

A Home Builder Perspective on Housing Affordability and Construction Innovation

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A HOME BUILDER PERSPECTIVE ON HOUSING AFFORDABILITY AND CONSTRUCTION INNOVATION

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ACKNOWLEDGEMENTS

The HIVE (Housing Innovation Vision Economics) Home Builder Survey was commissioned by Hanley Wood, LLC and the HIVE Action Partnership to provide background information for the HIVE Conference held in Austin, Texas, on November 28-29, 2018. This paper is based on the results of the survey. The purpose of the survey was to provide key background information on homebuilder attitudes related to housing affordability and the level of construction innovation. Special thanks is given to Hanley Wood, LLC, John McManus, Jennifer Castenson, and the many others at Hanley Wood who worked with the authors on the survey.

EXECUTIVE SUMMARY

The backdrop for the survey was a shortage of housing and a serious housing affordability challenge – some would call it a crisis – in many parts of the nation. Some of the key survey findings and remaining issues are outlined below.

- *Housing affordability is a serious challenge in the United States, and it hurts both consumers and home builders. The results of the home builder survey highlight the problems and provide a call to action.*
- *Labor cost and availability is the number one issue related to housing affordability for both single-family and multifamily builders.*
- *The cost and availability of building materials (especially lumber and plywood) is also a serious problem, and it is complicated by trade issues related to Canadian lumber.*
- *Regulatory barriers clearly add to the cost of a home, but they are difficult to combat. The two most significant regulatory barriers identified in the survey are the permitting/development approval process and land use zoning. These barriers have been discussed for years, but the time has come for federal, state, and local governments to work with the private sector to take action to address these issues and improve the cost of housing.*
- *Based on the home builder survey, there has been relatively little change in the construction methods of building homes over the last forty years. This reinforces the lack of improved productivity in the home building industry.*
- *However, the survey also provides an indication that change is coming – albeit slowly. The large majority of houses are still “stick-built,” but other approaches to complement “stick-built” such as “pre-cut” (including roof trusses and engineered floor trusses) as well as open wall and closed wall panels and factory-built/modular housing are being used. Innovations are underway, but they will take time. Home building is unique when compared to retail or manufacturing, and these unique characteristics add complications to improving productivity.*
- *A number of builders plan to increase the use of innovative construction methods over the next five years, and they recognize that more factory-built/modular housing is coming. However, how fast will this actually happen? Also, as innovation occurs, will it bring greater productivity and improve affordability?*

I. INTRODUCTION

The nation faces a significant housing affordability challenge. At the end of the first quarter, 2012, 77.5% of new and existing home sales were affordable to a family earning the local median income, according to the National Association of Home Builders/Wells Fargo “Housing Opportunity Index,” based on standard mortgage underwriting criteria. By the end of 2018, only 56.6% of new and existing home sales were affordable by the same standard.

The housing affordability crisis is further complicated by the rise in house prices and rents – especially compared to income growth – and constant labor cost pressures, along with the cost of building materials. Also, it is difficult for many potential home buyers to save the money for a down payment or qualify for a mortgage, and government regulations at the local, state, and federal levels add significantly to the cost of a house or apartment.

Underlying the nation’s housing affordability challenge is a shortage of housing. Laurie Goodman and Rolf Pendall at the Urban Institute raised the alarm in June, 2016. “In 2015, we estimate that more than a million new households were created, but only 620,000 new housing units were completed, creating a shortage of just over 430,000 units. This gap has pushed up home prices and rents, a trend that will continue for the foreseeable future absent imminent policy changes.”¹

More recently, in December, 2018, Freddie Mac’s chief economist, Sam Khater, spoke of the major challenge of U.S. housing supply: “We estimate that over the next decade, young adults will add about 20 million households – and those households will need a place to live.” According to Freddie Mac research, the current rate of construction is about 370,000 units below the level required based on long-term housing demand.²

The shortage of housing, rising home prices and rental costs, and numerous other factors have led to an important affordability challenge in many parts of the nation. (For a further discussion of these issues, see *The State of the Nation’s Housing, 2019*, Joint Center for Housing Studies of Harvard University, especially pp. 7–12.)

¹ Goodman, Laurie & Pendall, Rolf (June 20, 2016). “Housing Supply Falls Short of demand by 430,000.” *Urban Wire*, Housing and Housing Finance, The blog of The Urban Institute, Washington, DC.

² *The Major Challenge of U.S. Housing Supply*, Economic and Housing Research Insight, Freddie Mac, December, 2018.

In addition, although the home building industry is notorious for low construction productivity, there is broad awareness and growing discussion of new construction methods – factory-built/modular, pre-cut and panelized housing.³ Existing companies and new start-ups are trying new techniques and ideas, and the question is whether new construction methods and technology can speed production and help bring down housing costs.

³ See, for example, a sampling of the articles and papers on the use of new construction methods:
Alderton, Matt (2019, Mar. 15). "How Modular Construction Could Offer a Lasting Solution in the Affordable Housing Crisis." *ArchDaily*.
Hendrix, Michael (2019, Mar. 7). "Modular Housing is Affordable Housing." *National Review*.
Morris, Keiko (2019, Mar. 3). "New York City Tries Modular Construction for Affordable Homes." *Wall Street Journal*.
Brown, Elliott & Kusisto, Laura (2019, Feb.19). "Startup Backed by Softbank Pours Money Into a Bid to Reshape Construction" (Kattera raises over \$1 billion but questions remain over profitability). *Wall Street Journal*.
Chen, Stefanos (2018, Nov. 16). "Real Estate Technology: Try, Try Again." *New York Times*.
Wilson, Nigel (2018, Nov. 13). "Affordable Housing: From Postwar 'Prefab' to Modern Modular Construction (Part 2)." *Forbes*.
Wilson, Nigel (2018, Nov. 9). "As U.S. New-Home Sales Tumble, It's Time to Reimagine Modern Modular Housing (Part 1)." *Forbes*.
Fracassa, Dominic (2018, Sept. 10). "Mayor Wants to Lure Modular Housing Factory to San Francisco to Provide Both Homes, Jobs." *San Francisco Chronicle*.
Hill, Jeremy (2018, Aug. 16). "A New Home for \$90,000? Manufactured Housing is Making a Comeback." *Bloomberg*.
Dougherty, Conor (2018, Jun. 7). "Piece by Piece, a Factory-Made Answer for a Housing Squeeze." *New York Times*.

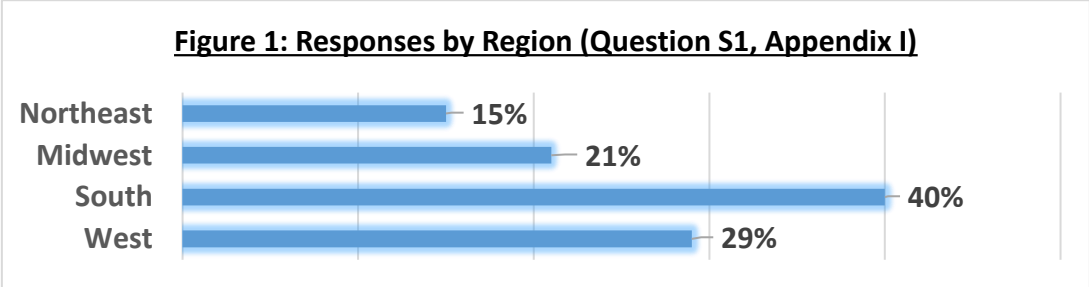
The HIVE Home Builder Survey was therefore designed with a two-fold purpose:

- To understand the home builder perspective on the challenges of housing affordability, and
- To understand the level of innovation in the home building industry related to construction methods.

This report provides the results of the survey. It is divided into four parts: (1) a profile of the respondents; (2) survey responses from home builders related to housing affordability issues; (3) survey responses related to innovation and technology in the home building industry; and (4) concluding thoughts on technology and residential construction.

