



# FRAMING MATERIAL USE IN RESIDENTIAL CONSTRUCTION

An investigation of the factors influencing framing  
material choice in residential building: 2018 follow up

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**AUSTRALIAN CONSTRUCTION INSIGHTS**

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# CONTENTS

- Executive summary .....2**
- Background.....4**
- Quantifying market share of key types of structural load bearing elements .....6**
  - Detached houses.....7
  - Class 1 attached dwellings .....11
  - Class 2 buildings .....14
- Choosing the material for load bearing elements in new home building .....17**
  - Decision making processes of building firms .....17
  - Factors influencing material choice .....21
  - Perceptions of consumer preferences.....23
- Innovation in structural framing materials .....24**
- Appendix A: What have been the most significant or important innovations in structural framing materials over the last five years? .....27**
- Appendix B: What types of innovation would you like to see? .....32**
- Appendix C: Other general comments from respondents .....36**

## EXECUTIVE SUMMARY

Timber used in the structural load bearing elements of newly built homes represents an important source of demand timber in Australia. The competitive market for residential building drives innovation and drives new trends in building methods and materials. The research presented in this report follows on from the report titled 'Framing materials used in residential building' (ACI, 2016) and investigates whether there have been any changes the market share for timber frame construction in the intervening period. The research also investigates factors influencing the decisions to use particular materials and assesses industry perceptions of innovation in materials and systems used for the structural load bearing elements of newly built homes.

### Quantifying the market share of timber construction

Analysis indicates that the market share for timber frame construction has declined between 2015 and 2017/18. This was evident in the quantitative estimates of activity and was validated by survey responses.

Around 73 per cent of detached houses built during the 2017/18 financial year were built using timber frame construction. This was down from 76 per cent in the 2015 calendar year (as reported in the 2016 report).

Timber frame construction had a 79 per cent market share of Class 1 attached dwellings built during the 2017/18 year. This represents a decline in the market share of around 6 per cent since 2015.

Timber frame construction accounted for around 46 per cent of the Class 2 dwellings in projects up to three storeys during the 2017/18 year, this was down from the 48 per cent estimated in 2015.

### Choosing materials for load bearing elements

The builder is typically responsible for deciding which materials or building system is used for the vertical load bearing wall and roof elements of new homes. This was the case for 40.3 per cent of respondents. A further 30.7 per cent of respondents reported that this decision was made by the building designer or architect.

Only 20 per cent of respondents reported that their business worked with the same wall and roof framing material for all projects. A much larger share (45 per cent) reported that they use the same material for most projects but occasionally made exceptions. A large share of these respondents reported that they rarely or never review their preferred or default material.

Comparing the responses from those who build exclusively with timber frames with those who build with other materials and systems revealed a number of factors considered more/less important by the two groups. Those using timber frame construction assign greater importance to 'cost', 'familiarity with material' and 'reliability' when compared to those using a variety of materials and building systems for load bearing elements. In contrast, those using a variety of materials appeared to assign greater importance to 'termite/fire resistance' and having their chosen structural framing material as 'point of differentiation' for their business.

### Innovation

Amongst all seven of the material types surveyed, timber had the largest share of respondents reporting that a high degree of innovation had occurred over the last five years. This was consistent across both respondents building exclusively with timber frame construction and those using a variety of materials.

Structural Insulated Panels (SIPs) had a slightly lower share of respondents reporting a high degree of innovation occurring over the last five years but had the highest share of respondents reporting a moderately high degree of innovation. When the 'high' and 'moderately high' ratings are combined, it provides the largest share of affirmative responses across the materials.

Looking to the future, responses from both groups convey the opinion that the greatest opportunities for innovation are in SIPs, followed by timber and lightweight steel.

## INTRODUCTION

There are three research elements presented in this report:

- 1. A quantitative estimate of the market share for each of the major structural framing types.**  
The scope of this estimate also considers differences in materials used in detached dwellings, attached dwellings in Class 1 buildings, and dwellings in Class 2 buildings of up to three storeys.
- 2. Analysis of decision-making processes and factors influencing the choice to work with a particular type of structural framing systems.**
- 3. Perceptions of innovation in building materials and systems used for structural load bearing elements.** The section considers recent innovation and perceptions of where future innovation may occur.

The report is organised as follows:

**Section 2** provides background to this report and a brief summary of the research undertaken by Forrest Wood Products Australia.

**Section 3** presents the results of the investigation into the market size and the estimate of the market share for the various common structural framing materials used in residential building.

**Section 4** presents a discussion of the decision-making processes and the factors that influence decisions to work with a particular structural framing material.

**Section 5** discusses perception of innovation in building materials and systems used for the structural load bearing elements of new homes.

**Appendix A** presents the written responses to the survey question 'What have been the most significant or important innovations in structural framing materials over the last five years?'

**Appendix B** presents the written responses to the survey question 'What types of innovation would you like to see?'

**Appendix C** presents the written responses to the survey question 'Are there any general comments you would like to add regarding wall & roof framing materials?'

**Note:** *While all care, skill and consideration has been used in the preparation of this report, the findings refer to the terms of reference of Forest Wood Products Australia and are designed to be used only for the specific purpose set out below. If you believe that the terms of reference are different from those set out below, or wish to use this report or information contained with it for another purpose, please contact Australian Construction Insights.*

*The objective of this report is to estimate the market share of dwellings built using timber structural framing, and improve the understanding of decision-making processes and trends for selecting the type of structural framing systems used for detached housing and low-rise multi-unit markets.*

*The findings of this report are subject to unavoidable statistical variation. While all care has been taken to ensure that the statistical variation is kept to a minimum, care should be taken whenever using this information. This report only takes into account information available to ACI up to the date of release of this report and so its findings may be affected by new information. The information in this report does not represent advice, whether express or inferred, as to the performance of any investment. Should you require clarification of any material, please contact ACI.*

## BACKGROUND

The use of timber in residential building, particularly the use in the structural framing elements of detached dwellings, represents a substantial source of demand for the timber and forestry industries. The predominant form of residential dwelling in Australia has historically been detached housing. A large share of the detached housing stock in Australia has been built using 'brick veneer' construction which required a large volume of timber in the structural framing.

There have been a number of significant changes in the supply of new homes, in terms of the types of homes being built, the materials being used and the methods of construction being employed. Data relating to the number of dwellings and the types of dwellings being built are collected by the Australian Bureau of statistics. Information and data relating to the changes in building methods and material usage is limited.

Until 2011 the Australian Bureau of Statistics collected statistics relating to the number of dwellings built stratified by common building materials and guided estimates of structural framing use. The ABS ceased to publish this data citing concerns around data quality. Since then there have been few attempts to quantify the amount of residential building work done using various building materials and very little analysis of the determinants of material use.

In this context, Forest Wood Products Australia (FWPA) has sought to understand the impact that the changes in the home building market will have on demand for timber.

This research builds upon and updates the knowledge base developed in earlier research projects. The findings of earlier research projects are summarised below.

### **FWPA Timber vs Steel Survey (2014)**

In 2014 the FWPA commissioned the "Timber vs Steel Survey" to plug some of the gaps in the knowledge of the residential framing market at the time. The work assessed the use of different framing materials, the factors influencing framing material selection and who made those choices. The report also investigated whether framing material suppliers could improve their level of service to residential builders. A survey of a small number of builders was undertaken to answer these questions about the market.

At the time the report was produced, the majority of builders chose timber framing for their residential building work. By far the most significant factor in this choice of framing material was how familiar the builder was with its use. This suggests that changing a builder's framing selection would be a difficult proposition. Speed of erection and cost were also a consideration in the choice of framing material, but experience with the product was the over-riding concern.

The choice of framing material was determined in the majority of cases by the builder, although the survey revealed that designers made this decision for one in four homes. Service levels from framing suppliers were found to be regarded favourably by the majority of survey respondents although one in four builders felt that turnaround times on delivery of frames could be improved.

