



**Home Innovation**  
RESEARCH LABS

# **BUILDER OUTLOOK ON USE OF COMPONENTS AND OFFSITE HOUSING TECHNOLOGIES**

Summary of Findings  
August 2019 Survey

Finding Innovation a Home

# Home Innovation Research Labs

- Founded in 1964 as wholly-owned subsidiary of NAHB
- Independent, for-profit researchers assisting development and commercialization of new building technologies
  - Engineering research & development
  - Market & field research
  - Laboratory testing
- #1 in green home building certification (NGBS)
- Building codes and standards developers
- Partners with ICC-ES to expedite AC development

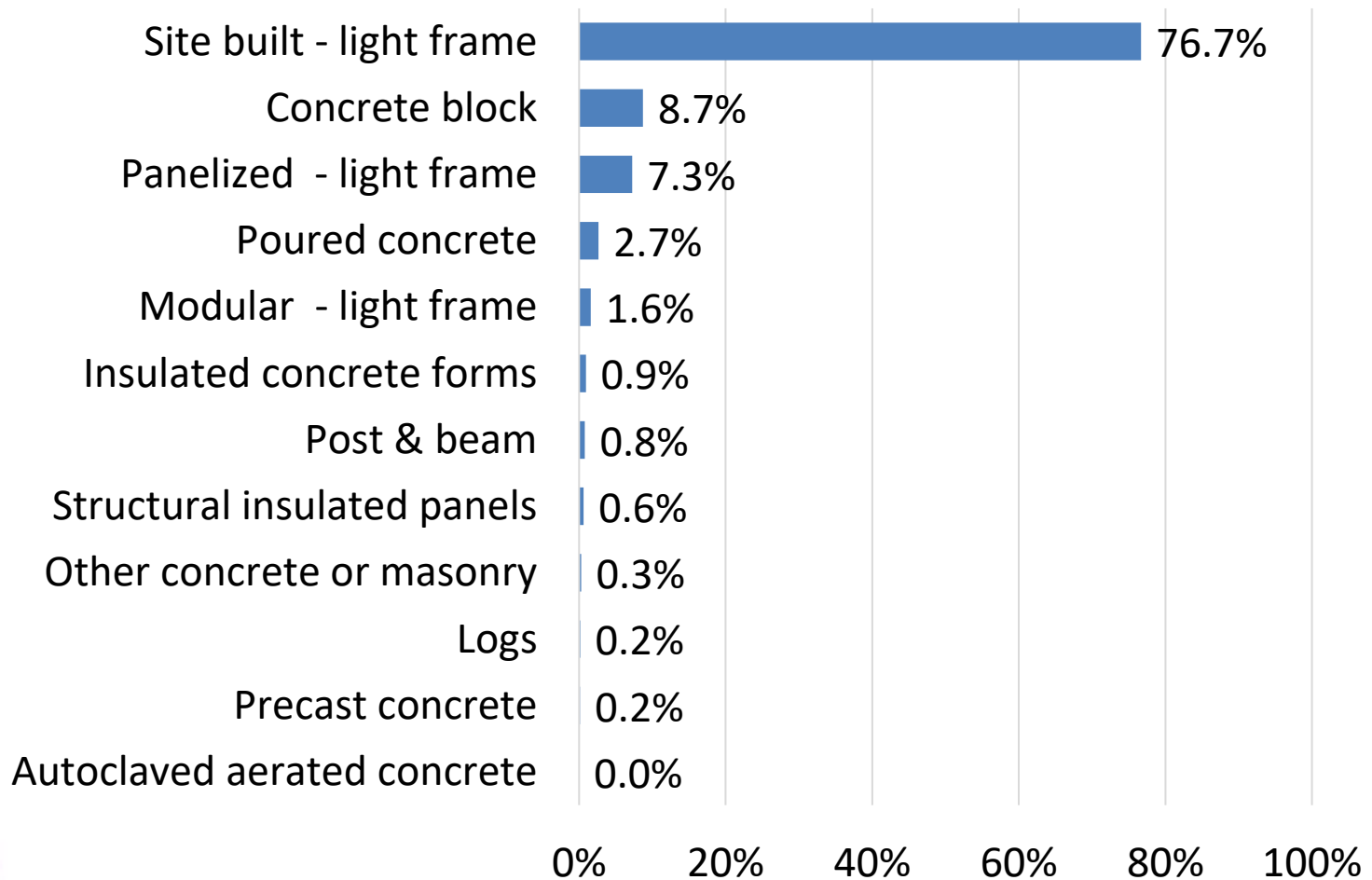


# Basis for Presentation Data: Tracking Studies of Home Builders

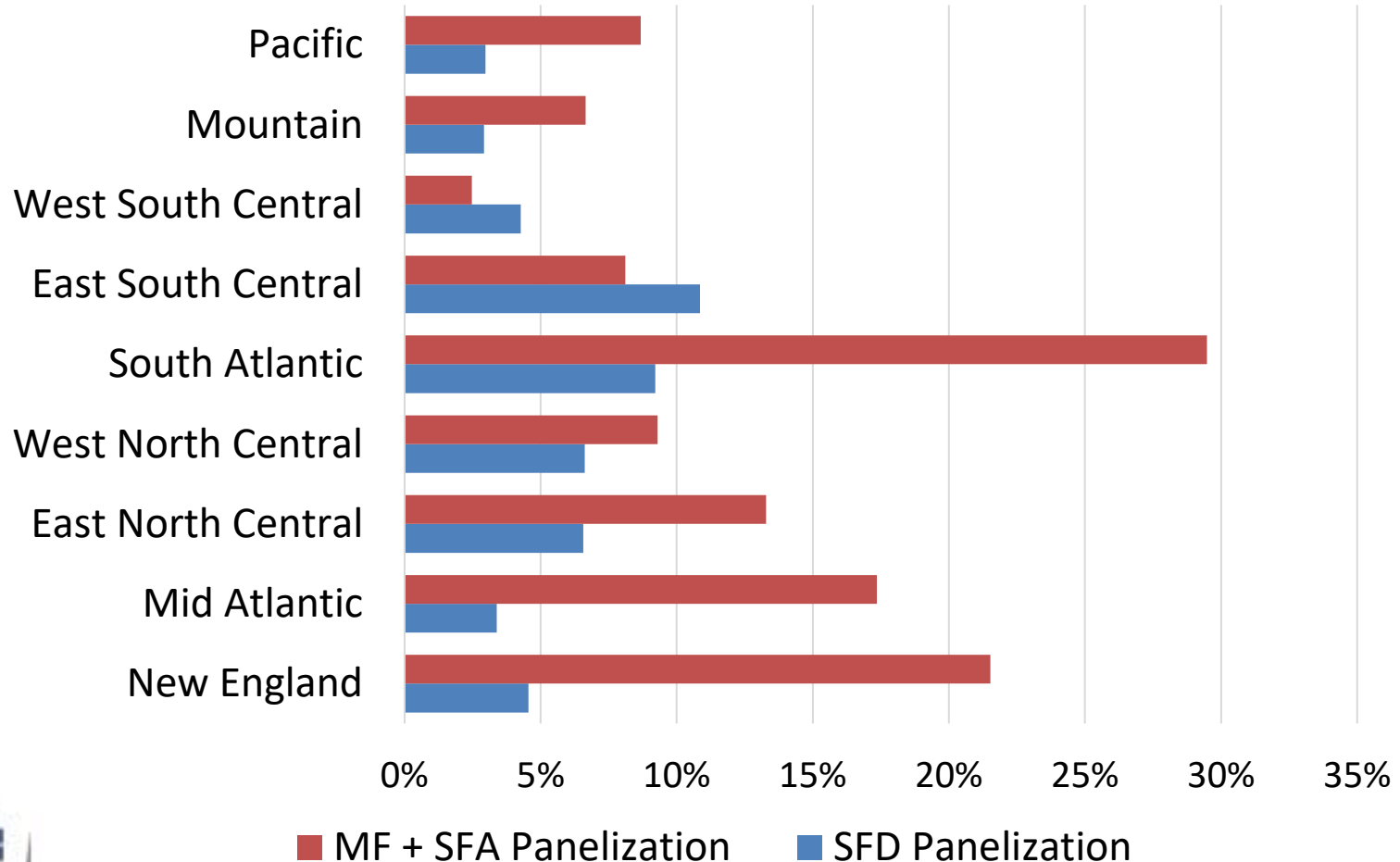
- Part 1: Home Innovation has been tracking annual materials purchases since 1995
  - Builder Practices Survey of 1,550 U.S. Builders
  - Consumer Practices Survey of 100,000+ U.S. households
- Part 2: A survey of 300+ builders was conducted in August 2019 and four questions were included on respondents' views on various off-site housing technologies