II. RESPONDENTS' PROFILE

The survey questionnaire was electronically mailed by Hanley Wood to the top 200 single-family builders, 25 largest multifamily builders, and top 10 builders in each of the top 50 metro markets (for a copy of the survey see Appendix I). Additional samples were from the *Builder* magazine subscription list (see Appendix II). In all, 40,000 surveys were distributed, with 290 usable responses received for an overall response rate of 1%. The distribution of responses from the four census regions was as follows:⁴



In addition to the questions covering the profile of the builders (type of houses built, price range of homes built), respondents were asked to rate the impact of labor and cost availability, the impact of the cost and availability of building materials, the impact of regulatory issues on the price of the homes they build, and the affordability issues faced by consumers.

⁴ The distribution of responses in each region is similar to the distribution of housing in each census region.

Builders were also asked to indicate their current methods of home construction, changes in home construction methods during the past 40 years, and expected changes in the next 5 years.

The primary operation for 62% of the respondents was building single-family homes, and for 10% of the respondents it was building multifamily homes. The primary operation for the remaining 28% was residential remodeling (19%), commercial construction (5%), land development (3%), and other (1%).

Figure 2a: Primary Operation of the Firm (Q1, Appendix I)

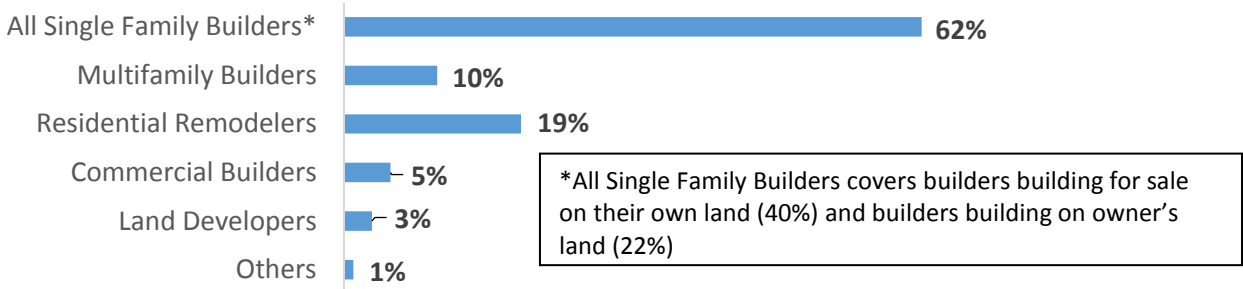
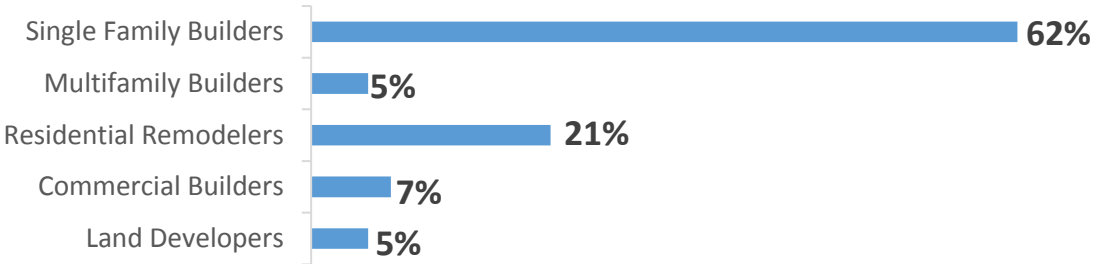


Figure 2b sets forth the NAHB builder member profile. A comparison of Figures 2a and 2b shows that the profile of the NAHB membership closely corresponds with the profile of the respondents to the HIVE Home Builder Survey.

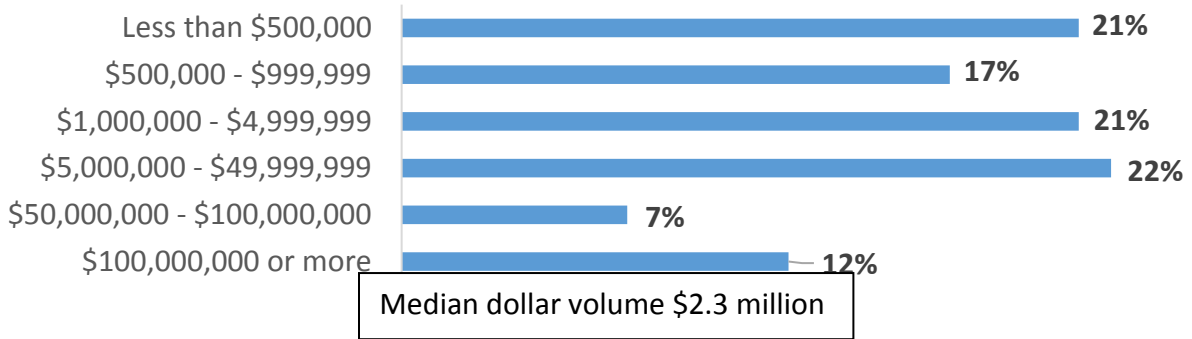
Figure 2b: NAHB Builder Member Profile



(Source: NAHB)

During 2017 about one-fifth of the respondents did less than \$500,000 of residential construction; 17% did \$500,000-\$1 million; 21% did \$1 million-\$5 million; and 22% did \$5 million-\$50 million. The remaining 19% did more than \$50 million during 2017.

Figure 3: Firm's Dollar Volume of Residential Construction-2017 (Q3, Appendix I)



TYPE OF HOUSING MARKETS GENERALLY SERVED

In response to the question about the type of housing markets builders are generally serving, among single-family builders 59% reported that they were serving the move-up market, and 51% reported serving the luxury/custom market. About one-third of the single-family builders (37%) reported serving the entry level market, and one-fourth (23%) are serving the affordable market. Among multifamily builders, only 18% are serving the entry-level market, and 39% are serving the affordable market.

Figure 4a: Single-Family Builders (Q7, Appendix I)

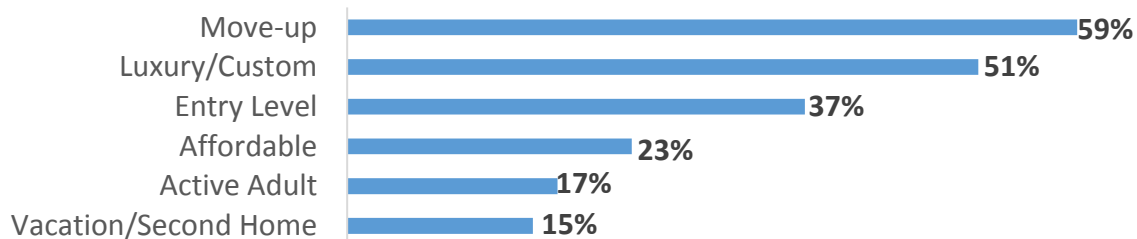
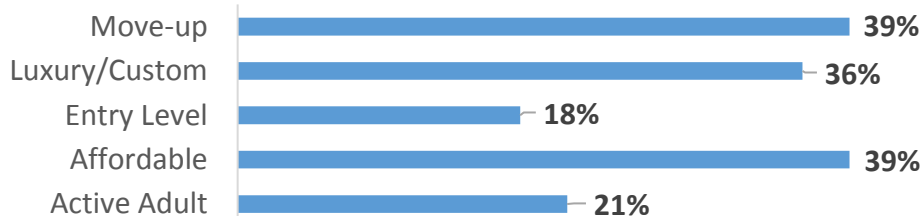


Figure 4b: Multifamily Builders (Q7, Appendix I)



III. HOUSING AFFORDABILITY ISSUES FACED BY HOME BUILDERS

BUILDER RATING OF HOUSING AFFORDABILITY

Housing affordability is a serious concern to both single-family and multifamily builders – across the nation and more so in their own market areas.

Builders were asked to rate the housing market affordability in their market area and across the nation. 75% of the respondents rated the affordability issue in their own market as very serious or serious. Interestingly, the concern across the nation was slightly less, with 70% of the builders rating the affordability as very serious or serious.