The small selection of builders surveyed provided useful insights into framing material use, although the inference about the broader residential building market is limited.

### **Framing materials used in residential building (2016)**

In 2016 FWPA commissioned Australian Construction Insights to extend upon the 2014 research and further investigate the key factors influencing the choice of structural framing material for detached houses and lower-rise attached dwellings in Australia. The 2016 research also included estimates of the respective market shares for the common construction methods across the different new dwelling types.

The report found that the decision regarding the framing material used in residential construction is predominantly made by the building firm. If a client has a preference for building with a particular material, firms will generally try to accommodate their preference, although this is typically accompanied by a change in the price. Even though the material costs might on paper appear similar

between framing systems, the builder will charge this premium to reflect the additional “back office” costs such as arranging new sources of supply and retraining costs for framers and following trades.

Tradition appears to play an important role in the choice of framing system: this tradition may go back as far as the training of the individual builder in a particular product through to the custom of the building firm. Consumer preference for ‘tried and true’ building methods with broad market acceptance was also noted.

The report concluded that the market share of the different framing systems is unlikely to change other than incrementally unless a substantial and prolonged price difference among the systems emerged. The research revealed a modest difference in construction costs between steel and timber framed detached houses. However, builders indicated that the costs of permanently switching from one method to another would be significant and involve substantial risk.

The research also concluded that comparable building firms with similar turnover, similar dwelling types and operating in similar locations will chose different framing systems for their own individual reasons. As such, caution should be taken in generalising about factors that motivate particular types of builders.

With respect to market share, homes built with timber frame construction were estimated to account for around 76 per cent of detached houses built in 2015. It is estimated that a further 13 per cent were built using lightweight steel frame construction, while 11 per cent were built using double brick construction.

The share of Class 1 attached dwellings (semi-detached, townhouses etc.) built using timber frame construction is estimated to be slightly higher at 85 per cent, with a smaller share built using light weight steel frame construction.

The share of dwellings in Class 2 buildings up to three storeys built using timber frame construction is estimated to be substantially lower at 48 per cent. Concrete construction was the next most common construction method with 32 per cent market share, while only 16 per cent were built using double brick construction and 2 per cent used lightweight steel frame construction.

## QUANTIFYING MARKET SHARE OF KEY TYPES OF STRUCTURAL LOAD BEARING ELEMENTS

In this section of the report we present the results of the investigation into the market size and estimate of the market share for the various common structural framing materials used in residential building, with regard to: Class 1 detached and attached dwellings and Class 2 buildings up to three storeys.

Data was collected via an online survey of HIA members designed to estimate the market share of timber frame construction. There were 322 respondents who completed the survey, of which 85 per cent identified as builders and 3 per cent identified as trade contractors. The remainder of respondents included a number of building consultants, draftsmen, architects, and people working in new home sales.

Building work undertaken by the survey respondents accounted for around 25.3 per cent of detached houses built in 2017/18 around 13.6 per cent of attached Class 1 dwellings and around 3.6 per cent of dwellings in Class 2 buildings of up to three storeys in height.

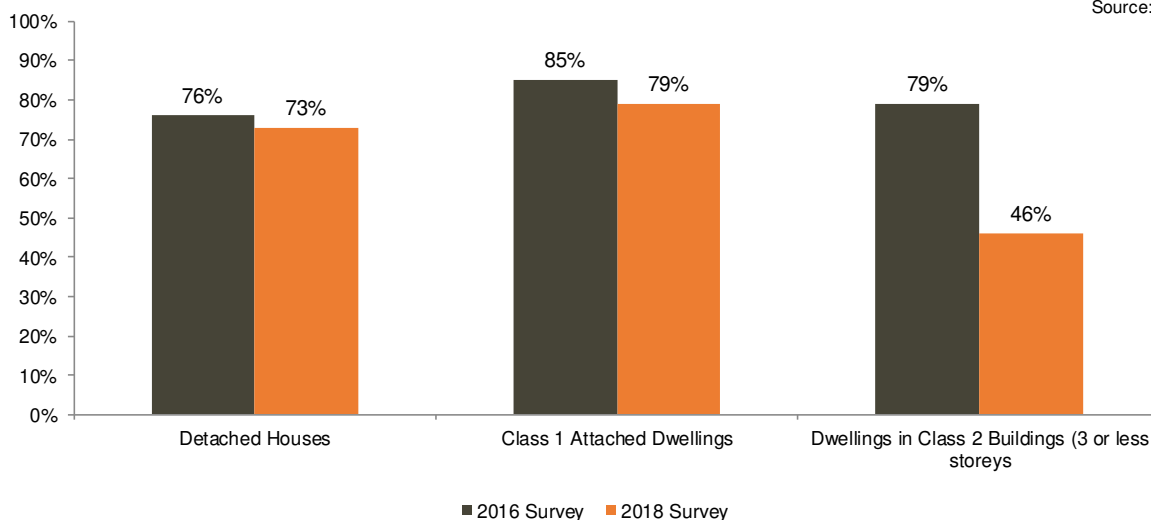
The geographic distribution of respondents was generally proportionate to the respective market size of the new home building industry in each state and the survey sample includes a cross section of firm sizes.

This section also considers respondents' assessments of whether their use of structural framing materials has changed over time and whether changes are occurring more broadly across the residential building industry.

The findings show that the share of dwellings built using timber frame construction has declined since this survey was undertaken in 2016. The declining share was evident across all three dwelling types. Survey responses also indicate an increase in the share of new homes built using lightweight steel framing and using structural insulated panels. This trend was evident when respondents were asked about their own work and when asked about their perception about activity across the rest of the industry.

### Change in Share of Homes Built Using Timber Frame Construction

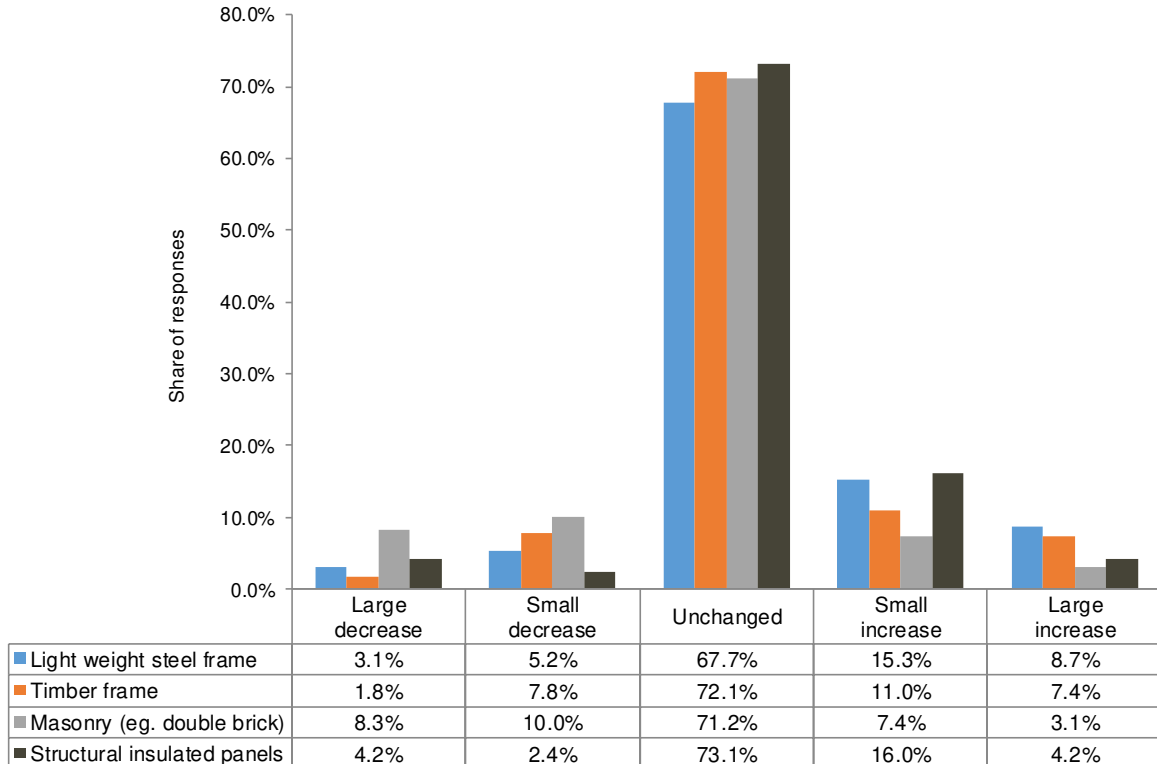
Source: ACI



## Detached houses

Has the share of detached houses that you built using these structural framing materials changed over the last five years?