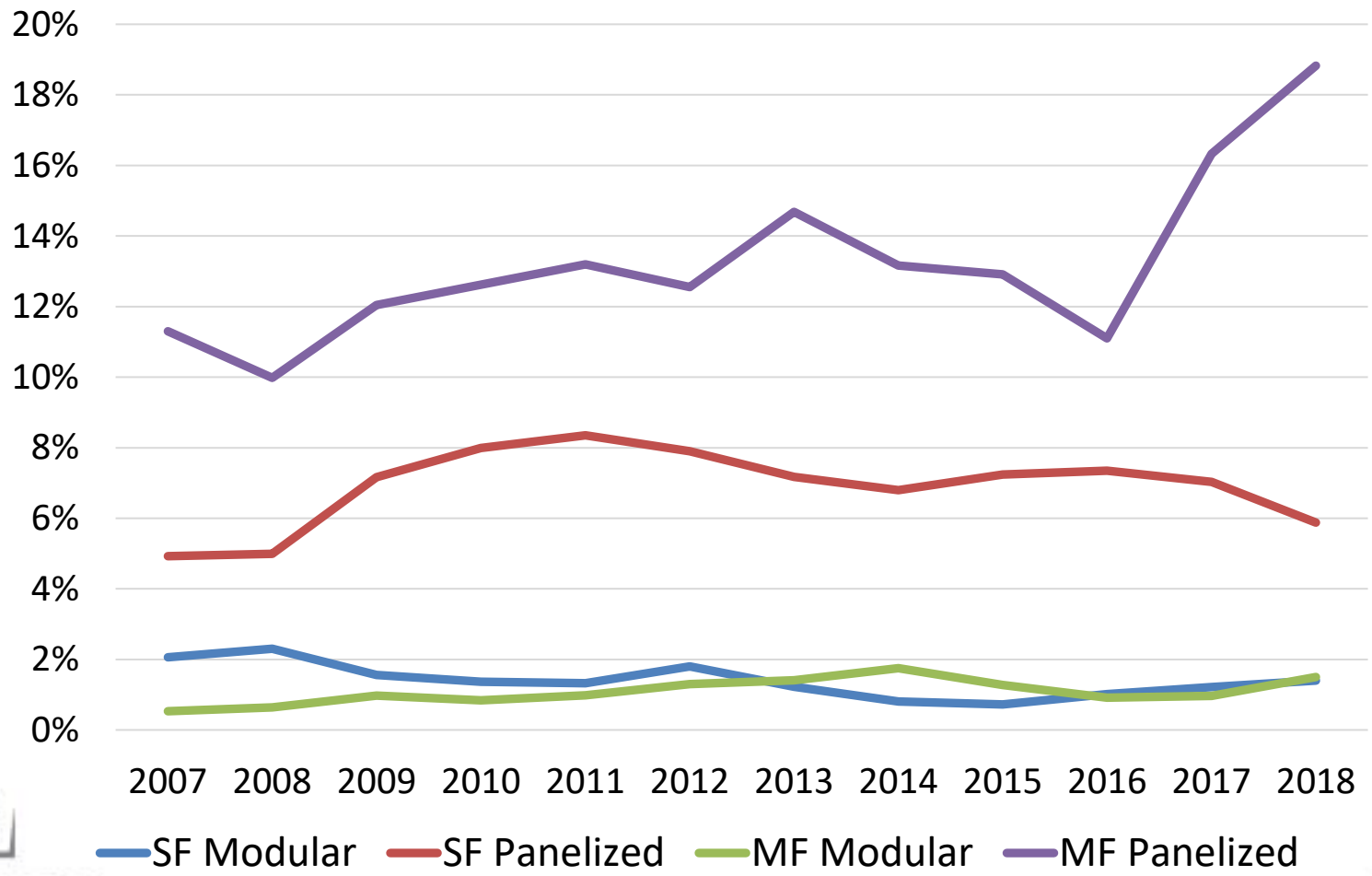
# New Home Above-Grade Wall Construction, 2018 (n=1,550)



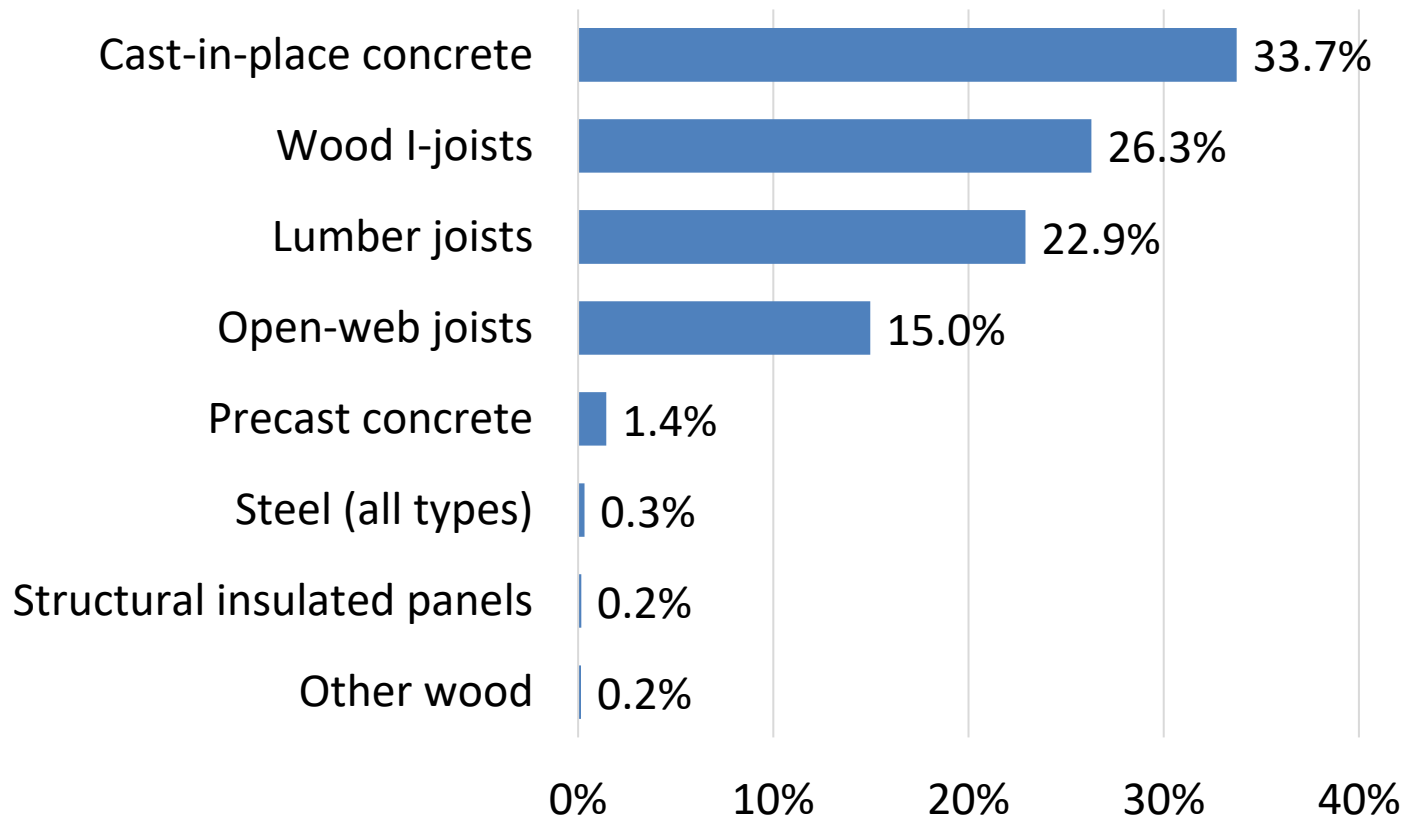
# New Home Market Penetration of Wall Panelization (6-year average usage rates)