The overall concern was greater for multifamily builders with 86% rating housing affordability as serious or very serious compared to 73% for single-family builders. The concern for multifamily builders across the nation was 67% compared to 71% for single-family builders.

Figure 5: Rating of Housing Affordability Issues in Your Market Area and Across the Nation (Q14, Appendix I)

	All Respondents	Single-Family	Multifamily
<u>In Your Market Area</u>			
Rating 4 or 5 (Serious or Very Serious)	75%	73%	86%
Rating Index	4.09	4.07	4.39
<u>Across the Nation</u>			
Rating 4 or 5 (Serious or Very Serious)	70%	71%	67%
Rating Index	4.01	4.04	4.04

However, there are significant differences in the concern about affordability in the different regions, both for their market area and across the nation. For example, the West had the greatest concern about affordability with 83% rating affordability in their market area as a serious concern compared to the Midwest, where only 63% rated affordability as a serious concern in their market.

Figure 6: Rating of Housing Affordability Issues by Census Regions (Q14, Appendix I)

	Northeast	Midwest	South	West
<u>In Your Market Area</u>				
Rating 4 or 5 (Serious or Very Serious)	70%	63%	77%	83%
Rating Index	4.02	3.85	4.09	4.35
<u>Across the Nation</u>				
Rating 4 or 5 (Serious or Very Serious)	60%	77%	78%	63%
Rating Index	3.78	4.12	4.12	3.99

COST AND AVAILABILITY OF LABOR

Labor is the number one affordability issue – both in terms of the cost of labor and the availability of labor.

Builders were asked to rate the impact of labor cost and availability on home prices on a scale of 1 to 5, 1=not at all important and 5=very important. 82% of the single-family builders and 86% of the multifamily builders rated the cost and availability of labor at the top levels of importance as it impacts the cost of the homes they build.

Figure 7a. Impact of Cost & Availability of Labor on the Cost of Homes You Build (Q11, Appendix I)

	Rating 4 or 5	Rating Index
Total	82%	4.32
Single-Family	82%	4.31
Multifamily	86%	4.39

There are significant differences on the impact of labor cost and availability among the four census regions of the country. The greatest concern was in the West with 87% rating it as very important or important, 81% in the Midwest, 76% in the South, and 64% in the Northeast.

Figure 7b. Impact of Cost & Availability of Labor on the Cost of Homes You Build (Q11, Appendix I)

	Rating 4 or 5	Rating Index
Northeast	64%	3.93
Midwest	81%	4.21
South	76%	4.20
West	87%	4.40

During the past two years, 19% of the single-family builders reported cost increase of more than 20%, and 41% reported an increase of 11-20%. Among multifamily builders, 32% reported a cost increase of more than 20% in the past two years, and another 32% reported cost increase of 11-20%.

Single-family builders reported an average cost increase of 17% in the past two years while multifamily builders faced an average cost increase of 19% during the past two years.

Figure 7c. Cost Increase in Past 2 Years (Q11, Appendix I)

	Single-Family Builders	Multifamily Builders
0%	9%	11%
1-10%	30%	25%
11-20%	41%	32%
21% or more	19%	32%
Average Cost Increase	17%	19%

COST AND AVAILABILITY OF BUILDING MATERIALS

The rising cost of building materials – especially lumber and plywood – has also had a serious impact on the cost of building a home.

Builders were asked to rate the impact of cost and availability of 11 different building materials on the cost of the homes they built. The two that were rated the highest were lumber and plywood, with 76% rating lumber as very important or important, and 70% rating plywood at the top level of importance.

For single-family builders the cost of cement (52%), windows and doors (49%) and kitchens (46%) were also areas of concern. For multifamily builders, the cost of cement was a top concern (69%), followed by HVAC (65%) and windows and doors (62%).

There are significant differences in the rating of different building materials across the regions of the country. In general, cost and availability of most building materials was higher in the South and West regions. Regarding lumber, 82% rated lumber as being very important or important in the West and 81% in the South, whereas it was 69% in the Midwest and only 56% in the Northeast. Plywood was rated 75% in the South and 74% in the West compared to 64% in the Midwest and 60% in the Northeast. Cement was rated 59% in the South and in the West compared to 43% in the Northeast and 41% in the Midwest. Regarding windows and doors, they were rated 54% in the Northeast, South, and West compared to 45% in the Midwest.

Figure 8. Cost and Availability of Building Materials (Q12, Appendix I)

(rated on a scale of 1 to 5, 1=not at all important, 5=very important)

		Total	SF	MF	NE	MW	S	W
Lumber	a.	76%	78%	73%	56%	69%	81%	82%
	b.	<u>4.1</u>	<u>4.3</u>	<u>4.2</u>	3.6	<u>4.0</u>	<u>4.3</u>	<u>4.3</u>
Plywood	a.	70%	74%	69%	60%	64%	75%	74%
	b.	<u>4.0</u>	<u>4.1</u>	<u>4.1</u>	3.6	3.8	<u>4.1</u>	<u>4.1</u>
Cement	a.	53%	52%	69%	43%	41%	59%	56%
	b.	3.6	3.6	<u>4.0</u>	3.1	3.3	3.8	3.8
Windows & Doors	a.	54%	49%	62%	54%	45%	54%	54%
	b.	3.6	3.5	3.7	3.5	3.4	3.6	3.7
Kitchens	a.	52%	46%	54%	56%	41%	50%	57%
	b.	3.5	3.4	3.5	3.4	3.4	3.5	3.6
Roofing	a.	51%	49%	54%	37%	44%	56%	54%
	b.	3.5	3.5	3.6	3.1	3.3	3.7	3.7
Bathrooms	a.	46%	38%	50%	40%	45%	43%	50%
	b.	3.4	3.3	3.5	3.2	3.4	3.4	3.6
HVAC	a.	47%	41%	65%	45%	48%	42%	54%
	b.	3.4	3.4	3.7	3.3	3.5	3.3	3.7
Gypsum	a.	41%	39%	50%	29%	31%	45%	49%
	b.	3.3	3.3	3.5	2.8	3.1	3.4	3.6
Insulation	a.	34%	30%	39%	37%	26%	32%	39%
	b.	3.1	3.1	3.4	3.0	2.9	3.1	3.1
Steel	a.	36%	15%	59%	33%	64%	27%	22%
	b.	3.1	2.8	3.5	2.3	3.8	2.9	2.8

a.= Rating 4 or 5, important or very important

b.= Rating index on scale of 1-5, 1=not at all important, 5=very important

REGULATORY BARRIERS ADD TO THE COST OF THE HOME

Both single-family and multifamily builders expressed their concern in the survey that regulatory barriers add to the cost of a home – especially the permitting and development approval process and land use/zoning controls.

Builders were asked to rate seven regulatory challenges they face as they try to keep down the cost of the homes they build. Among single-family builders, the permitting/development approval process was rated the number one barrier with 70% indicating it was a top concern, followed by land use/zoning at 66%, and environmental regulations at 51%.

Among multifamily builders, land use/zoning topped the list with 83% indicating it was a top concern, followed by the permitting/development approval process with 75%, and environmental regulations at 67%.

Chart 9a. Builders Rating of Different Regulatory Challenges – Single Family and Multifamily (Q13, Appendix I)

(rated on a scale of 1 to 5, 1=not a concern, 5=major concern)

	SINGLE-FAMILY		MULTIFAMILY	
	Rating 4 or 5	Rating Index	Rating 4 or 5	Rating Index
Permitting/Development Approval Process	70%	3.97	75%	4.21
Land Use/Zoning	66%	3.85	83%	4.37
Environmental Regulations	51%	3.46	67%	3.85
Building Codes	48%	3.33	39%	3.36
Development Standards	46%	3.23	50%	3.61
Frequency of Code Inspections	30%	2.91	29%	3.04
OSHA Regulations	28%	2.89	25%	3.04

The concerns over regulatory barriers are greater in larger metro areas. Among metro areas with a population of 1 million or more, 81% of the respondents identified the permitting/development approval process as their top concern, followed by land use/zoning at 74%, and environmental regulations at 56%.

