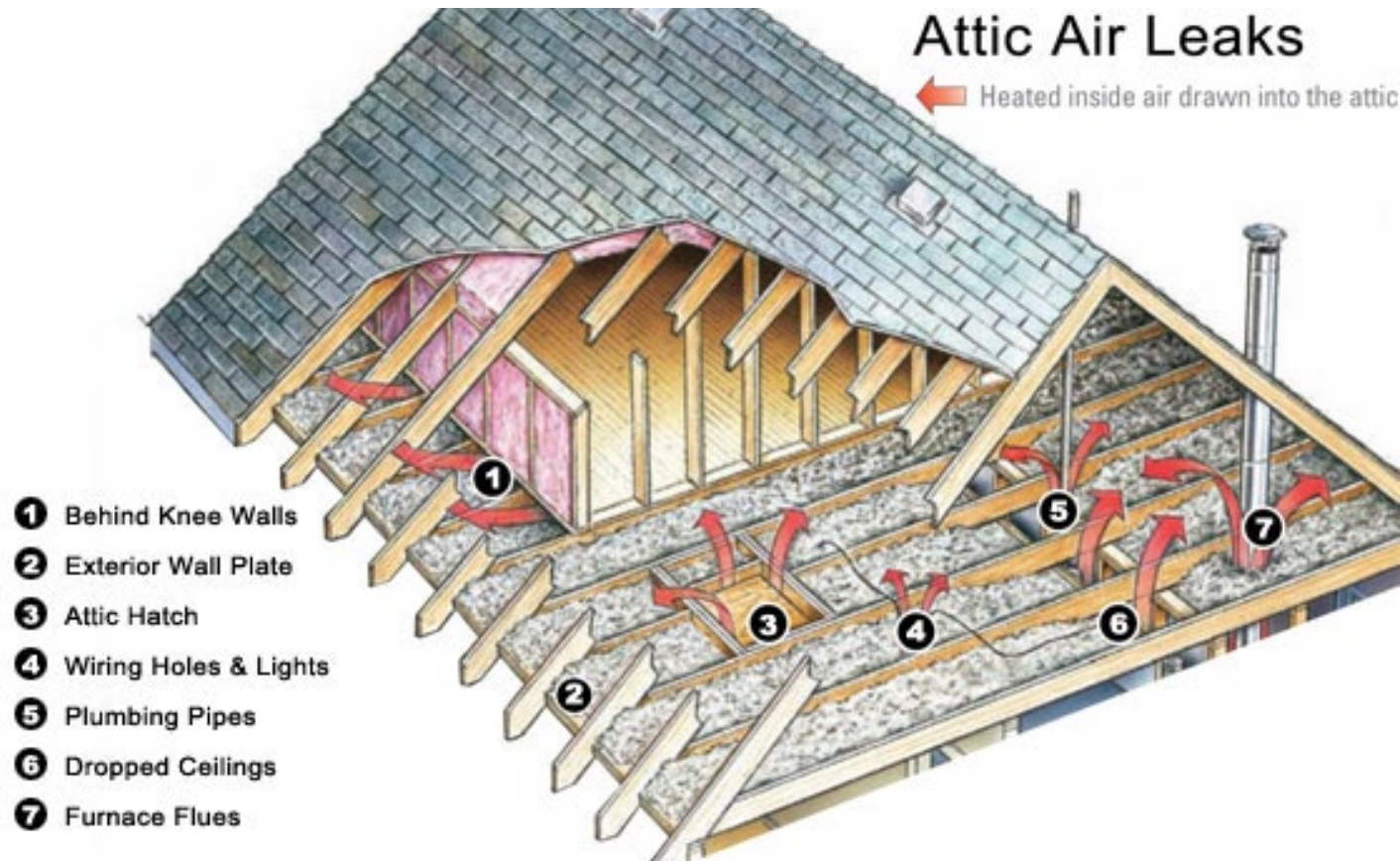
Odd Geometry:

- Cantilevers
- Knee-walls

Cracks:

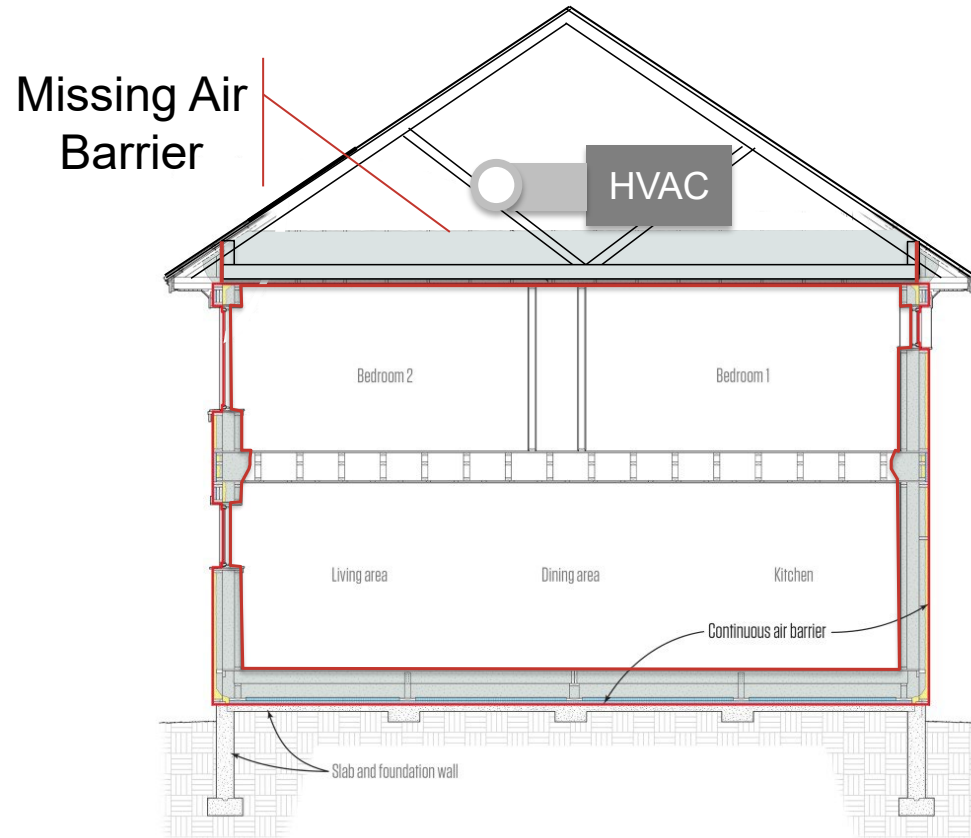
- Sill Plates
- Windows & Doors
- Drywall at Top Plate
- Access Panels
- Sheathing Joints
- Foundation/Framing
- Air Barriers (see Air Barrier Checklist)





Attic/Ceiling:

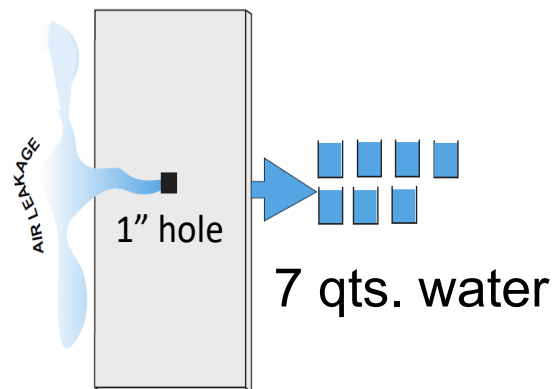
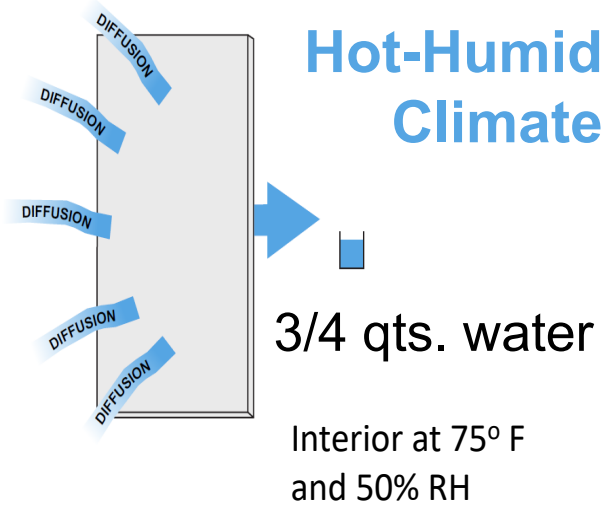
- Delta T
- Pressure (Stack Effect)
- Air Barriers
 - Knee Walls
 - Dropped/Raised Ceilings
 - Shafts
 - Wind Baffles
- Air Leakage:
 - Penetrations
 - Duct Boots
 - Access Panels
 - Drywall to Top Plate
- HVAC Location