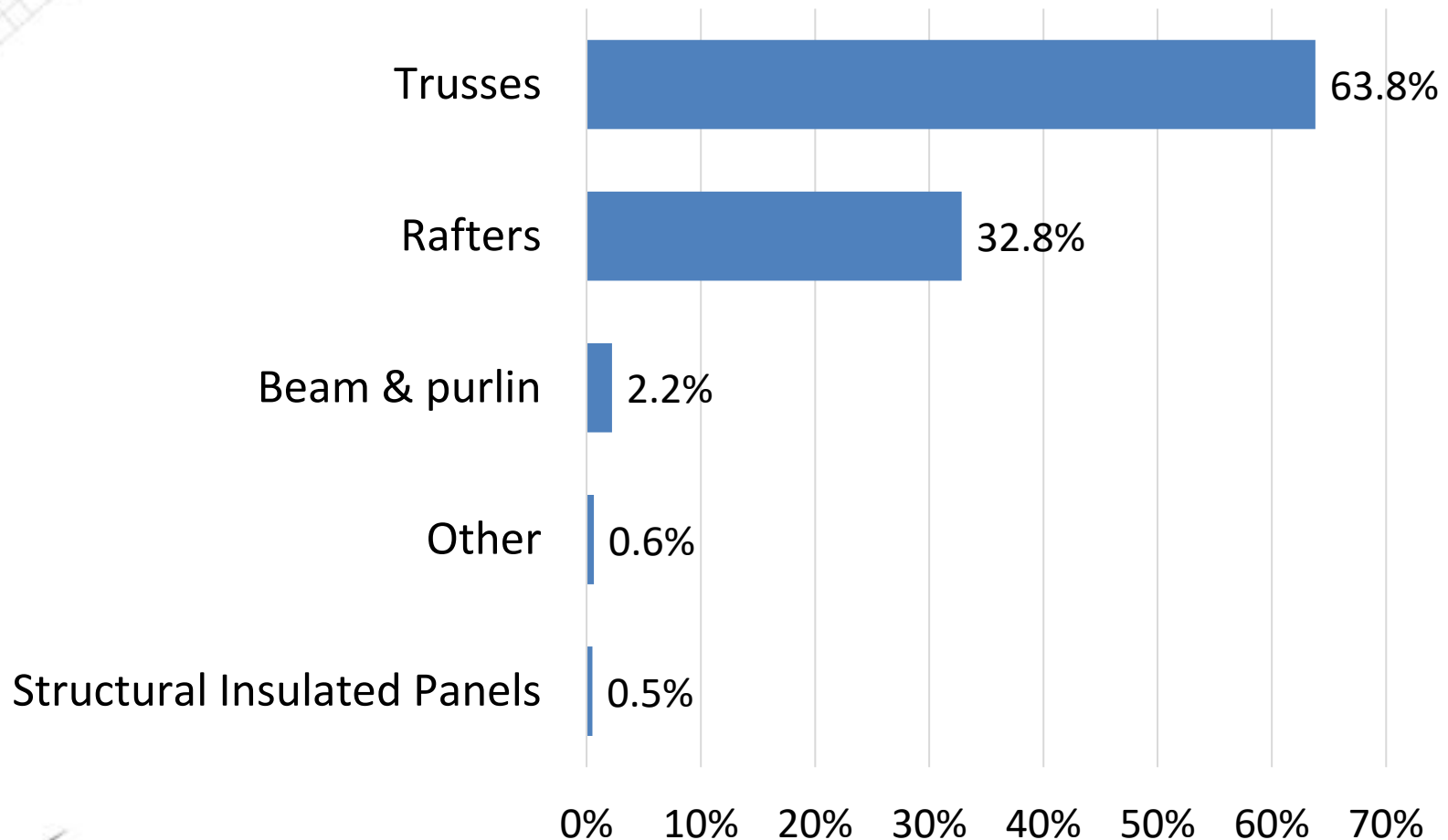
# Builder Practices Reports on Offsite Housing