Among metro areas with a population of less than 1 million, the permitting/development approval process was identified as a top concern by 60% of the builders, followed by land use zoning at 61%, and environmental regulations at 53%.

Figure 9b. Builders Rating of Different Regulatory Challenges - Metro Area Population (Q13, Appendix I)

	POPULATION OF 1 MILLION OR MORE		POPULATION OF LESS THAN 1 MILLION	
	Rating 4 or 5	Rating Index	Rating 4 or 5	Rating Index
Permitting/Development Approval Process	81%	3.70	60%	4.31
Land Use/Zoning	74%	3.66	61%	4.12
Environmental Regulations	56%	3.43	53%	3.73
Building Codes	49%	3.32	50%	3.49
Development Standards	47%	3.20	48%	3.49
Frequency of Code Regulations	55%	2.85	53%	3.10
OSHA Regulations	28%	2.90	33%	3.02

CONSUMERS ARE BEING PRICED OUT OF THE MARKET

Consumers face serious affordability issues according to the builders responding to the survey – with the top issue clearly being the price of the home. 61% of all the builders (both single-family and multifamily) identified the price of the home being a 4 or 5 ranking in terms of

seriousness. Interest rates were second with a 39% ranking, followed by qualifying for a mortgage at 36% and down payment at 34%.

There are some differences in builder ratings of top home buyer issues between larger versus smaller metro areas and across regions. In the larger metro areas over 1 million in size, the price of the home was a top issue for 72% of the respondents; in metro areas below 1 million it was still the top issue, but only for 54% of the respondents.

Figure 10a. Prospective Home Buyers - Builder Ratings of Top Home Buyer Issues by Metro Area Population (Q10, Appendix I) (rated on a scale of 1 to 5, 1=not at all serious, 5=very serious)

		METRO AREA POPULATION		
		Total	>=1 million	< 1 million
Price of Home	a.	61%	72%	54%
	b.	3.6	3.9	3.5
Interest Rates	a.	39%	44%	35%
	b.	3.0	3.2	3.6
Qualifying for a Mortgage	a.	36%	33%	36%
	b.	2.9	2.9	2.9
Down Payment	a.	34%	37%	32%
	b.	2.9	3.1	2.8
Property Tax	a.	25%	25%	24%
	b.	2.6	2.6	2.5
Trouble Selling Current Home	a.	20%	22%	2.5
	b.	2.4	19%	2.4
Settlement Costs	a.	14%	9%	2.5
	b.	2.3	16%	2.3

a.= Percent Rating 4 or 5; b.= Rating Index

Figure 10b. Builder Ratings of Top Home Buyer Issues by Census Regions (Q10, Appendix I)

(rated on a scale of 1 to 5, 1=not at all serious, 5=very serious)

		Regions			
		NE	MW	S	W
Price of Home	a.	63%	53%	67%	61%
	b.	3.7	3.5	3.9	3.6
Interest Rates	a.	24%	34%	43%	45%
	b.	2.7	2.9	3.1	3.3
Qualifying for a Mortgage	a.	35%	38%	30%	47%
	b.	2.8	2.9	2.8	3.2
Down Payment	a.	17%	29%	38%	34%
	b.	2.3	2.7	3.0	3.0

a.= Percent Rating 4 or 5; b.= Rating Index

IV. INNOVATION/TECHNOLOGY IN THE HOME BUILDING INDUSTRY

One of the primary purposes of the HIVE Home Builder Survey was to understand the level of innovation in home building related to construction and the use of technology. One of the critiques of home building and the construction industry is that it has not kept pace with the productivity gains and the benefits of technology in other industries such as manufacturing or retail. For example, the McKinsey Global Institutes (MGI's) report, *Reinventing Construction: A Route to Higher Productivity* (February, 2017) says: "While sectors such as retail and manufacturing have reinvented themselves, construction seems stuck in a time warp. Global labor-productivity growth in construction has averaged only 1% a year over the last two decades, compared with growth of 2.8% for the world economy and 3.6% in manufacturing."

To begin to address these issues, the survey asked about current home building construction methods, changes in the past 40 years, plans to increase use of innovative construction methods, and expected changes in the future.

CONSTRUCTION TYPES/METHODS USED IN 2017

The large majority of the homes are still "stick-built," but other approaches such as "pre-cut" (including roof trusses and engineered floor trusses) as well as open wall and closed wall panels are being used.

In the survey, builders were asked to indicate the various construction methods they were using.⁵ (See footnote 5 for a definition of different construction methods.)

5

Definitions of Home Builder Construction Methods:

Site-Built Homes: Often referred to as "stick-built," site-built homes are constructed entirely on location.

Pre-Cut Homes (including roof trusses and engineered floor trusses): The framing components are cut in such a way that they only need to be assembled at the site.

Panelized Homes: Built with factory-made walls that are joined at the home site.

Open Wall Panel: The walls are assembled with at least one side of the wall having no finished material in it.

Closed Wall Panel: Material is installed on both sides of the wall.

Modular/Factory-Built Homes: Built in a factory with two or more modules that are joined together at a home site.

Manufactured Homes: Often built almost completely in a factory based on a separate HUD code and transported to the home site. They used to be known as mobile homes, and today are sometimes called HUD Code Manufactured.

85% of the single-family builders reported that during 2017 they built stick-built. Among multifamily builders, 82% indicated they built stick built.

However, other methods were also used. 44% of the single-family builders reported the use of pre-cut, 9% used open wall panels and 4% used closed wall panels. Only 4% of the single-family builders built modular/factory-built homes.⁶

Among multifamily builders, 42% reported using pre-cut, with 11% using open wall panels and 4% closed wall panels. 7% of the multifamily builders built modular/factory-built.

HUD Code Manufactured homes were installed by only 2% of the single-family builders responding to the survey.

⁶ In a November 13, 2018, Special Studies Report by Robert Dietz, Chief Economist, National Association of Home Builders (NAHB), it was reported that the total market share of non-site single-family homes was 3.3% of completions in 2017, according to Census Bureau Survey of Construction data and NAHB analysis. This number is similar to the 4% found in the HIVE Home Builder Survey.

Figure 11a. Construction Types/Methods Used in 2017 to Build Homes – Single-Family and Multifamily (Q15, Appendix I) (share of builders building)

	Single-Family	Multifamily
Stick-Built	85%	82%
Pre-Cut	44%	42%
Open Wall Panels	9%	11%
Closed Wall Panels	4%**	4%
Modular/Factory-Built	4%	7%
HUD Code Manufactured	2%	N/A
Steel	1%	6%
Concrete	2%	6%

The share of builders – single-family and multifamily – building stick-built is highest in the West at 93% and lowest in the Northeast at 73%. The share of builders – single-family and multifamily – building modular/factory-built is highest in the Northeast at 12%, followed by 5% in the West, 4% in the Midwest, and only 1% in the South.