Source: ACI

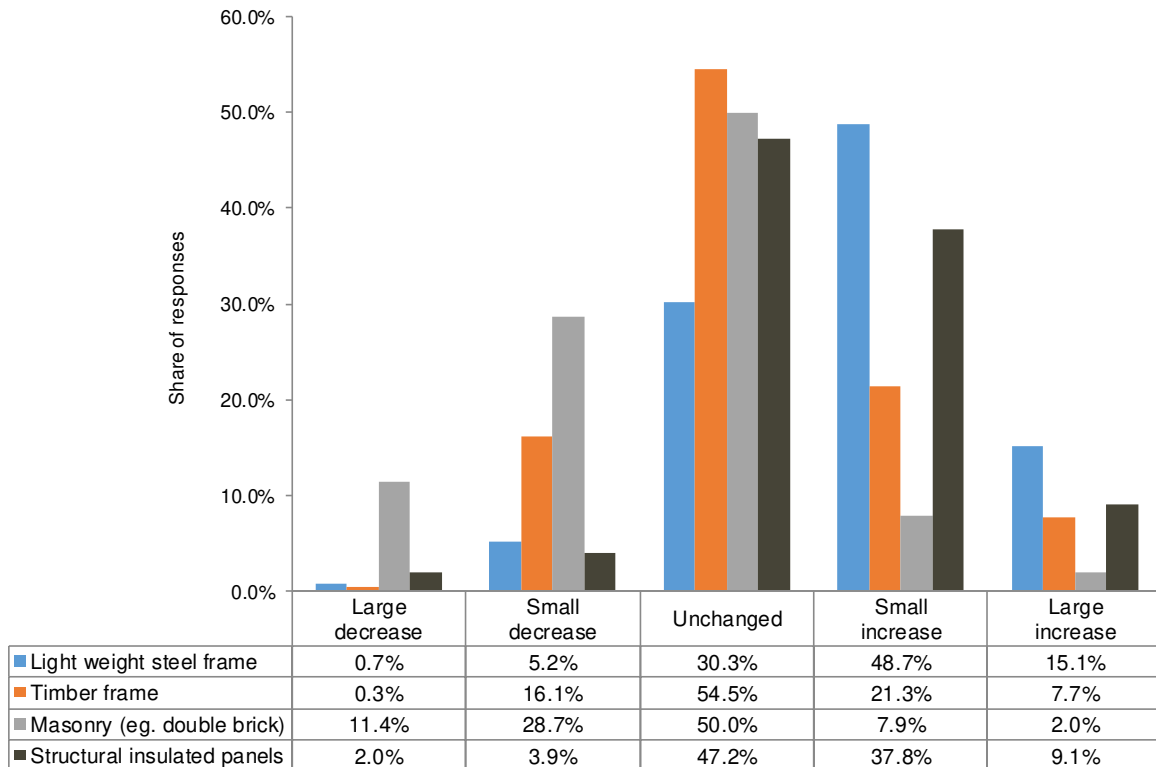


- The majority of respondents reported that the share of homes that they built with the various structural framing materials had not changed over the last five years.
- Masonry construction had the largest share of respondents (18.3 per cent) reporting that the share of detached houses built using this method of construction had reduced over the last five years. This was followed by timber frame construction with 9.6 per cent reporting a reduced share.
- The largest share of respondents reported that the share of homes that they had built with lightweight steel frame construction had increased (24.0 per cent). This was followed by SIPs with 20.2 per cent of respondents reporting that the share had increased, and timber frame construction with 18.4 per cent of respondents reporting that share had increased.



## Has the share of detached houses built by the rest of the industry using these structural framing materials changed over the last five years?

Source: ACI



- When asked about trends in the rest of the industry, there is a broad perception (48.7 per cent of respondents) that there has been a small increase in the share of detached homes being built with lightweight frame construction and a further 15.1 per cent reported a large increase. Only 30.3 per cent of respondents thought that the share of detached houses using lightweight steel framing had remained unchanged.
- A little over half of the respondents (54.5 per cent) believed that the share of detached houses using timber frame construction was unchanged over the last five years. Interestingly, only 16.4 per cent believed that the share built using timber frame construction had declined while 29 per cent believe that the share has increased.
- While SIPs remains a relatively small share of the overall detached house market, a large share of respondents (37.8 per cent) believe that there has been a small increase and a further 9.1 per cent believe that there has been a large increase.
- Half of the respondents reported that the share of detached houses built using masonry construction had not changed over the last five years. This was closely matched by the 40.2 per cent of respondents who believe that the share had declined.

## Survey Result - Detached Houses by Structural Framing

		Timber	Lightweight Steel	Double Brick	Structural insulated panels	Total	Dwelling Starts (4 qtrs to Mar 18)	Survey Sample
<b>New South Wales</b>	Number	4,658	811	114	109	5,691	29,436	19.3%
	% of state	82%	14%	2%	2%			
<b>Victoria</b>	Number	11,812	1,622	658	398	14,490	38,120	38.0%
	% of state	82%	11%	5%	3%			
<b>Queensland</b>	Number	4,302	955	46	12	5,315	25,853	20.6%
	% of state	81%	18%	1%	0%			
<b>South Australia</b>	Number	1,074	162	20	5	1,261	7,838	16.1%
	% of state	85%	13%	2%	0%			
<b>Western Australia</b>	Number	312	381	2,440	61	3,194	14,028	22.8%
	% of state	10%	12%	76%	2%			
<b>Tasmania</b>	Number	91	0	2	2	95	2,019	4.7%
	% of state	96%	0%	2%	2%			
<b>Northern Territory</b>	Number	1	11	-	1	13	610	2.1%
	% of state	8%	85%	0%	8%			
<b>Australian Capital Territory</b>	Number	67	-	0	-	67	1,000	6.7%
	% of state	100%	0%	0%	0%			
<b>Total</b>	Number	22,316	3,942	3,280	588	30,126	118,904	25.3%
	% of total	74%	13%	11%	2%			
<b>Market size adjusted*</b>	% of total	73%	14%	11%	2%			

Source: ACI

\*To account for varying sample coverage in each state, survey responses for each state are weighted to reflect the state's actual market share.

- Survey results indicates that around 73 per cent of detached houses built during the 2017/18 financial year were built using timber frame construction. This was down from 76 per cent in the 2015 calendar year (as reported in the 2016 report).
- The share built using lightweight steel frame construction in 2017/18 was 14 per cent, up from 13 per cent in the 2016 report.
- Contrary to findings from other survey questions, which indicated that the share of detached houses built using masonry construction had declined, the quantitative analysis indicates that the share was unchanged at 11 per cent.
- The survey this year included an estimate of the share of detached houses built using SIPs (2 per cent). This method of construction was not was not quantified in the 2016 report and has been included this year after it was identified as an area of innovation.