# New Home Floor Construction, 2018 (% of floor area)

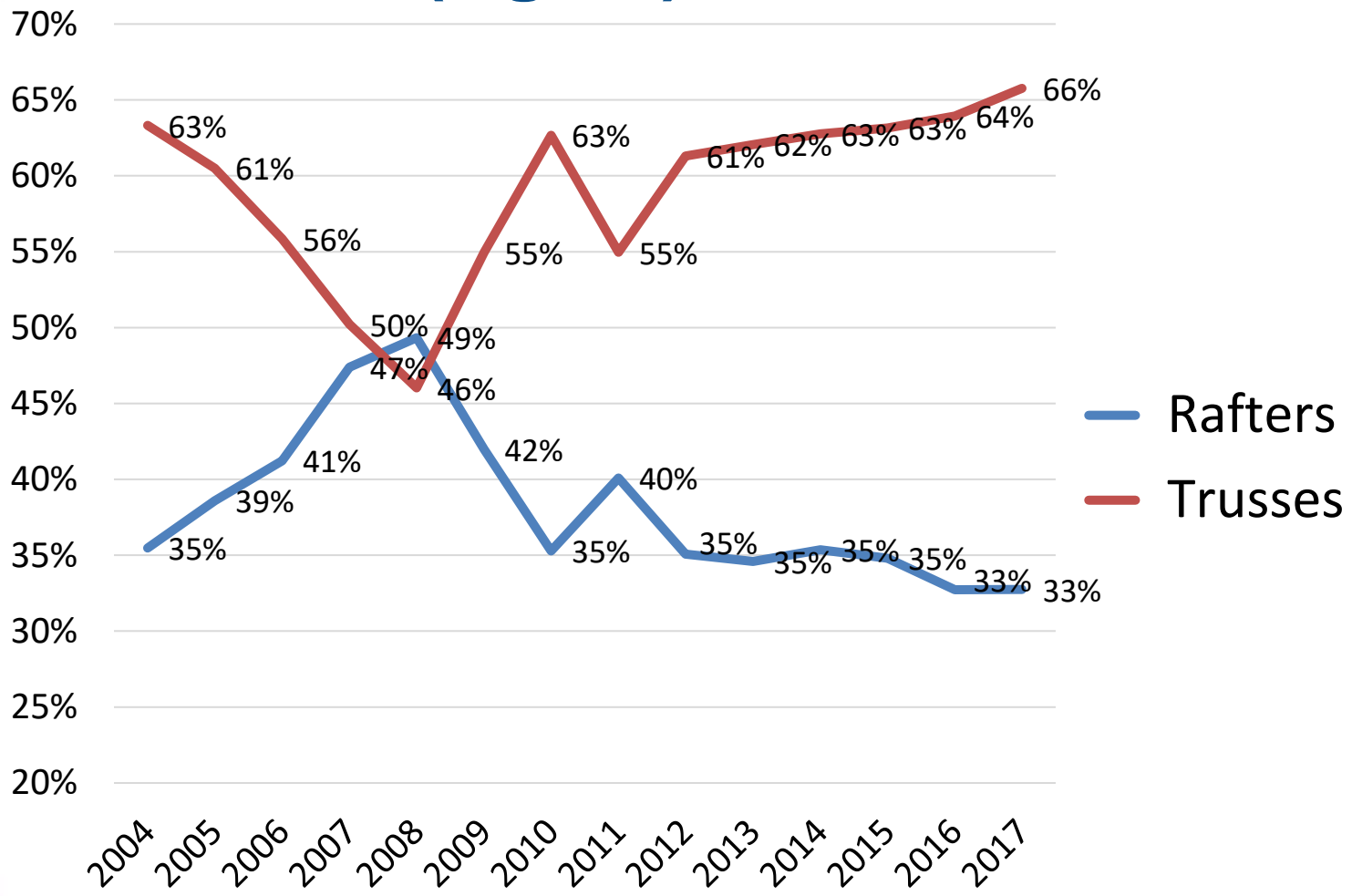


# New Home Roof Construction, 2018 (% of roof area)





# Wood Trusses Trending Upward (Again) in New SFD Homes



# Questions on Offsite and Components Use in Builder Survey

(306 respondents, cross-section of U.S. home builders)

## E1

Considering only the new homes your company builds, how often do you anticipate using the following construction practices in the coming year compared to last year?

	Didn't use and don't plan to use	Plan to use it less often	Plan to use it about the same	Plan to use it more often
Roof trusses—shop built	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pre-cut framing package	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Factory-built open wall panels (only one side of wall panels enclosed)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Factory-built closed wall panels (walls delivered with interior & exterior sides enclosed)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Panelized, pre-assembled floor sections ("cassettes")	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Modular (full wall, floor and roof assembled when delivered to the site)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Turn-key framing services (contractor provides both labor and materials)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Precast concrete floor, wall, or roof panels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Manufactured homes (HUD-code)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



# Questions on Offsite and Components Use in Builder Survey

(306 respondents, cross-section of U.S. home builders)

## E2

Considering only the new homes your company builds, how often do you anticipate using the following construction practices in five years compared to last year?

	Didn't use and don't plan to use	Plan to use it less often	Plan to use it about the same	Plan to use it more often
Roof trusses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pre-cut framing package	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Factory-built open wall panels (only one side of wall panels enclosed)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Factory-built closed wall panels (walls delivered with interior & exterior sides enclosed)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Panelized, pre-assembled floors (floor "cassettes," in sections)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Modular (full wall, floor and roof assembled when delivered to the site)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Turn-key framing services (contractor provides both labor and materials)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Precast concrete floor, wall, or roof panels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Manufactured homes (HUD-code)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



# SUMMARY: Builder Anticipation for Coming Year

	Didn't use and don't plan to use	Plan to use it less often	Plan to use it about the same	Plan to use it more often
Roof Trusses	20%	5%	64%	10%
Pre-Cut Framing Package	64%	5%	25%	7%
Factory-Built Open Wall Panels	77%	4%	12%	7%
Turn-Key Framing	57%	5%	31%	7%
Factory-Built Closed Wall Panels	82%	5%	10%	3%
Panelized, Pre-Assembled Floors	80%	4%	12%	3%
Modular	83%	5%	8%	3%
Precast Concrete	72%	7%	18%	3%
Manufactured (HUD-Code)	88%	4%	7%	1%