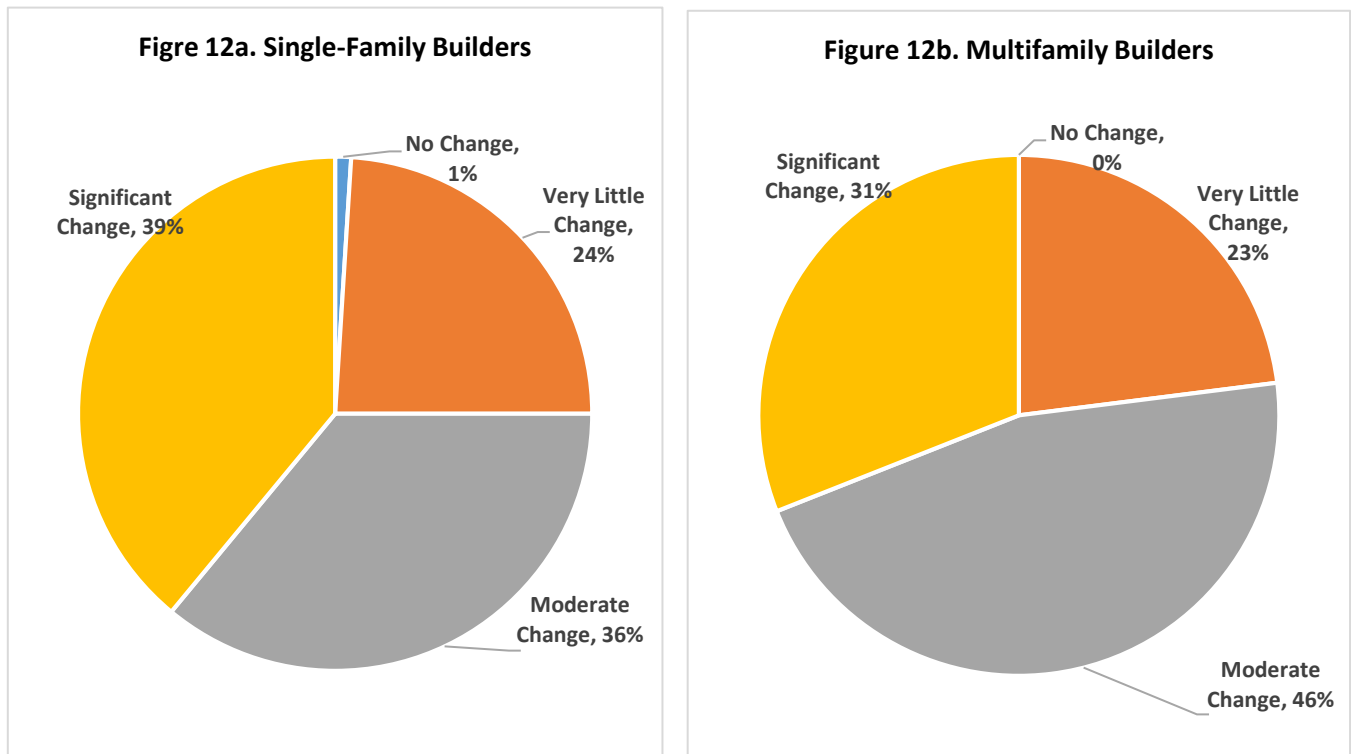
Figure 11b. Construction Types/Methods Used in 2017 to Build Homes – Single-Family and Multifamily – by Census Regions (Q15, Appendix I) (share of builders building)

	NORTHEAST	MIDWEST	SOUTH	WEST
Stick-Built	73%	81%	82%	93%
Pre-Cut	42%	48%	46%	34%
Open Wall Panels	11%	19%	10%	9%
Closed Wall Panels	8%	4%	4%	5%
Modular/Factory-Built	12%	4%	1%	5%
HUD Code Manufactured	8%	4%	0%	2%
Steel	0%	0%	0%	5%
Concrete	0%	0%	3%	2%

CHANGE IN CONSTRUCTION METHODS OVER THE LAST 40 YEARS

In response to the question: “In your opinion, have the construction methods of building a home changed in the last 40 years?”,⁷ 25% of single-family builders and 23% of multifamily builders say there has been very little change or no change in construction methods over the last 40 years. In addition, 36% of single-family builders and 46% of multifamily builders say there has been moderate change. In other words, 60% of the single-family builders and 69% of the multifamily builders say that there has been little or no change or moderate change. However, there is a divergence of opinion, and 39% of single-family builders and 31% of multifamily builders say the change has been significant.

Figure 12a-12b. Change in Construction Methods of Building Homes in the Last 40 Years – Single-Family Builders and Multifamily Builders (Q16, Appendix I) (Percent of respondents)



⁷ This question was intended to gauge the opinion of the respondents regarding the degree of change in the construction methods of building homes over a somewhat arbitrary period of time – 40 years. It was not intended as a precise measure – rather a general indicator of change or the lack thereof.

Among single-family home builders, the recognition of change seems to be greatest in the Northeast and Midwest, and less in the South and the West. About 5 out of 10 builders in the Northeast and the Midwest think that there has been a significant change in construction methods during the past 40 years. However, 3.5 out of 10 builders in the South and 4.5 out of 10 home builders in the West think that change in construction methods has been significant. Only one out of ten builders in the Northeast and two out of ten in the Midwest think that there has been no change to very little change.

Figure 12c. Change in Construction Methods for Single-Family Builders Over the Last 40 Years (Q16, Appendix I) (Percent of respondents)

BY CENSUS REGIONS

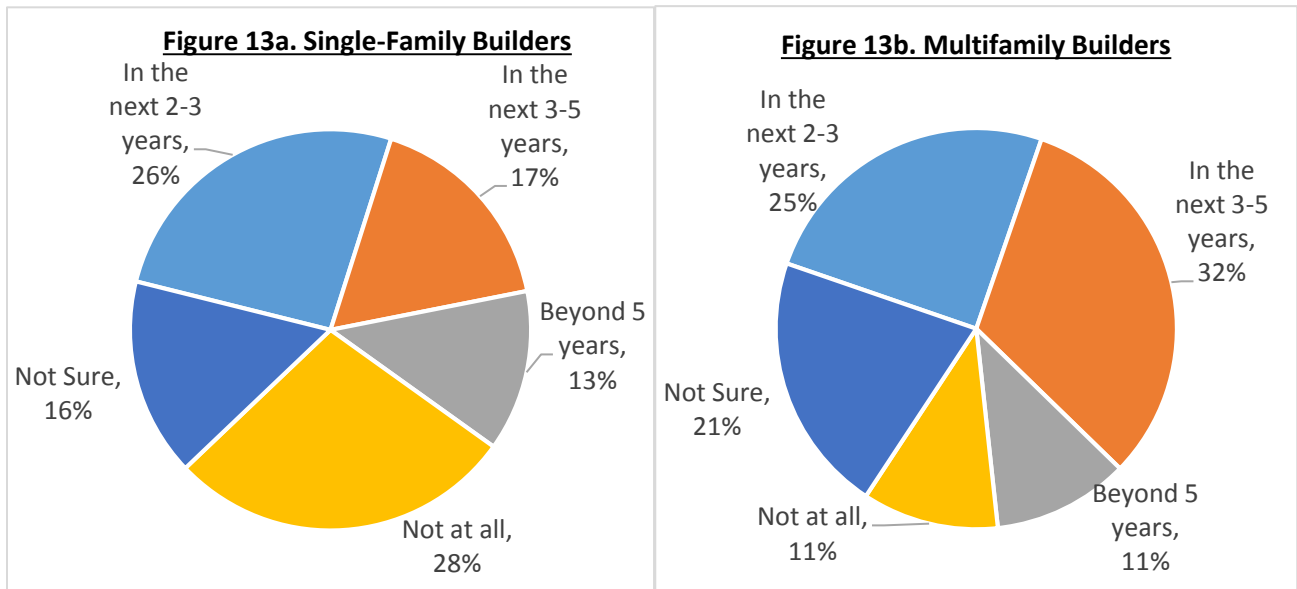
	NORTHEAST	MIDWEST	SOUTH	WEST
Significant Change	49%	50%	35%	44%
Moderate Change	39%	29%	39%	28%
Very Little Change	10%	21%	25%	26%
No Change	1%	0%	1%	2%

PLANS TO INCREASE USE OF INNOVATIVE CONSTRUCTION METHODS

When asked what their time frame would be if they plan to increase the use of innovative construction methods (such as factory-built/modular, pre-cut, open wall panels, closed wall panels), 46% of all respondents indicated that they would increase their use in the next 2-5 years.

However, multifamily builders seemed more likely to increase their use than single-family builders. 57% of multifamily builders felt they would increase their use in the next 2-5 years compared to 43% of the single-family builders. 28% of single-family builders do not expect to increase the use of innovative construction methods at all, whereas 11% of multifamily builders do not expect to use them.