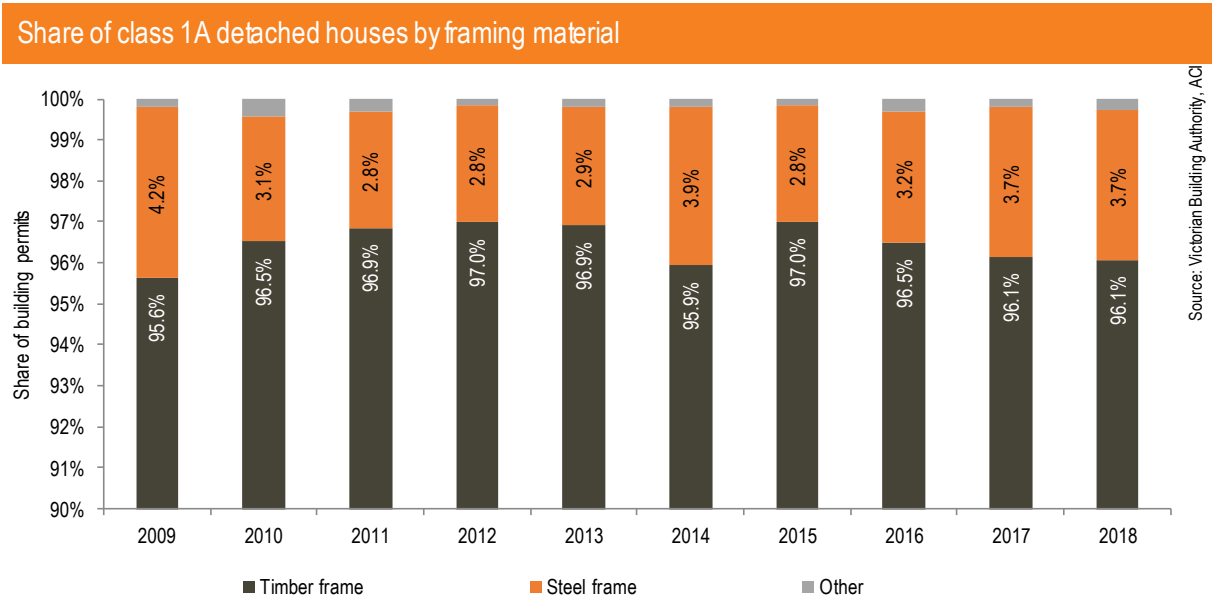
When comparing the 2016 survey with the 2018 survey, the result for Victoria implies a sharp reduction in the share of detached houses built using timber frame construction and a large increase in the share using steel frame construction. This overstates the actual change in the market. The large change arises from a change in the survey sample between the two surveys. In the 2015/16 survey there were no respondents within the sample who reported building a large volume of homes using lightweight steel frame construction, whereas in the 2018 sample there was a respondent who built a large number of homes and reported using lightweight steel frame construction for all jobs.

This variation in the sample detracts from the capacity to draw inferences about developments in the broader market, however it provides evidence of diversity in the building practices of the state's large builders that was not evident in the 2016 survey. In providing additional insight into the Victorian market we have also analysed the Victorian Building Authority's Building Permit Activity data which provides an alternative source from which to estimate the market share of the key structural framing materials in the state.

The data from the Victorian Building Authority is comprehensive in that it provides a record of all permit activity, however there are a relatively large share of records with incomplete information. Over the last decade data fields relating to framing materials are incomplete for between 7 per cent and 27 per cent of new class 1a detached dwellings each year (incomplete information was observed for 22.9 per cent of records from the first six months of 2018). Despite the incomplete nature of the dataset, it

nevertheless provides further insight into the respective market share for timber and steel frame construction in the state.

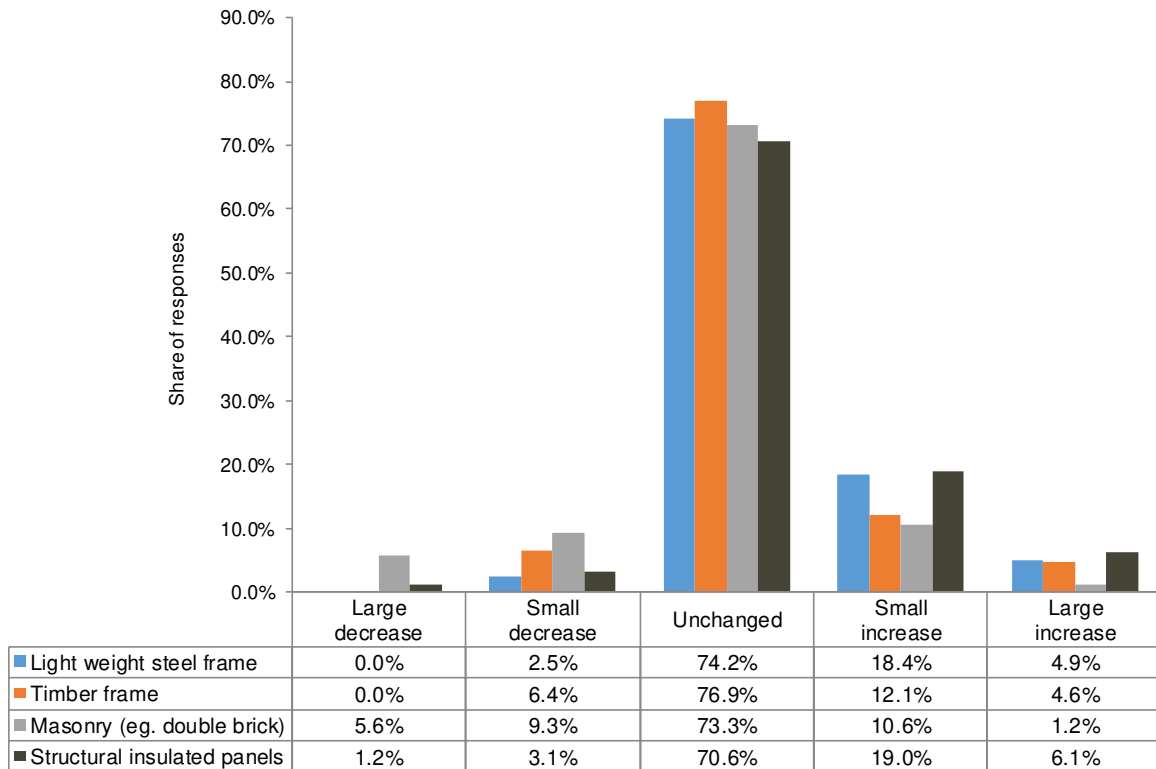
Victorian building permit figures indicate that the market share for timber framing has declined each year since 2015, although only moderately. In the 2015 calendar year, the market share of new detached houses was 97.0 per cent, in the first six months of 2018 the share of permits for timber frame construction was 96.1 per cent. Over this timeframe the share of steel frame construction has increased from 2.8 per cent to 3.7 per cent. The chart below shows the change over time (note that the vertical scale has been abbreviated to cover the range between 90 to 100 per cent).



## Class 1 attached dwellings

Has the share of class 1 attached dwellings that you built using these structural framing materials changed over the last five years?