# SUMMARY: Builder Anticipations for Coming 5 Years

	Didn't use and don't plan to use	Plan to use it less often	Plan to use it about the same	Plan to use it more often
Roof Trusses	14%	5%	66%	15%
Factory-Built Open Wall Panels	69%	5%	14%	12%
Pre-Cut Framing Package	60%	6%	25%	9%
Turn-Key Framing	55%	4%	31%	9%
Factory-Built Closed Wall Panels	77%	3%	13%	7%
Panelized, Pre-Assembled Floors	78%	4%	11%	7%
Modular	80%	3%	10%	7%
Precast Concrete	74%	4%	15%	7%
Manufactured (HUD-Code)	87%	3%	9%	1%



# 5 Year Anticipation of Using More Often

	All Builders	Small Builders (1-24)	Large Builders (25+)
Roof Trusses	15%	15%	16%
Pre-Cut Framing Package	9%	7%	19%
Factory-Built Open Wall Panels	12%	8%	27%
Factory-Built Closed Wall Panels	7%	5%	17%
Panelized, Pre-Assembled Floors	7%	5%	14%
Modular	7%	5%	13%
Turn-Key Framing	9%	9%	13%
Precast Concrete	7%	5%	13%
Manufactured (HUD-Code)	1%	1%	3%



# 5 Year Anticipation of Using More Often

	All Builders	Local Builder	Regional or National
Roof Trusses	15%	14%	24%
Pre-Cut Framing Package	9%	8%	20%
Factory-Built Open Wall Panels	12%	12%	15%
Factory-Built Closed Wall Panels	7%	7%	7%
Panelized, Pre-Assembled Floors	7%	7%	10%
Modular	7%	6%	15%
Turn-Key Framing	9%	9%	10%
Precast Concrete	7%	6%	10%
Manufactured (HUD-Code)	1%	1%	2%



# 5 Year Anticipation of Using More Often

	<b>Northeast Builders</b>	<b>Midwest Builders</b>	<b>South Builders</b>	<b>West Builders</b>
Roof Trusses	20%	13%	15%	15%
Pre-Cut Framing Package	8%	9%	9%	13%
Factory-Built Open Wall Panels	14%	12%	7%	21%
Factory-Built Closed Wall Panels	16%	4%	5%	9%
Panelized, Pre-Assembled Floors	12%	6%	4%	11%
Modular	12%	4%	6%	8%
Turn-Key Framing	12%	6%	10%	11%
Precast Concrete	10%	5%	7%	4%
Manufactured (HUD-Code)	4%	1%	1%	0%





# 5 Year Anticipation of Using More Often

	All SFD Builders	SFD Starter Builders	SFD Move-up Builders	SFD Luxury Builders
Roof Trusses	15%	18%	15%	17%
Pre-Cut Framing Package	10%	10%	10%	11%
Factory-Built Open Wall Panels	12%	14%	13%	13%
Factory-Built Closed Wall Panels	7%	8%	8%	7%
Panelized, Pre-Assembled Floors	7%	8%	7%	6%
Modular	7%	8%	8%	7%
Turn-Key Framing	10%	11%	10%	10%
Precast Concrete	7%	9%	9%	9%
Manufactured (HUD-Code)	1%	1%	2%	1%



# 5 Year Anticipation of Using More Often

	All SFD Builders	Custom Builders	Semi-Custom Builders	Production Builders
Roof Trusses	15%	16%	10%	24%
Pre-Cut Framing Package	10%	7%	7%	26%
Factory-Built Open Wall Panels	12%	8%	17%	24%
Factory-Built Closed Wall Panels	7%	3%	10%	13%
Panelized, Pre-Assembled Floors	7%	4%	7%	18%
Modular	7%	5%	4%	13%
Turn-Key Framing	10%	8%	11%	16%
Precast Concrete	7%	7%	6%	5%
Manufactured (HUD-Code)	1%	1%	3%	3%



# 5 Year Anticipation of Using More Often

	<b>SFD Builders</b>	<b>Townhouse Builders</b>	<b>Apartment Builders</b>
Roof Trusses	15%	19%	30%
Pre-Cut Framing Package	10%	21%	17%
Factory-Built Open Wall Panels	12%	26%	17%
Factory-Built Closed Wall Panels	7%	23%	30%
Panelized, Pre-Assembled Floors	7%	16%	17%
Modular	7%	12%	22%
Turn-Key Framing	10%	19%	22%
Precast Concrete	7%	12%	22%
Manufactured (HUD-Code)	1%	5%	4%



# Construction Labor Environment and Offsite Housing

Open-end question in builder survey:

“Considering your company’s decision to use (or not use) pre-fabricated building systems and components, what role does the availability of construction labor play in that decision? Please explain.”

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# Huge Diversity in Responses

- About 1/3 responded that Labor Availability plays role—from modest to a “huge” role
- Most of the remaining responses fell into one of the following categories:
  - Difficulty of training current workers or subcontractors
  - Personal preference for site-built
  - Greater difficulty in coordinating construction or longer lead times
  - Homebuyers’ negative perceptions of “pre-fab”
  - Inflexibility of subcontractors to adapt to change
  - Need of flexibility for last-minute changes in framing
  - Offsite solution provider not available in their area, or has capacity limits when the market heats up



# Labor and Offsite Housing: It's a Major Driver

“Huge, labor is our biggest problem ... “

“A huge role. I have a big problem finding and keeping framing carpenters.”