Figure 13a-13b. Time Frame in Which You Plan to Change Your Construction Methods – Single-Family Builders and Multifamily Builders (Q17, Appendix I) (Percent of Respondents)



The likelihood of increased use of innovative construction methods seemed more likely in the Northeast. 57% of the builders in the Northeast expect increased use in the next five years, compared to 43% in the Midwest, 38% in the West, and 37% in the South.

Figure 13c. Time Frame in Which You Plan to Change Your Construction Methods (Q17, Appendix I) (Percent of Respondents)

BY CENSUS REGIONS

	NORTHEAST	MIDWEST	SOUTH	WEST
In the next 2-3 years	24%	24%	21%	33%
In the next 3-5 years	33%	19%	16%	15%
Beyond 5 years	14%	16%	11%	17%
Not at all	19%	26%	32%	20%
Not sure	10%	15%	20%	15%

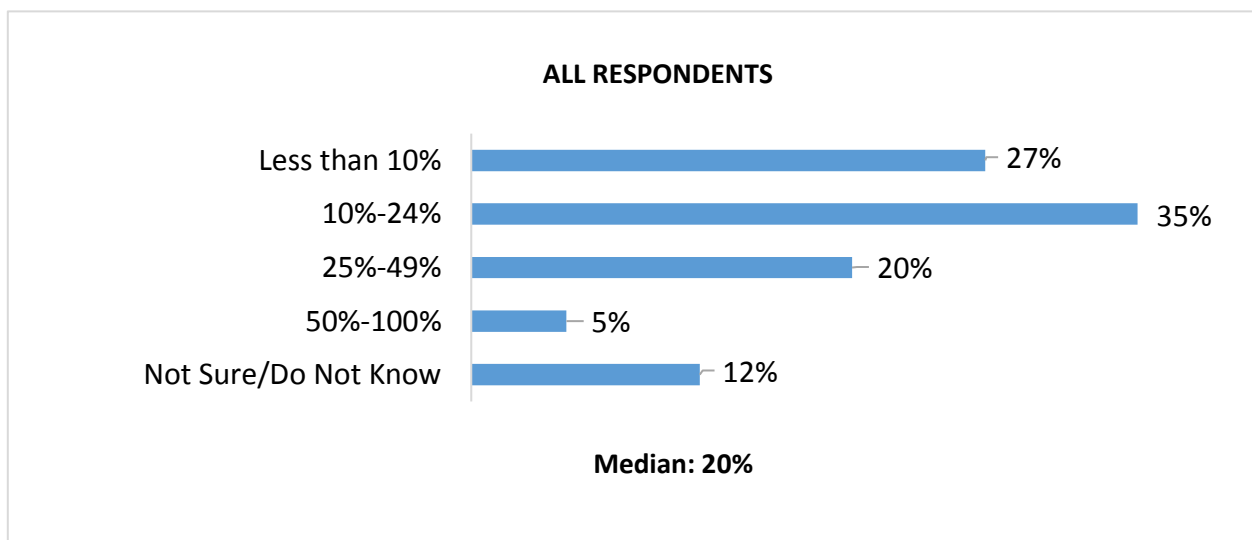
SHARE OF SINGLE-FAMILY HOMES THAT WILL BE FACTORY-BUILT/MODULAR IN THE NEXT FIVE YEARS

As noted earlier, the survey found that 4% of single-family builders and 7% of multifamily builders were building modular/factory-built housing. Also, a separate NAHB report in November, 2018 found a similar result – that 3.3% of home building completions were non-site single-family homes.

When asked what share of single-family housing they think will be factory-built/modular in the next 5 years, 35% of the survey respondents felt the number would be between 10-24% and 20% felt that it would be between 25-49%. 5% felt that it would be between 50-100%, and 27% felt that it would be less than 10%.

The median for all respondents who shared their expectation was 20%, implying the possibility that 20% of the homes built in five years might be factory-built housing. This would be a big increase in factory-built/modular housing considering where we are now – with only 4% of the single-family builders and 7% of the multifamily builders building factory-built/modular housing (see Figure 11a).

Figure 14a. Share of Single-Family Homes That Will Be Factory-Built/Modular in the Next Five Years (Q18, Appendix I)



Of the four census regions, the respondents from the Northeast were the most likely to predict a higher level of factory-built/modular housing in the next 5 years. For example, only 16% in the Northeast felt that the number would be less than 10% compared to 33% in the Midwest, 30% in the South, and 27% in the West.

Figure 14b. Share of Single-Family Homes That Will Be Factory-Built/Modular in the Next Five Years by Census Regions (Q18, Appendix I)

	NORTHEAST	MIDWEST	SOUTH	WEST
Less than 10%	16%	33%	30%	27%
10%-24%	47%	31%	38%	42%
25%-49%	16%	23%	15%	20%
50%-100%	11%	5%	5%	0%
Not Sure/Do Not Know	11%	8%	12%	11%
Median	21%	18%	18%	18%

Figure 14c. Share of Single-Family Homes That Will Be Factory-Built in the Next 5 Years by Metro Area Population (Q18, Appendix I)

	POPULATION OF 1 MILLION OR MORE	POPULATION OF LESS THAN 1 MILLION
Less than 10%	32%	26%
10%-24%	34%	37%
25%-49%	18%	20%
50%-100%	8%	4%
Not Sure/Do Not Know	8%	13%
Median	18%	20%

V. TECHNOLOGY AND RESIDENTIAL CONSTRUCTION

Based on the home builder survey, there has been relatively little change in the construction methods of building homes over the last forty years. Among single-family builders, 60% indicated there had been very little change or moderate change, and among multifamily builders 69% indicated there had been very little or moderate change. This reinforces the lack of change and the lack of improved productivity in the home building industry (see Appendix III). However, the survey also provides an indication that change is coming – albeit slowly. Pre-cut technology is used by 44% of single-family builders and 42% of multifamily builders. Also, in the survey, builders suggest that 20% of the homes could be factory-built or modular in the next five years, and it appears there is a greater adoption of technology in certain regions of the country – especially the Northeast.

However, the nature of homebuilding is unique when compared to retail or manufacturing, and these unique characteristics add complications to trying to increase productivity. In order to build a finished home, the builder, or someone involved in the project, must own the land, and a variety of regulations must be met in numerous areas such as land use, permitting and approval, building codes, environmental regulations, and the list goes on. Most often, these regulations and approvals must be satisfied by different regulators – many at the local level, and some at the state and national level.

Further, homebuilding is a very decentralized industry compared to other industries (think of automobiles, computer manufacturers, electronic devices, etc.) and compared to many other countries (where a relatively small numbers of companies build the large majority of the homes). In addition, a home or an apartment building (or a unit within an apartment) is a very large product to transport, and the United States is a big country. If a house is built in a factory and assembled on site, how far can it be transported and still be economical? Further, all of these challenges exist without taking into consideration consumer and homebuyer preferences.

Modular homes have been built in this country for a long time, and there have been numerous experiments to improve productivity (e.g. Operation Breakthrough at the

Department of Housing and Urban Development under Secretary George Romney). Are we just barking up the same old tree?

Our answer is no. It is different today. The internet and the world of technology is rapidly changing our lives in many other ways outside of home building. As a society we realize that change is underway, and we recognize the benefits that have come (along with the challenges) of new technology and increased productivity. A number of high-production builders are looking at the opportunities and the latest technological developments, and some are beginning to experiment. (The top 10 builders build 23% of the single-family homes completed, and the top 100 builders build 39% of the single-family homes completed.) Most are waiting for when it is clear that building a home in a factory will provide a lower cost and added benefits compared to what they are generally doing today – building “stick built” homes – while at the same time improving their building processes through pre-cut technology and other approaches. However, the high costs and scarce availability of labor add dramatically to the momentum for change.

In addition, a number of new homebuilding startups have begun. Forty years ago if you had building skills and wanted to be a home builder, you would buy a piece of land and a pickup truck and begin. It seems that now the people starting home building companies are “tech-savvy,” and they are looking for ways to use the technology to bring down the cost of a house, or to provide a service or approach which is new.