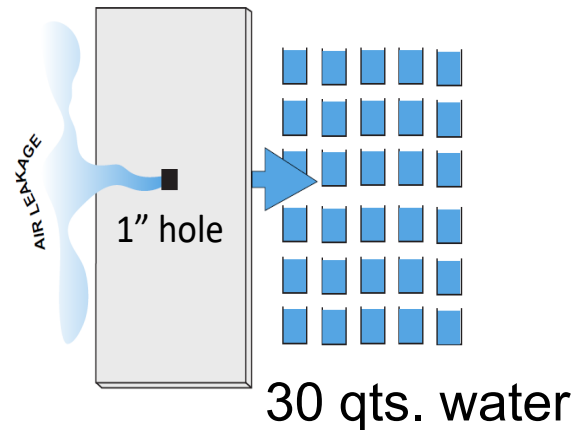
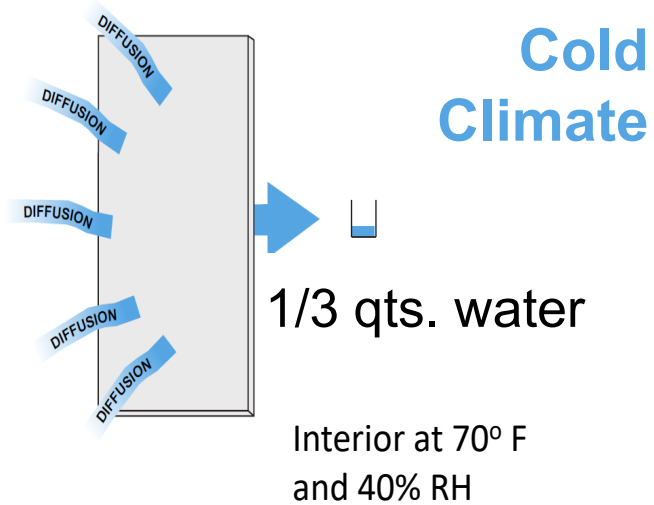
Conventional Framing

Source: *'Air-Barrier Basics,'* Steve Bazcek, The Journal of Light Construction, January 9, 2019

Air Flow Control Risk : Air Leakage vs. Diffusion



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



Moisture vapor flow over Winter from the interior to exterior with 5 Pascal pressure difference

Air Flow Critical

Moisture flow due to air leakage vs. diffusion:

~10X Greater
in Hot-Humid Climate

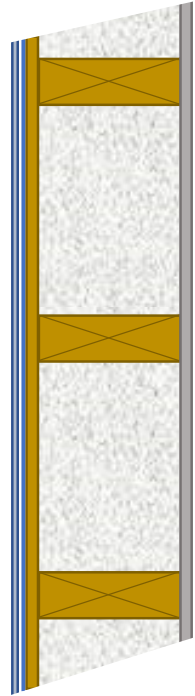
~100X Greater
in Cold Climate



Thermal Flow Control: Greater Accountability



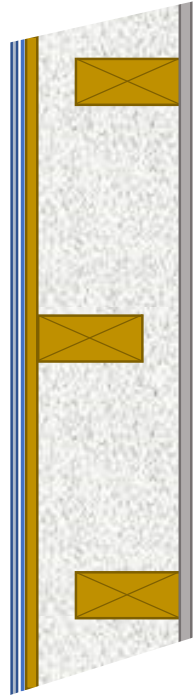
Thermal Flow Control: Thermal Bridging



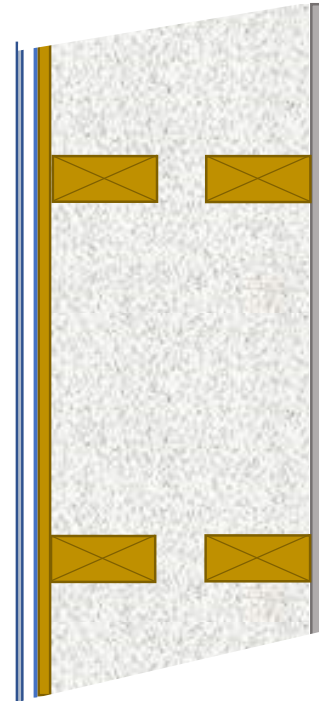
Conventional Framing
25-30% F.F.



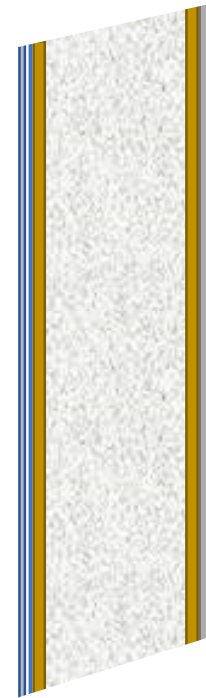
Advanced Framing
19% F.F.



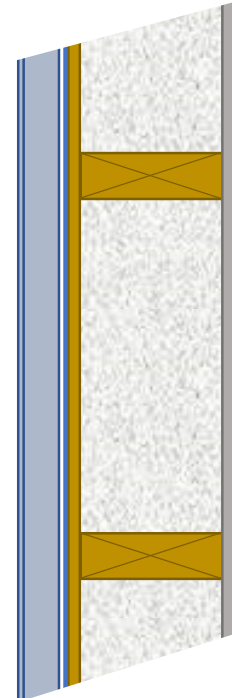
Staggered Stud Framing
12% F.F.