“Huge role. No readily available labor means delays which means PROFIT loss or even project loss!”

“Huge - labor is getting impossible to find and has no skill level”

“Shortage of labor has me investigating component use”

“For the past 2 years there has been an extreme shortage of labor. It takes longer to complete a project...”



# Labor and Offsite Housing: Important but Not the Primary Driver

“Labor is tight but manageable in our area”

“Some (role.) It is still very hard to get good help”

“(Labor is the) biggest factor that I'm aware of. If the price was similar and my framer would get on board, I would try it.”

“We've always used pre-fab walls. Labor shortage is still a problem either way - need them in the field and in the wall shop.”

“WE have one framer doing panelizing on some of our multifamily projects, seems to work well and they are able to frame them quicker. They do have issues finding people to work in the factory and on site though.”



# Labor and Offsite Housing: It's Becoming a Major Driver

“will be a factor in the future”

“Lack of available quality labor pushes us to consider using prefab systems more and more verses full stick built framing.”

“It makes no difference at this point, it could in the future if labor is more difficult to find.”

“(if) Labor get much shorter in supply will have to do pre-fabricated”

“We have not had a problem with the availability of construction labor that would make us switch to pre-fabricated building systems (at this time).”





# Labor and Offsite Housing: Labor is a Major Deterrent

“We do not have the labor pool or expertise required for this type on installation”

“Crews would rather not use (pre-fabricated components)”

“Labor (is) tight and we are finding crews are unwilling to try new things that require an upfront learning curve even though they may be a time or resource saver in the future.”

“Our company is old school and not trained in pre-fab systems...may look at it in the future when our younger partners take over “

“...the labor force around here doesn't give you any break for using prefabricated system”



# Labor and Offsite Housing: Labor is a Major Deterrent

“Considerably. At this point, most trades are so busy you take what you can get, which means most use traditional building practices.”

“Limited labor available in this area. Mostly immigrants. Language barrier.”

“Local help not that familiar”

“Learning curves are unknown and given the overall shortage of labor and subcontractors this uncertainty is a barrier “



# Labor and Offsite Housing: Labor is Not An Issue

“None. We are self sufficient.”

“(Labor) plays no role—I use panelized because of the speed of framing”

“Our employees are craftsman at their work and are paid significantly higher wages than average construction labor.”

“I have the best of the best”

“(There is) plenty of labor at the right price”

“Labor (is) still cheaper (than paying higher price for components)”

“Labor is not an issue in our area.” “I don't have any problems recruiting and hiring qualified tradesmen.”



# Labor and Offsite Housing: Financial Factors are More Important

“We look at the prefabrication process purely from a financial standpoint. As the availability of construction labor goes down the cost of that labor will go up. When the cost of factory built components are less than site built (there) will be change.”

“We would use pre-fabricated building systems if they were more cost-effective than site built homes.”

“The only problem is that their (framers’) price normally remains the same or is not...low enough to make a difference”

“It's about the cost of the total package installed. Today I can stick build everything yet for less than any components other than trusses.”



# Labor and Offsite Housing: Buyer Perception is More Important

“We do not use pre-fabricated systems or components and never will, even if there is a pinch on labor.”

“Some but not primary--Customers opinion most important”

“Labor is an issue, but not overriding our 'hands-on' policy”

“Quality of known pre-fabricated products is not compatible with our market.”

“Customer Perception on quality - most don't like the thought of a "pre-fab" home, even if it is just the walls”



# Labor and Offsite Housing: Quality or Flexibility is More Important

“We consider it very important to have direct control of the labor to assure of getting the quality we require”

“Minimal ... QUALITY is of greater importance”

“Labor is not a factor. Customers driving changes is the main factor.”

“Stick built wall assemblies are so prevalent and custom building is so innate to our local building culture and client expectations...that it seems like a competitive disadvantage in some ways to implement (offsite) for higher-end homes that we build where the client may feel entitled to make changes once plans are final and after contract so the ability to be flexible to accommodate those changes.”



# Labor and Offsite Housing: Local Supply is Most Important

“It would cut labor cost (but) we don't have connection to get them (no supplier). I would like to know more about them.”

“Having a local provider with service, support, and quality control is very important.”

“Would like to use pre fab systems and components. Lack of those resources in our area.”

“None...pre-fabrication in our area is not available!”

“...our interest is high in this area, but our concern is that larger builders will demand the capacity afforded by the producers. Entekra and Katerra are who we are trying to work with.”

“Access to the product is the governing factor”



# Question: Barriers to Using Offsite Technologies

Open-end question in builder survey:

“What are the biggest obstacles that keep your company from more fully adopting the offsite building technologies described in the previous two questions?”