Multifamily homebuilding – especially in the least affordable areas like California – is already focusing on factory technology, and more and more media articles are being written about the possibilities and benefits therein.⁸ Single-family homebuilding will follow, and the high-production builders are likely to lead the way, followed closely by a variety of technology-oriented homebuilder startups. It will take time, but it is coming! In fact, some of the new players are beginning to grow, and perhaps someone will be able to disrupt the market. (Think of Amazon in the homebuilding space, or Warren Buffett teaming up with a high-production builder to try to dominate the market.)

⁸ The large majority of the articles identified in footnote 3 on page 5 focus on using new construction technology to build multifamily homes.

Other factors will impact the number of homes that will be modular or factory-built. In any given year 20-30% of the new single-family homes nationwide are still built on the owner's lot, and those owners are often looking for a custom home. However, the technology now supports custom building as well, and at some point the costs may come down where it will clearly be less expensive to produce a factory-built custom home than a stick built home.

The home builder survey begins to provide a glimpse of the future. However, it also shows the opportunities that abound. Most importantly, though, given the significant twin challenges of the shortage of housing and the housing affordability crisis in many communities around the country, the survey provides an important call for action as we look to the future.

APPENDIX I – HIVE SURVEY OF HOME BUILDERS

(September 19, 2018)

Thank you for participating in our survey for BUILDER Magazine! As a thank you for your time, at the end of the survey you'll have a chance to enter to win one of three \$500 American Express gift cards we'll be awarding!

S1. In what regions does your firm build homes?

- Northeast
- South
- Midwest
- West
- No homes built in the US (thank and term)

1. Please select all operations performed by your firm in 2018 and then also select the **one** that would be considered your firm's primary operation.

	All Operations (select all that apply)	Primary Operation (select only one)
1) Single-Family Builder (pre-sold or speculative homes)	()	()
2) Single-Family General Contractor (build on customer's lot)	()	()
3) Multifamily Builder (rent or own)	()	()
4) Land Developer	()	()
5) Residential Remodel/Rehab	()	()
6) Commercial Construction	()	()
7) Other _____(specify)	()	()

2. How many housing units were started by your firm in 2017, and how many are planned for 2018? *Within the survey, please consider the term "housing unit" or "home" to indicate an individual residence.*

Please enter whole numbers without commas or decimals.

	Single-Family Detached	Townhouses & Plexes	Multifamily/ Condo or Co-op (rent or own)	Total
2017	_____	_____	_____	_____
Planned for 2018	_____	_____	_____	_____

3. What was your firm's dollar volume of residential construction in 2017?

- | | |
|--|--|
| <input type="checkbox"/> Less than \$500,000 | <input type="checkbox"/> \$25,000,000 - \$49,999,999 |
| <input type="checkbox"/> \$500,000 - \$999,999 | <input type="checkbox"/> \$50,000,000 - \$99,999,999 |
| <input type="checkbox"/> \$1,000,000 - \$4,999,999 | <input type="checkbox"/> \$100,000,000 or more |
| <input type="checkbox"/> \$5,000,000 - \$9,999,999 | |
| <input type="checkbox"/> \$10,000,000 - \$24,999,999 | |

4. Is the firm privately or publicly held?

- Privately held
- Publicly held (Publicly held firms are those that have stock which is owned and traded by the public)

5. Please indicate the approximate number of housing units in each sale price range started by your firm in 2017 (sale price is market value including land, construction, overhead and profit).

Please enter whole numbers without commas or decimals

	Single-Family Detached	Townhouses & Plexes	Multifamily/ Condo or Co-op (rent or own)	Total
Less than \$100,000	_____	_____	_____	_____
\$110,000 - \$149,999	_____	_____	_____	_____
\$150,000 - \$249,999	_____	_____	_____	_____
\$250,000 - \$499,999	_____	_____	_____	_____
\$500,000 - \$999,999	_____	_____	_____	_____
\$1 million and over	_____	_____	_____	_____
Total	_____	_____	_____	_____

6. For the types of houses or projects that you are building, please estimate the percentage of the cost of the house/project that is derived from labor, material, overhead & profit, and land cost. (PROGRAMMER NOTE ASK ONLY FOR THOSE MENTIONED IN Q5)

Please enter whole numbers without commas or decimals

	Single-Family Detached	Townhouses & Plexes	Multifamily/ Condo or Co-op (rent or own)
Labor	_____	_____	_____
Material	_____	_____	_____
Overhead & Profit	_____	_____	_____
Land Cost	_____	_____	_____
Total	100%	100%	100%
Average price of the home	_____	_____	_____

7. Which housing market do you generally serve? (check all that apply)

- Affordable
- Entry-Level
- Move-Up
- Luxury/Custom
- Active Adult
- Vacation/Second
- Other _____ (specify)

8. In how many states did your firm build homes in 2017?

9. Generally what size (population) metro area do you build in?

- Less Than 100,000
- 100,000-250,000
- 250,000-500,000
- 500,000-1,000,000
- 1,000,000-5,000,000
- 5,00,000 or more
- Not sure

Q10OPEN. What types of issues do you find prospective homebuyers consider as obstacles to buying your homes? [OPEN TEXT]

- No obstacles come to mind [skip option]
- Your units are rented only [skip option 2, skips Q10 as well]

10. Using a 5 point scale where 1 is not a concern and 5 is a major concern, to what extent do prospective home buyers consider the following issues as obstacles to buying your homes?
Please note the "other rating is optional

1- Not a Concern 2 3 4 5- Major Concern Not sure/Don't know

- 1) Price of the Home
- 2) Interest Rates
- 3) Downpayment
- 4) Qualifying for a Mortgage
- 5) Settlement Costs
- 6) Property Tax
- 7) Trouble Selling Their Current Home
- 8) Other _____(specify)

11. Compared to two years ago, how much has labor cost increased?
_____%

Labor costs have not increased.

Q11A. On a scale of 1 to 5, where 1 is not at all important and 5 is very important, please rate the impact that the cost and availability of labor has on the cost of the homes that you are building today?

1- Not at all Important 2 3 4 5- Very Important Not sure/Don't Know

Labor cost and availability

Q11B. (PROGRAMER NOTE ONLY ASKED IF LABOR COST AND AVAILABILITY=1,2, OR 3) Why are labor costs and availability not important factors in homes you are building today?
[OPEN TEXT]

No specific reasons come to mind [skip option]

Q11C. (PROGRAMER NOTE ONLY ASKED IF LABOR COST AND AVAILABILITY=4 OR 5) What are the biggest challenges you are facing in terms of labor cost and availability on homes you are building today? [OPEN TEXT]

No challenges come to mind [skip option]

12. On a scale of 1 to 5, where 1 is not at all important and 5 is very important, please rate the impact that the cost and availability of the following building materials has on the cost of the homes that you are building today? *Please note the "other rating is optional*

1- Not at all Important 2 3 4 5- Very Important Not sure/Don't know

- Cement
- Gypsum
- Insulation
- Steel [only appears when multifamily is previously selected]
- Lumber
- Plywood
- Roofing
- Windows & Doors
- Kitchens
- Bathrooms
- HVAC
- Other _____(specify)

Q13OPEN. What are the regulatory challenges you are facing today as you try and keep down the costs of the homes you are building? [OPEN TEXT]

No regulatory challenges come to mind [skip option]

13. Using a 1 to 5 scale where 1 is not a concern and 5 is a major concern, in your opinion, please evaluate the regulatory challenges that you are facing today as you try to keep down the cost of the homes you build. *Please note the "other rating is optional*

1- Not a Concern 2 3 4 5- Major Concern Not sure/Don't know

- 1) Permitting/Development Approval Process
- 2) Land Use/Zoning (moratoria, impact fees, public attitude towards growth)
- 3) Building Codes
- 4) Frequency of Code Inspections
- 5) Development Standards (streets, sidewalks, etc.)
- 6) Environmental Regulations (wetlands, stormwater protection, construction waste disposal)
- 7) OSHA Regulations
- 8) Other _____(specify)

Q14OPEN. What are the challenges you are seeing today building affordable housing in your market? [OPEN TEXT]

No challenges come to mind [skip option]

14. Using a 1 to 5 scale with 1 being not at all serious and 5 being very serious, how would you rate the issue of housing affordability in your market area and across the nation?