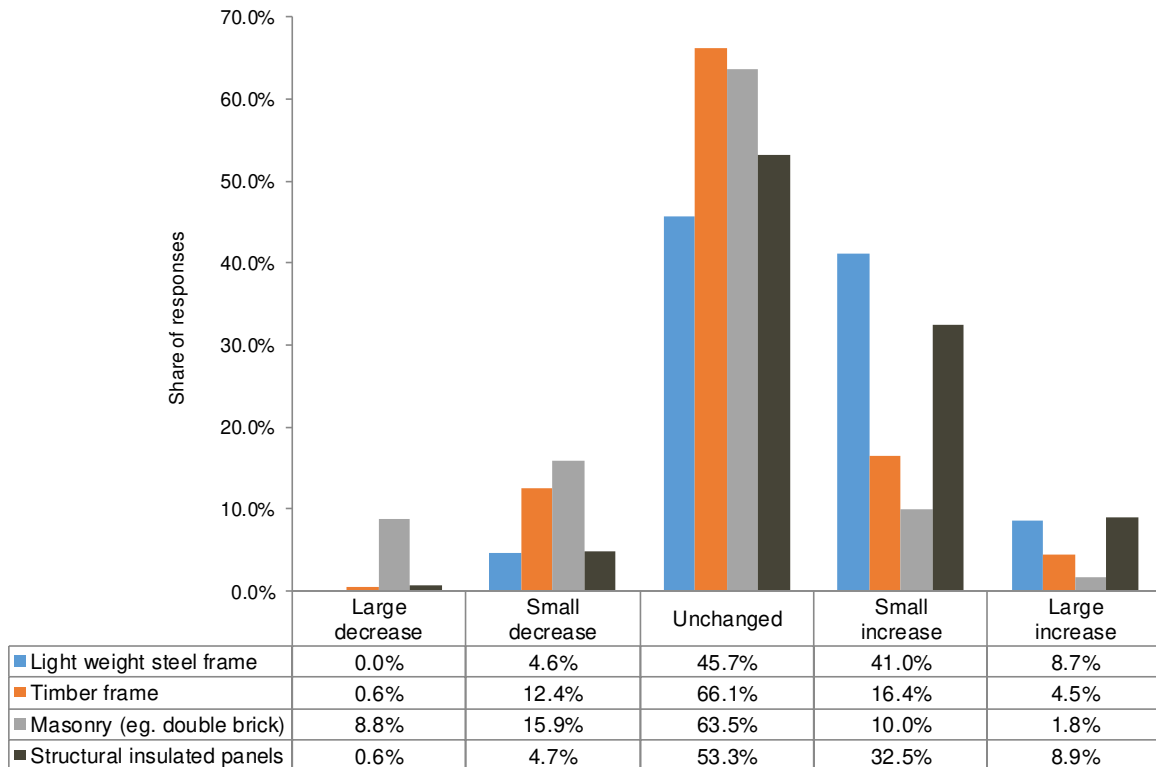
Source: ACI



- Responses to questions about changes in material usage in Class 1 attached dwellings revealed similar trends to those evident in detached houses.
- The majority of respondents reported that their material usage had not changed over the last five years.
- Amongst those who reported changes in material usage, the largest share of respondents reported increasing their usage of SIPS. 25.1 per cent of respondents reported increasing their use of SIPs for Class 1 attached dwellings over the last five years. This was followed by 23.3 per cent of respondents who reported increasing their use of lightweight steel frame construction and 16.1 per cent of respondents reported that timber frame construction accounted for a larger share.
- 11.8 per cent of respondents reported that the share of Class 1 attached dwellings built using masonry construction had increased, although a larger share (14.9 per cent) reported that the share had declined.

## Has the share of class 1 attached dwellings built by the rest of the industry using these structural framing materials changed over the last five years?

Source: ACI



- When asked about trends in material usage by the wider industry, the largest share of respondents reported that the shares for various materials were unchanged.
- With respect to timber frame construction, 66.1 per cent of respondents reported that the share of Class 1 attached dwellings built using this method had not changed over the last five years. Among those who reported a change in the share, more reported that the share had increased (20.9 per cent) compared with 13.0 per cent who believed the share had declined.
- A large share of respondents (41.0 per cent) reported that there had been a small increase in the share of Class 1 attached dwellings built using lightweight steel frame construction and a further 8.7 per cent of respondents reported that there had been a large increase.
- There was large share (32.5 per cent) of respondents who reported that there had been a small increase in the share of dwellings built using SIPs and a further 8.9 per cent reported that there had been a large increase.

## Survey Result - Class 1 Attached Dwellings by Structural Framing

		Timber	Lightweight Steel	Double Brick	Structural insulated panels	Total	Dwelling Starts (4 qtrs to Mar 18)	Survey Sample
<b>New South Wales</b>	Number	1,234	72	56	93	1,456	9,367	15.5%
	% of state	84%	5%	4%	6%			
<b>Victoria</b>	Number	1,718	160	90	63	2,031	13,076	15.5%
	% of state	84%	8%	4%	3%			
<b>Queensland</b>	Number	338	3	19	16	376	6,927	5.4%
	% of state	89%	1%	5%	4%			
<b>South Australia</b>	Number	188	151	10	4	353	2,100	16.8%
	% of state	53%	43%	3%	1%			
<b>Western Australia</b>	Number	47	14	356	40	457	1,816	25.2%
	% of state	10%	3%	77%	9%			
<b>Tasmania</b>	Number	43	-	1	2	46	466	9.9%
	% of state	94%	0%	3%	3%			
<b>Northern Territory</b>	Number	-	3	-	-	3	100	3.0%
	% of state	0%	100%	0%	0%			
<b>Australian Capital Territory</b>	Number						909	0.0%
	% of state							
<b>Total</b>	Number	3,569	403	533	218	4,722	34,761	13.6%
	% of total	76%	9%	11%	5%			
<b>Market size adjusted*</b>	% of total	79%	8%	8%	4%			

Source: ACI

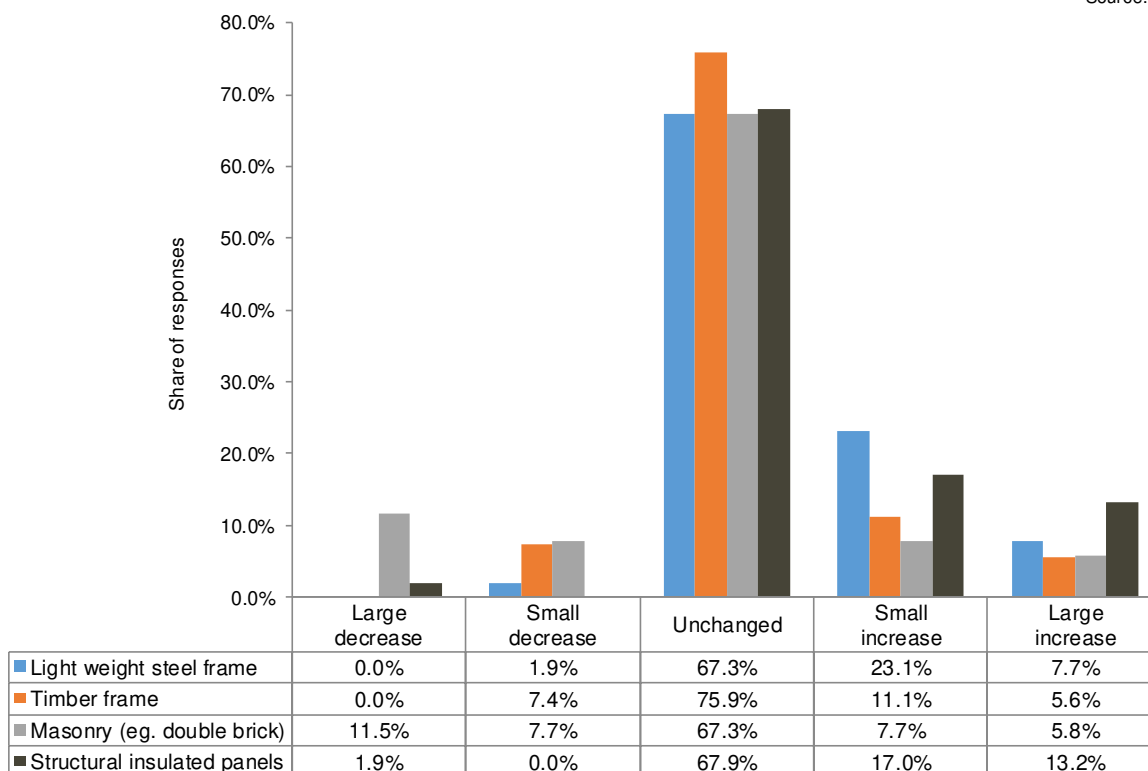
\*To account for varying sample coverage in each state, survey responses for each state are weighted to reflect the state's actual market share.