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# Summary of Barriers from Responses

- None—we use them already
- What we're doing now works fine
- Unaware of options, need trustworthy sources for local supply
- Costs more than site-built
- Workforce unwilling/unable to change
- Takes time & effort to change
- Requires pre-planning & wait time
- Local logistics issues or shipping
- Negative market perceptions
- Lack of ability for last-minute changes



# BARRIERS TO OFFSITE: No Barriers

“None, We plan on building with steel SIPS in the future”

“Nothing”

“No one ever has called on me to help me get started using other framing methods. My cell is 210.834.\*\*\*\* Larry”

“Still a little old fashioned but would like to explore pre fab technology where possible. ”

“We do a version of this on our own ”



# BARRIERS TO OFFSITE: What We're Doing Now Works Fine

“I'm old & don't want to change”

“Our market is strictly on-site builds, using trusses and precut studs, all assembled on site.

“Like to do on our own” “Personal pride”

“Like stick-built homes on site” “I'm old school, just do not like pre-fab”

“Already have a (in-house) framing crew”

“We prefer our houses be stick framed and done on the job... The framers prefer this...”



# Market & Industry Lack of Awareness of Options, etc.

“Lack of information regarding costs and finding experienced installers”

“My unfamiliarity with them.”

“(I ) do not feel comfortable with the process.”

“Just don't have the call for them i guess people don't know about them.”

“Customer demand”

“Market acceptance”

“The marketplace in the area doesn't support their use.”



# BARRIERS TO OFFSITE: Costs more than site built.....

“I am not opposed to them and have used them in the past. If the price drops a little more...I would reconsider using them”

“I would say the largest obstacle is cost. Cost, cost, and cost. The minimal time saved just does not outweigh the added cost.”

“The cost of using those techniques have always been too expensive so until costs come down or labor is completely unavailable, we will not be using it.”

“We can do it cheaper on site”

“...and we haven't seen any cost savings with prebuilt walls, etc.”

“...factory-built components are not competitive at this time.”



# BARRIERS TO OFFSITE: Workforce Not Willing / Able

“The system are only as good as the people putting them together on site. Most of them can't be retrained. The quality of sub's is horrendous and not very teachable...”

“Local trade reluctance” “framer know-how”

“Framers prefer to stick-build than pre-built walls”

“learning how to adjust from stick building” “learning curve”

“finding qualified labor”

“Cumbersome to use due to lack of knowledge by subs”

“Lack of trades willing to install and comfortable installing. Fear they will charge the same even if it's easier and quicker for them”



# BARRIERS TO OFFSITE: Need Trustworthy Local Supplier

“Finding suppliers close by to reduce freight”

“Availability of good manufacturers and shipping costs.”

“Our rural area” “Not typical in this area”

“Labor force that is trained to use. Services not offered in our area”

“Supplier who can deliver and laborers willing to take on the work”

“Trust in the accuracy and completeness of the supplier”

“Good local supplier and needs to be cost effective”

“Those services are not available locally at this time, I would consider using those services if they were available locally”



# BARRIERS TO OFFSITE: Need Time & Education to Change

“Time to establish connection with a supplier. - learning curve in build process. - I have not even considered it - I don't think we build enough homes to make it worth our time. We have several house plans and build 15-20 homes per year.”

“Change is hard—training and customer education...”

“Lack of expertise ... “

“Product knowledge”

“Finding time to educate myself and staff”





# BARRIERS TO OFFSITE: Pre-Planning, Logistics, Wait Time

“Too long lead times”

“Time schedules”

“Time to receive product”

“Delivery to site”

“Cost and wait times”

“control at every stage”

“Cost and logistics”

“Site access”

“Delivery timing, needing a staging area, not being able to include the facade, complex plumbing connections”

“Lead time is biggest obstacle and supply”

“Availability and logistics”

“Logistics, site access”

“Difficult to plan and time”



# BARRIERS TO OFFSITE: Negative Perceptions

“As a built-on-your-lot builder, our customers won’t accept that as quality construction”

“I used to be a sales rep for modular and panelized companies and I can build a better product stick built on site”

“Lack of quality and damaging to reputation”

“Customer Perception - site built has the perception of higher quality”

“...do not want the reputation that we use them”

“Public acceptance” “The pieces don’t come correct”

“Some of our home buyers actually ask if we were panel construction...”



# BARRIERS TO OFFSITE: Last-Minute Changes or Adjustments

“Customers are always changing their minds. Offsite building technologies do not make allowances for jobsite changes that need to happen.”

“Last minutes custom changes”

“Custom builder - many changes onsite”

We prefer to build onsite to deal with any architecture design flaws as they come up...”

“...inability to make changes quickly”

“Custom homes in which the homeowner changes the plan just before and/or during construction”

“Quality control, Changes as building progresses”



# BARRIERS TO OFFSITE: Limitations or Mistrust of Suppliers

“The ability of providers to have enough capacity to serve us”

“Assuring they are accurate”

“...would be at the mercy of the manufacturer & their issues”

“Finding reliable manufacturers that can keep up with demand and time frame.”



# Other Barriers

“...village codes”

“Inspections”

“Mortgage companies”

“Lending requirements”

“codes for bracing requirements require on-site framers”

“concrete block”

“Permitting”

“Building codes”



# Possible Strategies to Enhance Success

- Turnkey installation service—integrate upstream or downstream
- Decentralized production strategy—many small producers with local service
  - Lowers transportation cost & local technical support
  - Potentially providing system, equipment, software and know-how to builders for their home-spun solution
- Get framers / setters on-board—train crews to create pull-through demand
- Focus on quality and other benefits with some audiences
- Use of Virtual Reality to better evaluate final layouts
- 3-D modeling/BIM to minimize construction changes





**Home Innovation**  
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**THANK YOU**

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