Double-Wall Framing
10% F.F.

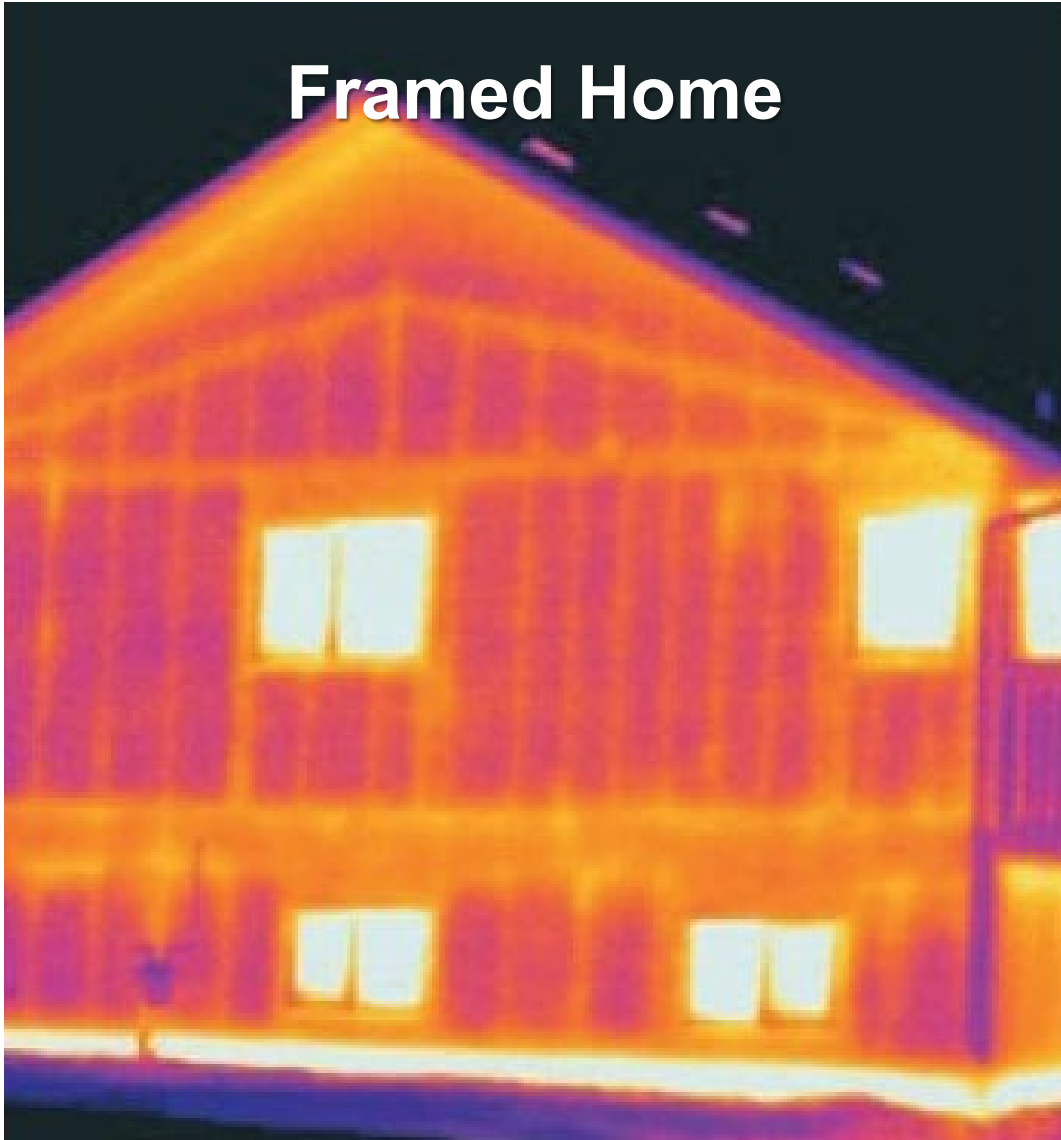


Structural Insulated Panels
5% F.F.



Rigid Insul. Sheathing
2% F.F.