- We estimate that timber frame construction had a 79 per cent market share of Class 1 attached dwellings built during the 2017/18 financial year. Compared with the 2016 report, which assessed activity in the 2015 calendar year, this represents a decline in the market share of around 6 per cent.
- We estimate that the market share built using lightweight steel frame construction increased since the 2015. It was estimated that this method of construction accounted for 4 per cent of the Class 1 attached dwelling market in 2015 and latest estimate for the 2017/18 year indicates an 8 per cent share.
- The share of Class 1 attached dwellings built using masonry construction appears to have declined by a very small amount since the market share estimate for 2015. The latest estimate indicates an 8 per cent share during 2017/18 compared with a 9 per cent share in 2015.
- It is estimated that SIPs accounted for around 4 per cent of the Class 1 attached dwelling market in 2017/18.

## Class 2 buildings

Has the share of class 2 attached dwellings that you built using these structural framing materials changed over the last five years?

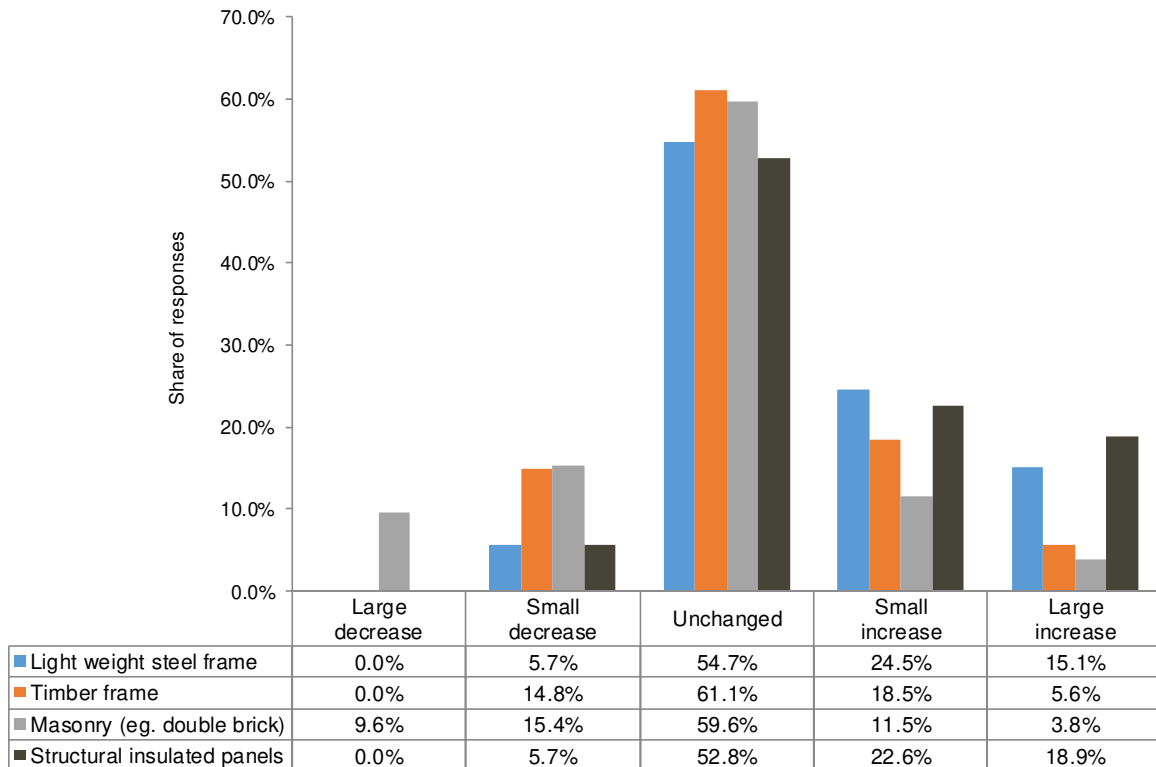
Source: ACI



- The majority of respondents reported that they had not changed the structural framing materials that they used building Class 2 dwellings (up to three storey) over the last five years.
- Amongst those who reported that they had changed their materials the share of Class 2 attached dwellings, the largest share noted that they had increased the share of dwellings built using lightweight steel and SIPs.
- 30.8 per cent of respondents noted that they had increased the share of dwellings built using lightweight steel frame construction and 30.2 per cent of respondents reported that they had increased the share of dwellings built using SIPs.
- Over 75 per cent of respondents reported that the share of dwellings that they built using timber frame construction had not changed, 16.7 per cent reported that the share had increased while 7.4 per cent reported that there had been a small reduction in the share.
- 67.3 per cent of respondents reported that the share of dwellings that they built using masonry construction for the load bearing elements had not changed over the last five years. The remaining respondents were split more closely between those who had increased their use of masonry construction and those who have decreased; 19.2 per cent reported that the share had declined while 13.5 per cent reported that the share had declined.

## Has the share of class 2 attached dwellings built by the rest of the industry using these structural framing materials changed over the last five years?

Source: ACI



- Respondent's perceptions of changes in material use in Class 2 attached dwellings by the rest of the industry mirrored the trends that respondent's reported in their own businesses. However, more respondents reported changes in the broader industry than reported changes within their own business.
- A large proportion of respondents reported an industry wide increase in the share of Class 2 attached dwellings built using lightweight steel frame construction (39.6 per cent of respondents) and SIPs (41.5 per cent of respondents).
- With respect to the use of timber frame construction in Class 2 attached dwellings, 24.1 per cent of respondents reported that the share had increase over the last five years while 14.8 per cent reported that the share had declined.
- Amongst the 40 per cent of respondents who reported that there had been a change in the industry's use of masonry construction for Class 2 attached dwellings, 15.4 per cent reported that the share had increased while 25.0 per cent reported that the industry had reduced it share.



## Survey Result - Dwellings in Class 2 Buildings (3 or less storeys) by Structural Framing

		Timber	Lightweight Steel	Double Brick	Structural insulated panels	Concrete	Total	Dwelling Starts (4 qtrs to Mar 18)	Survey Sample
<b>New South Wales</b>	Number	12	1	1	0	1	15	1,713	0.9%
	% of state	83%	4%	5%	2%	7%			
<b>Victoria</b>	Number	14	1	2	1	26	45	1,546	2.9%
	% of state	31%	2%	6%	3%	58%			
<b>Queensland</b>	Number	9	0	17	1	2	29	983	3.0%
	% of state	30%	1%	59%	2%	7%			
<b>South Australia</b>	Number							835	0.0%
	% of state								
<b>Western Australia</b>	Number	4	44	54	25	1	127	616	20.6%
	% of state	3%	35%	42%	19%	1%			
<b>Tasmania</b>	Number	5	-	1	1	-	7	115	6.1%
	% of state	67%	0%	16%	16%	0%			
<b>Northern Territory</b>	Number							24	0.0%
	% of state								
<b>Australian Capital Territory</b>	Number							335	0.0%
	% of state								
<b>Total</b>	Number	44	46	75	28	30	223	6,168	3.6%
	% of total	23%	24%	39%	15%	16%			
<b>Market size adjusted*</b>	% of total	46%	7%	21%	5%	22%			

Source: ACI

\*To account for varying sample coverage in each state, survey responses for each state are weighted to reflect the state's actual market share.

- Compared with the number of responses relating to detached houses and Class1 attached dwellings, there are relatively few informing market share estimates of Class 2 attached dwelling. Quantitative estimates are not are not fully consistent with responses to some survey questions.
- It is estimated that timber frame construction accounted for around 46 per cent of the Class 2 dwellings in projects up to three storeys during the 2017/18 financial year. This was down from the 48 per cent estimated in 2015.
- The share built using lightweight steel frame construction increased from the 2 per cent estimated for 2015 to 7 per cent in the 2017/18 financial year period.
- The share of Class 2 dwellings (up to three storey) built using concrete construction remained the second most common method of construction although the share was reduced from 32 per cent estimated for 2015 to 22 per cent in the 2017/18 year.
- While a number of survey respondents reported a belief that the share of Class 2 dwellings (up to three storey) built using masonry construction, our quantitative estimates suggest that there was an increase from 16 per cent in 2015 to 21 per cent in the 2017/18 year.
- It is estimated that around 5 per cent of Class 3 attached dwellings built in 2017/18 year were built using SIPs. The market share of SIPs was not estimated for 2015.