1- Not at all Serious 2 3 4 5- Very Serious Not sure/Don't know

In Your Market Area
Across the Nation

15. Of the housing units built by your firm in 2017, please indicate the approximate number of units that were built using the various construction types noted below: (PROGRAMMER NOTE, ASK ONLY FOR THOSE MENTIONED IN Q5)

Please enter whole numbers without commas or decimals

	Single-Family Detached	Townhouses & Plexes	Multifamily/ Condo or Co-op (rent or own)
Stick Built (wall framing assembled on site)	_____	_____	_____
Pre-Cut (including roof trusses and engineered floor trusses)	_____	_____	_____
Open Wall Panels	_____	_____	_____
Close Wall Panels	_____	_____	_____
Modular/Factory Built (only those homes that are built in a factory and are put on foundations)	_____	_____	_____
HUD Code Manufactured	_____	_____	_____
Steel Frame [only appears for MF previously selected]	_____	_____	_____
Concrete Frame [only appears for MF previously selected]	_____	_____	_____

16. In your opinion, have the construction methods of building homes changed in the last 40 years?

- No Change
- Very Little
- Moderate
- Significant
- Not sure/Don't know

17. If you plan to increase the use of such construction methods (factory built/modular, pre-cut, open wall panels, closed wall panels) in building homes in the future, in what time frame do you expect this to happen?

- Not at all
- In the near term (2-3 years)
- In the next 3-5 years
- Beyond five years
- Not sure/Don't know

18. In the next five years, what share of single family housing do you think will be factory built/modular?

- Less Than 10%
- 10-25%
- 25-49%
- 50-99%
- 100%
- Not sure/Don't know

19. (PROGRAMMER NOTE: OPTIONAL) Please enter your name and telephone number if we may contact you with any follow-up questions to assist with our study:

Contact information will only be used in regard to this study

Name:

Telephone Number:

20. (PROGRAMMER NOTE: OPTIONAL) Thank you for your time and participation in this important study. We invite you to enter for a chance to win one of three \$500 American Express gift cards we'll be awarding by completing your email below. Winners will be drawn at random and this information will only be used to notify the winners. Good luck!

Email:

APPENDIX II – SAMPLING PLAN

- I. Sample Sources
 1. Top 200 Single Family Builders (*Builder Magazine* List)
 2. 25 Largest Multifamily Builders (NMHC List)
 3. Top 10 Builders in each of the Top 50 Metro Markets (*Builder Magazine* List)
 4. Additional Sample from *Builder Magazine* Subscription List
- II. Response...Total and Across Regions – 290
 - Northeast – 15%
 - Midwest – 21%
 - South – 40%
 - West – 29%
- III. Housing Starts in 2017: Total – 1.2 million
 - Single-Family – 849,000 (71%); Multifamily – 354,000 (29%)
 - Share of Starts in Each Census Region:
 - Northeast – 9%
 - Midwest – 15%
 - South – 50%
 - West – 26%

APPENDIX III – PRODUCTIVITY, TECHNOLOGY AND AFFORDABILITY

As the home builder survey shows, the nation faces a serious challenge related to housing affordability. There is a shortage of housing. As noted earlier, according to recent research by Freddie Mac, the current annual rate of housing construction is about 370,000 units below the level required based on household formation and long-term demand.ⁱ Further, there is not enough housing being built that is affordable. Builders and developers are finding a gap between the cost of building a new home, and a home that is affordable for a low, moderate, or even middle-income family.

The high cost of housing is in part due to a persistently low rate of productivity growth in the construction industry in general, and in the residential construction industry in particular. According to the McKinsey Global Institute (MGI) study “Reinventing Construction: A Route to Higher Productivity,” construction sector labor-productivity averaged 1% a year over the past two decades, compared to 2.8% for the total world economy and 3.6% for manufacturing.ⁱⁱ The report continues: “Absent change, global need for infrastructure and housing will be hard to meet. If the construction activity were to catch up with the total economy, the industry value added could rise by \$1.6 trillion a year, and would boost global GDP by 2%.... One-third of the opportunity is in the United States, where since 1945, productivity in manufacturing, retail, and agriculture has grown as much as 1,500%, but productivity in construction has barely increased at all.”ⁱⁱⁱ

In the United States, residential construction labor productivity experienced a significant decline from before to after the Great Recession. Total value of construction put in place during 2017 was \$1,246 billion, with 43% in residential and 57% in non-residential construction. During 2005, total value of construction put in place was \$1,117 billion, with \$630 billion (57%) in residential and \$487 billion (43%) in non-residential (see Table 1). During 2005, 2.07 million housing units were started and declined to 1.20 housing units in 2017, a decline of 42% in

ⁱ *The Major Challenge of Inadequate U.S. Housing Supply*, Economic and Housing Research Insight, Freddie Mac, December, 2018.

ⁱⁱ *Reinventing Construction: A Route to Higher Productivity, Executive Summary*, McKinsey Global Institute, February, 2017, p. 1.

ⁱⁱⁱ *Reinventing Construction: A Route to Higher Productivity, Executive Summary*, McKinsey Global Institute, February, 2017, p. 1.

housing starts whereas the total number of employees in residential construction declined only 19 % from 4.8 million to 3.9 million (see Table 1). However, since residential construction employees are also involved in remodeling, and additions and alterations work, some of the reduction in employees is accounted for by shifts from home building to remodeling.

The low productivity in the residential construction industry in the United States is further supported in an article by Matthew C. Klein. He notes that “American homebuilders started work on the same number of houses in the past year as they did a quarter-century ago, even though there are 36% more people working as resident builders now than then... This suggests that there is a severe decline in productivity that might partly explain the rise in US housing prices compared to places like Japan.”^{iv}

What are some of the reasons for the poor productivity performance? Many have already been highlighted. First, the industry is extensively regulated at the federal, state, and especially the local level. As discussed earlier, homebuilding is unique when compared to retail or manufacturing. A house or a residential apartment must be built on land, and the regulations begin with land use, but also include permitting and approvals, building codes, a variety of environment regulations, and OSHA standards for health and safety, among others. In addition, the residential construction industry is highly fragmented compared to most other industries. (The top ten builders build only 23% of the single-family homes completed, and the top 100 builders build 39%.) The industry is also cyclical, and often inexperienced owners and buyers find it hard to navigate in an opaque marketplace.

All the factors conspire against increased productivity. However, with the changes in technology that are underway, the potential is there for new technology and increased productivity to improve the cost of housing.

^{iv} Klein, Matthew C. (2017, May 25). “More on America’s Unproductive Homebuilding Sector.” *Financial Times*.

Table 1
ANNUAL VALUE OF CONSTRUCTION PUT-IN-PLACE, HOUSING STARTS & EMPLOYMENT

	Annual Value of Construction Put-in-Place (Billions of Dollars)					Total Housing Starts (000)	Total Employment (in millions)	Residential Construction Employment (in millions)
	Total	Residential		Non-Residential				
2017	1,246	532	43%	714	57%	1,204	154.5	3.9
2016	1,192	474	40%	718	60%	1,174	152.6	3.8
2015	1,114	829	39%	685	61%	1,112	150.5	3.8
2014	1,006	375	37%	631	63%	1,003	148.0	3.7
2013	906	329	36%	577	64%	925	145.1	3.6
2012	850	276	32%	574	68%	781	143.0	3.1
2011	788	253	32%	535	68%	609	140.4	3.3
2010	809	252	31%	527	69%	587	139.0	3.2
2009	907	256	28%	651	72%	554	140.6	3.3
2008	1,077	367	34%	710	66%	906	146.3	3.7
2007	1,148	496	43%	652	57%	1,355	142.6	4.4
2006	1,162	614	53%	548	47%	1,801	141.5	5.1
2005	1,117	630	57%	487	43%	2,069	136.5	4.8