Framed Home



SIPs Home



Thermal and Air Flow Control

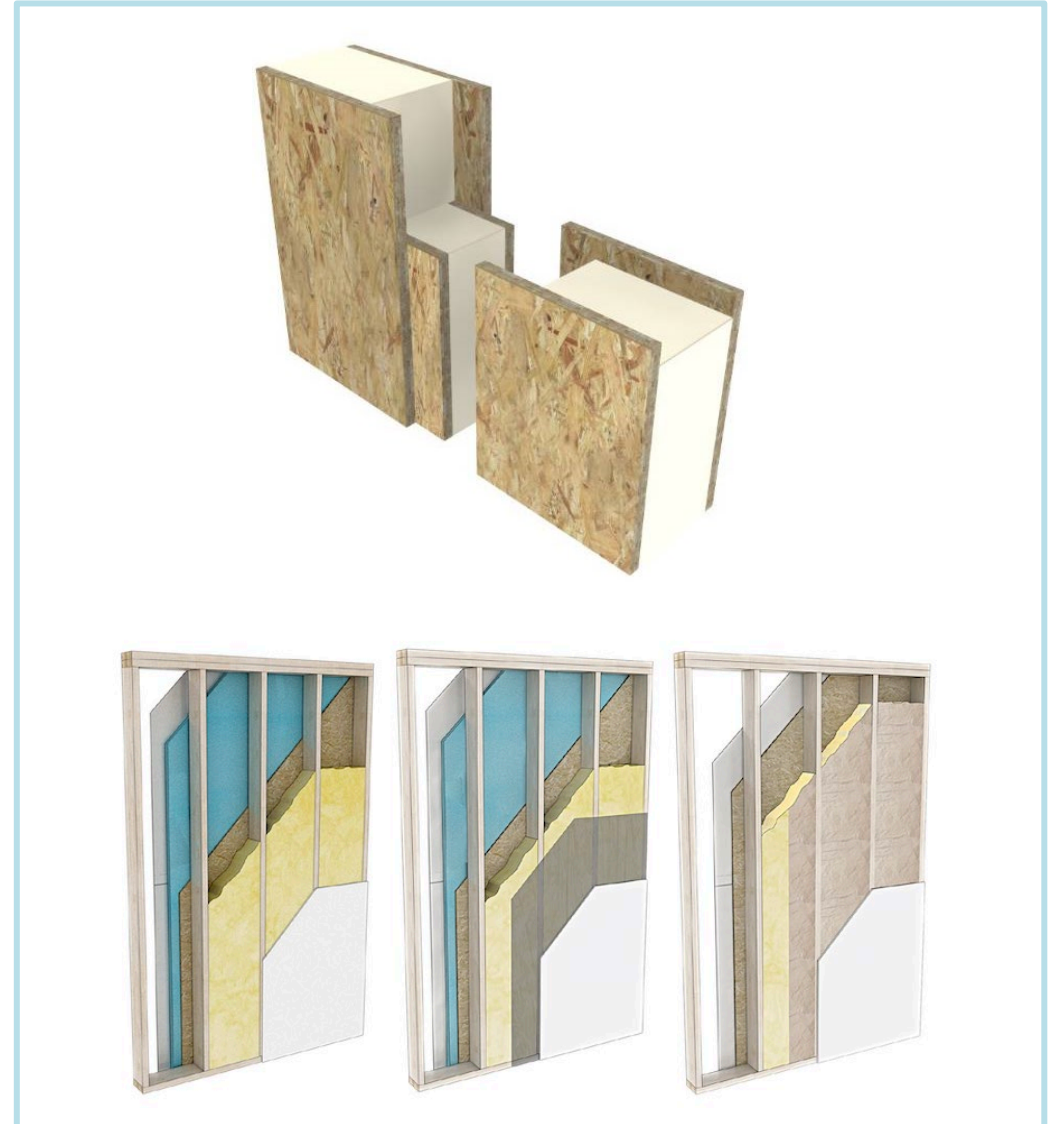
Inherent
Air Tightness

Inherent
Vapor Flow Control

Optimize
Insulation Quantity

Optimize Insulation
Installation Quality

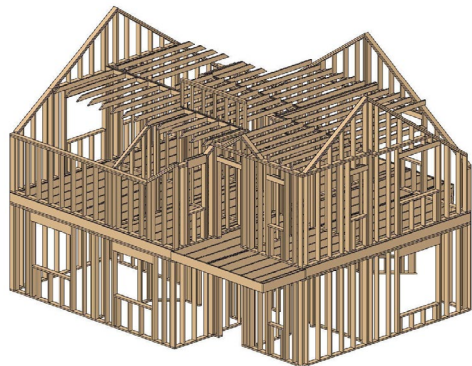
Minimize
Thermal Bridging



HPH Enclosure Innovation: SIPs vs. Framing



vs.