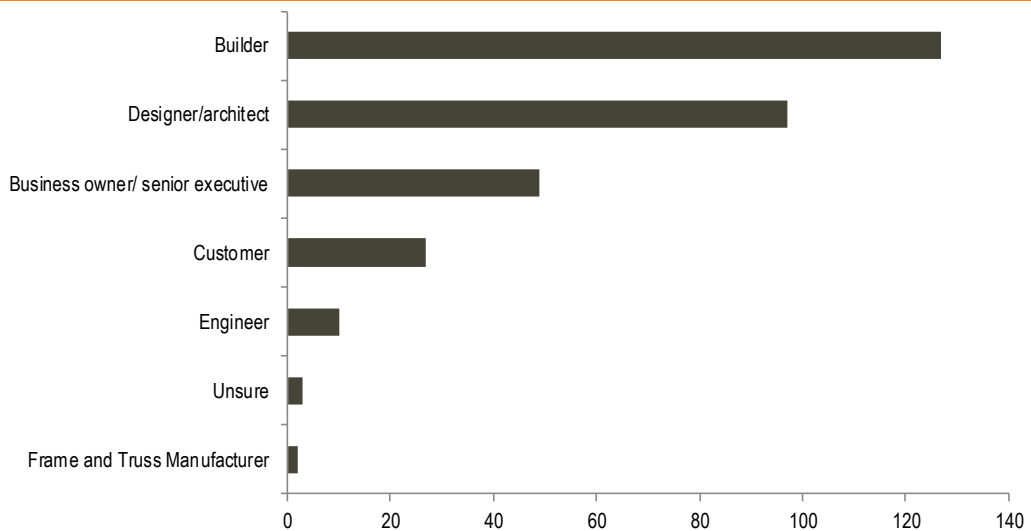
# CHOOSING THE MATERIAL FOR LOAD BEARING ELEMENTS IN NEW HOME BUILDING

## Decision making processes of building firms

This section of the report discusses the findings of ACI's investigation into preferences, attitudes and views towards wall and roof framing materials and how these factors influence material selection.

- The builder is typically responsible for deciding which materials or building system is used for the vertical load bearing wall and roof elements of new homes. This was the case for 40.3 per cent of respondents. A further 30.7 per cent of respondents reported that this decision was made by the building designer or architect.

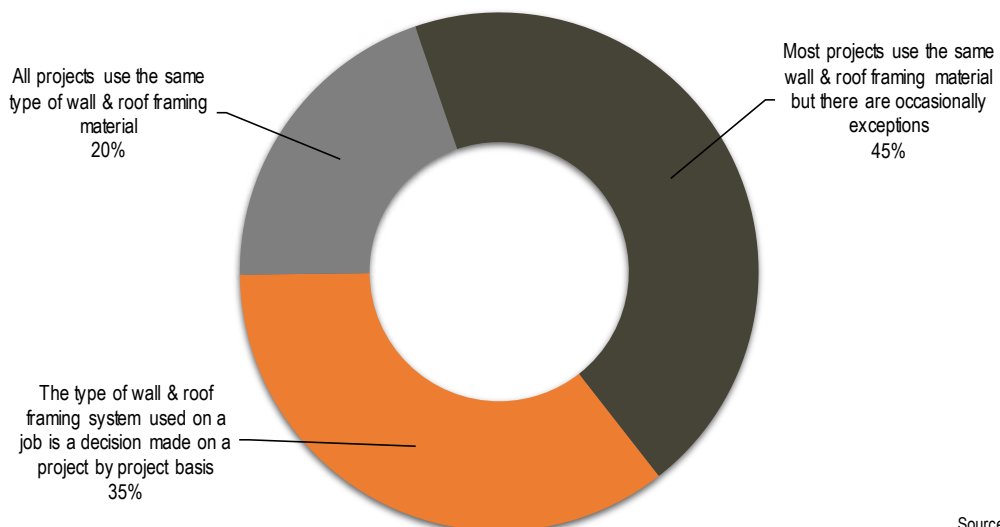
### Who generally determines what material or system is used for the wall and roof framing?



Source: ACI

- Only 20 per cent of respondents reported that their business worked with the same wall and roof framing material for all projects. A much larger share (45 per cent) reported that they use the same material for most projects but occasionally made exceptions.
- 35 per cent of respondents reported that the decision about the wall and roof framing material or system was made on a project-by-project basis.

### Which best describes the operations of the business where you work?

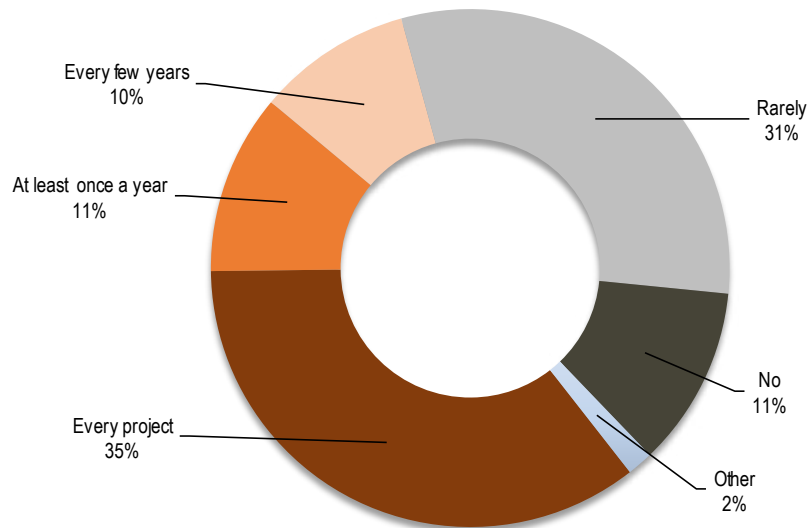


Source: ACI



- Respondents who had a 'default' material (i.e. they always or usually used the same material on their jobs) were asked how frequently they reviewed the decision to use their chosen 'default' material.
- Amongst these respondents, only 17 per cent reviewed their 'default' material at least annually and only 15 per cent reviewed this 'every few years'.
- A large share of these respondents appear unlikely to change their 'default' material, having reported that they rarely (31 per cent) or never (17 per cent) undertake such a review.

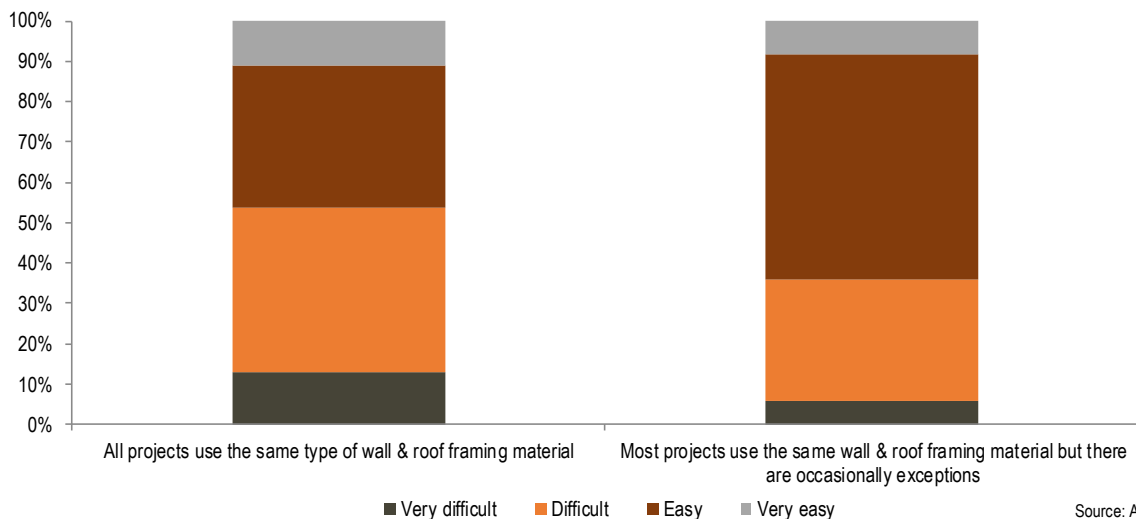
Is the decision to work with particular wall and roof materials periodically reviewed?