Faster

- Framing
- Air Sealing and Air Barriers
- Insulation
- Attic Venting
- Drywall
- Trim

Better

- Inherent Air Tightness
- Inherent Insulation Quality Installation
- Low Risk (Assembly vs. Construction)
- Dimensional Accuracy
- Greater Strength/Resilience
- Reliance on Trades
- Added Condition Space

Cheaper

- Less Cycle Time
- Less Inspections
- Less Rework
- Less Waste

Site Built Construction Schedule



Offsite Construction Schedule

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

SIPs Reduced Cycle Time = Lower Cost

Days Saved for SIPs vs. Framing Example:

16 Days

Cost Savings Per Day Saved:

\$500 - \$800/Day*

Cost Savings:

\$8,000 - \$12,800

Source: 'The Cost of Quality', IBACOS research

Average Construction Cost Variance:
\$1,850 (as high as \$7,000)

Construction Cost Variance:
**One-third Due to Poor
Construction Documentation.**

SIPs Cost Savings: Reduced Warranty Calls

Average # of service requests per home: **15**

Cost of respond to warranty service call: **\$250**

Assume 6 fewer calls with SIPs:

6 fewer calls x \$250/call = **\$1,500/home**

Source: 'The Cost of Quality', IBACOS research

Research results suggest builders could save
\$3,800+ per house
(on average) with just a
1% improvement in quality
across eight areas of their business.

Source: 'The Cost of Quality', IBACOS research

Trades Eliminated:

- Exterior Framing
- Insulation
- Air Barriers
- Air Sealing

Trade Work Reduced:

- Interior Framing
- Drywall
- Finishes

SIPs Cost Savings: Reduced Waste



Typical
Construction
Waste:
8,000 lbs.
50 Cu. Yds.

Source: NAHB Study

Typical Construction Site Dumpster:

\$300 - 500 Usable Materials

Average Cost Per Dumpster Haul: **\$560***

Average Dumpsters Per Home: **3****

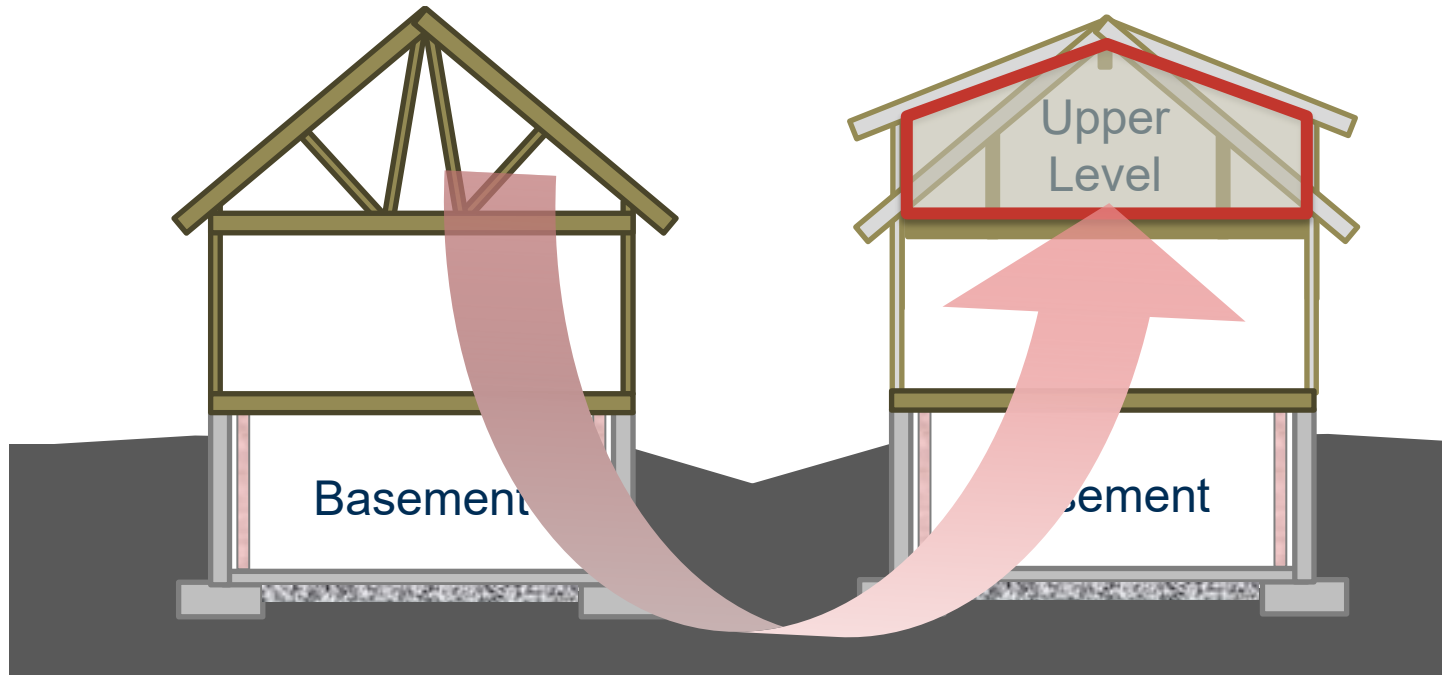
Assume 1 Dumpster with SIPs

2 Dumpsters saved x \$560/dumpster = **\$1,120/home**

**Source: 'The Cost of Quality', IBACOS research*

Source: Dumpsters.com

SIPs Added Value: More Conditioned Space

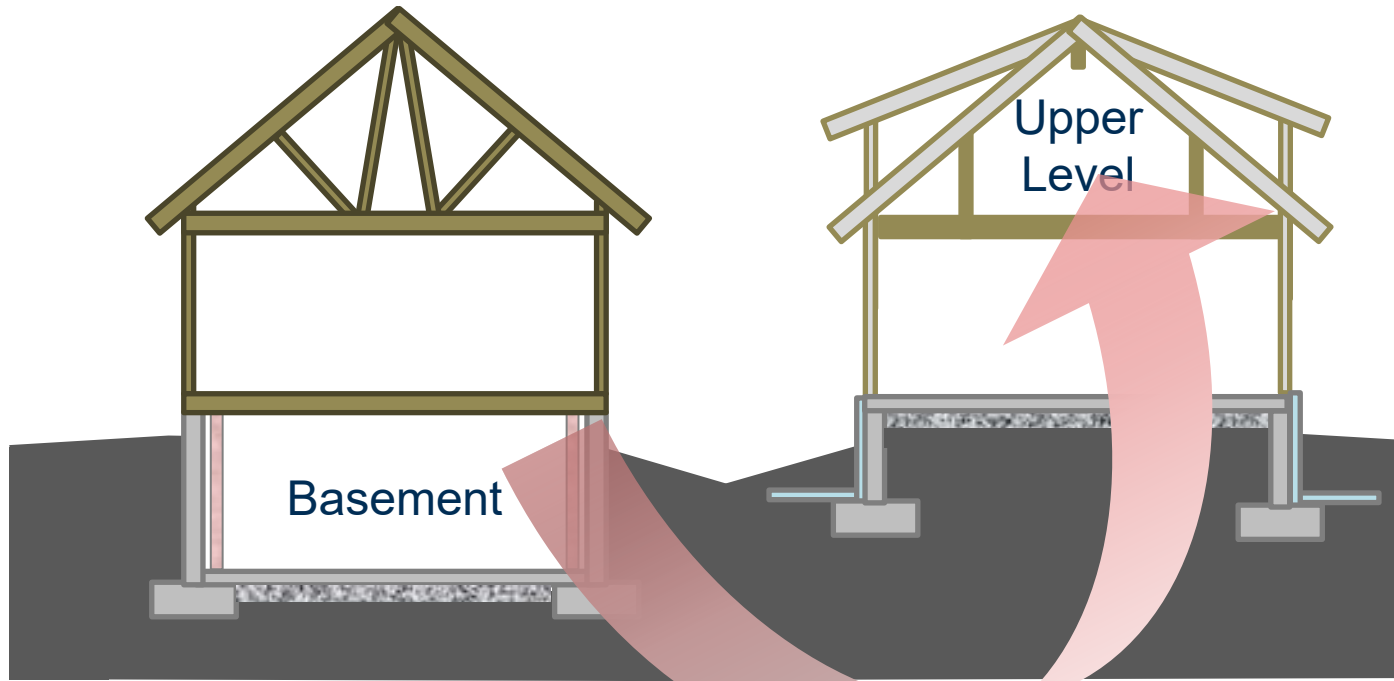


Framed Roof

SIP Roof

Cost Savings	
Air Seal/Barriers	\$1K - \$2K
Attic Venting	\$1K - \$1.5K
Reduced Waste	\$1K - \$2K
Time (3 days)	\$1.5K - \$2.5K
Added Value	
Upper-Level Space	\$160K - \$200K

SIPs Cost Savings: Basement for 2nd Floor



Framed Roof

SIP Roof

¹“Frost-Protected Shallow Foundations, NAHB Research Center, 4/30/04

Cost Savings	
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 - \$2.5
Added Value	
Upper-Level Space vs. Basement	\$60K - \$100K



Translating Innovation Value

Time

- Framing
- Drywall
- Trim

Air Flow

- Air Sealing
- Air Barriers
- Attic Venting

Quality

- Interior Trim (rework)
- Reserves for Callbacks
- Inspections (inherent QA)

Waste

- Framing
- Drywall
- Trim

However,
cost savings only
count if ...
integrated in the
bidding process
and coordinated
with trades.

Savings

- Waiting Time
- Utility Bills
- Insurance

Livability

- Comfort
- Quiet
- Higher Ceilings

Quality

- Dimensional Accuracy
- Solid Construction

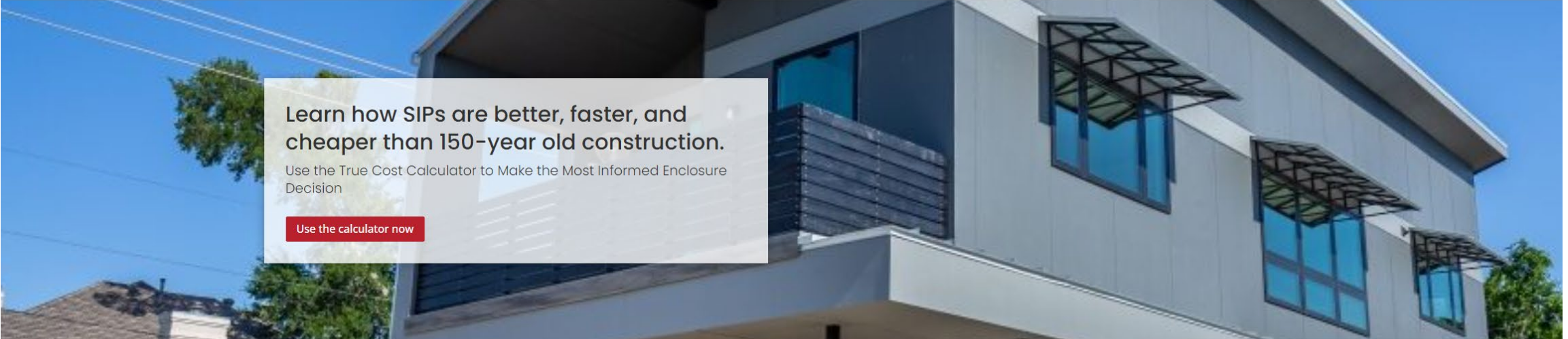
Resilience

- Wildfires
- Impact
- Earthquake
- Pests
- Post-Event Occupancy

Added Volume

- Unvented Attics
- Thinner Walls & Roofs / R-value

However,
added value only counts if ...
communicated and integrated in the sales and bidding processes



Learn how SIPs are better, faster, and cheaper than 150-year old construction.

Use the True Cost Calculator to Make the Most Informed Enclosure Decision

[Use the calculator now](#)

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.](#)

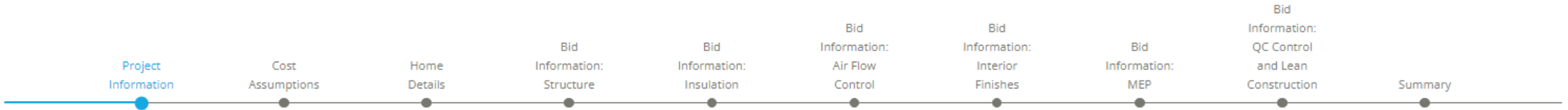
Start on a sample project.

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.](#)



SIPA True Cost Bidding Tool: Proof the “Why”



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

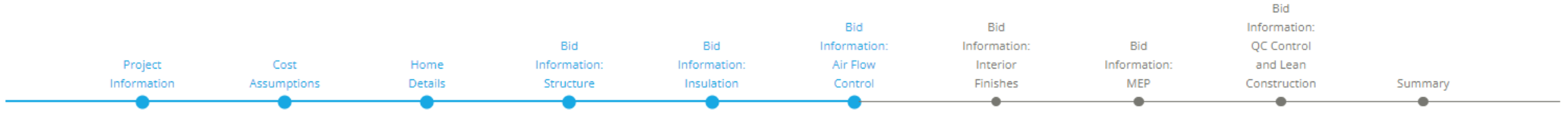
Live Better Homes

SIP Provider

ACME SIPs



SIPA True Cost Bidding Tool: Proof the “Why”



PROJECT DASHBOARD: Willows Creek

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

Air Barriers	Cost with Traditional Framing (USD) 1,000	Cost Using SIPs (USD) 700
Air Sealing	Cost with Traditional Framing (USD) 1,500	Cost Using SIPs (USD) 400
Wind Baffles	Cost with Traditional Framing (USD) 250	Cost Using SIPs (USD) 250
Total Air Flow Costs	Total Cost with Traditional Framing \$ 2,750	Total Cost Using SIPs \$ 1,350



SIPA True Cost Bidding Tool: Proof the "Why"



PROJECT DASHBOARD: Willows Creek

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



SIPA True Cost Bidding Tool: Proof the "Why"



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

Bid Coversheet

- Level Playing Field with Framing
 - Contrast w/Actual Framing Bid
 - Contrast w/Estimated Framing Bid

“Faster, Better, Cheaper” Case Studies

- Marketing
- SIPs Presentations
- SIPA Award Required Submission

Sales Process

- Reveal Hidden Savings and Value
- Earn ‘Trust’ Using Builder Inputs
- Target ‘Best Fit’ Builders
- Identify Competitive Framing Costs

High-Performance Enclosures: Faster, Better, Cheaper

Sam Rashkin Info:

Phone: 703-618-1932

Email: sam.rashkin@truhomefacts.com

Housing 2.0 Resources:

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