Source: ACI

- These respondents were also asked how easy it would be for the business to change its default material.
- Respondents who reported that they use the same material for all projects had a greater propensity to report that changing to a new material would be difficult (41 per cent) or very difficult (13 per cent). This compares with 30 per cent (difficult) and 6 per cent (very difficult) for respondents who reported that most of their projects use the same wall & roof framing material but there are occasionally exceptions.
- This suggests that businesses who have some experience working across different materials perceive fewer barriers to change.

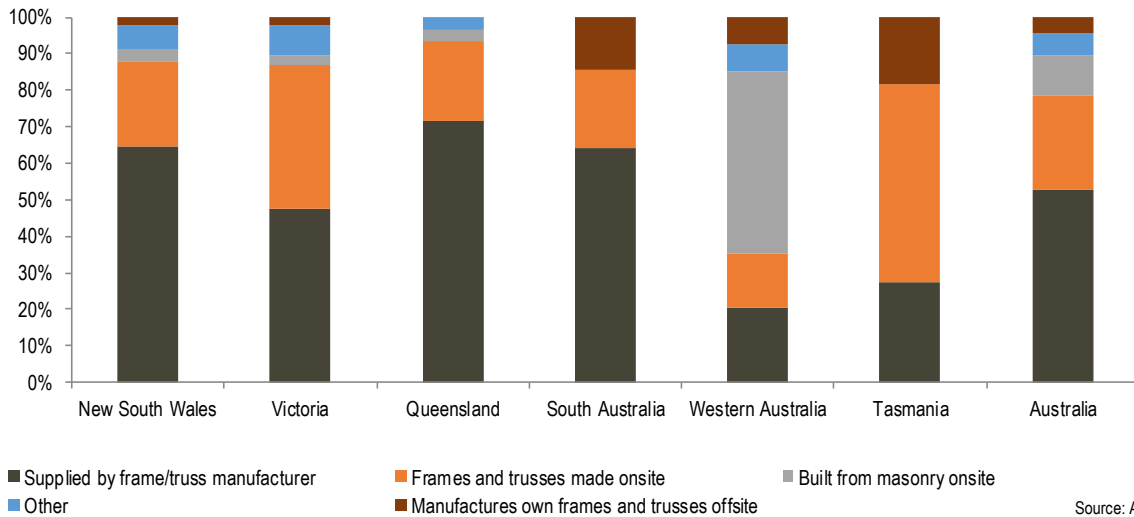
Would it be easy for the business to change to another framing material?



Source: ACI

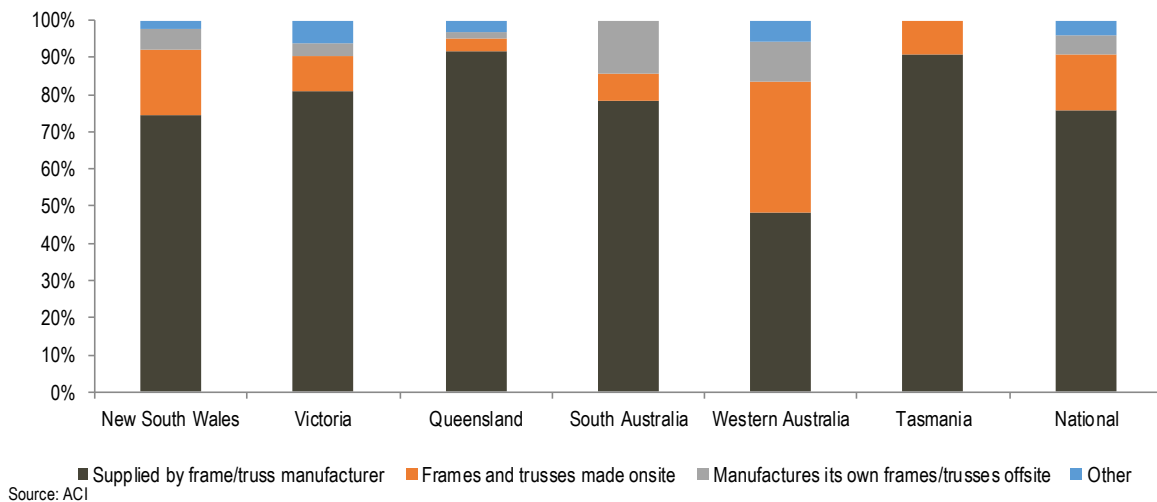
- With respect to sourcing materials for load bearing wall elements, around 53 per cent reported that these are supplied by a frame manufacturer, while a further 26 per cent of respondents reported that frames were made onsite.
- Around 11 per cent of respondents reported that the load bearing wall elements were built from masonry on site. The majority of these responses related to the Western Australian market, elsewhere masonry construction remains a small share of the market.
- A small proportion of respondents who reported that they manufacture their own frames offsite.

Which of the following best describes how the business usually sources the load bearing wall elements?



- Roof truss manufacturers supply the majority of the market, cited as the source of roof framing elements by 76 per cent of respondents.
- Western Australia was an exception to this, where only 48 per cent reported using manufactured roof trusses, and 35 per cent reported that they make roof frames onsite.

Which of the following best describes how the business usually sources roof framing elements?

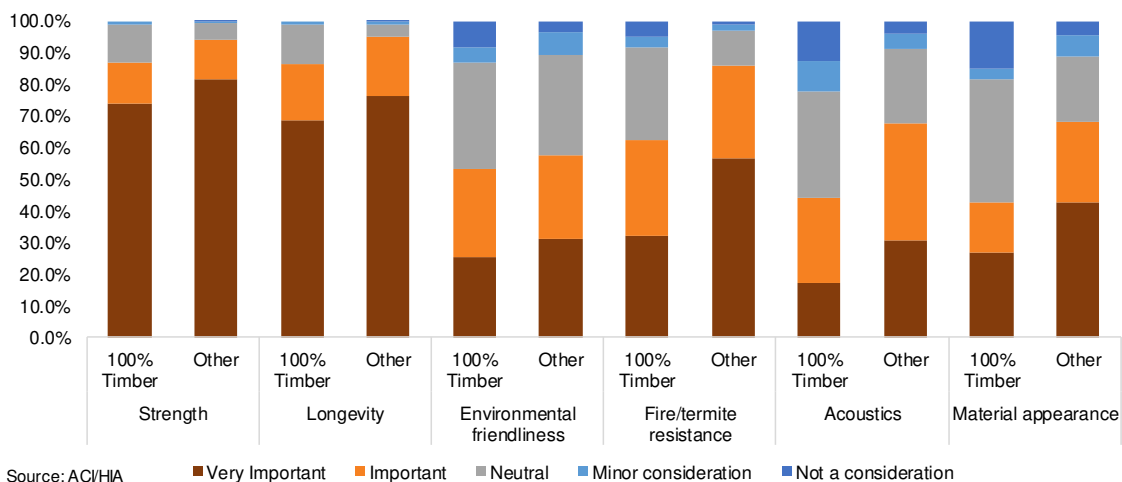


- The differences between the Western Australia and other jurisdictions are consistent with the local trend for building double brick homes with a 'stick roof'.

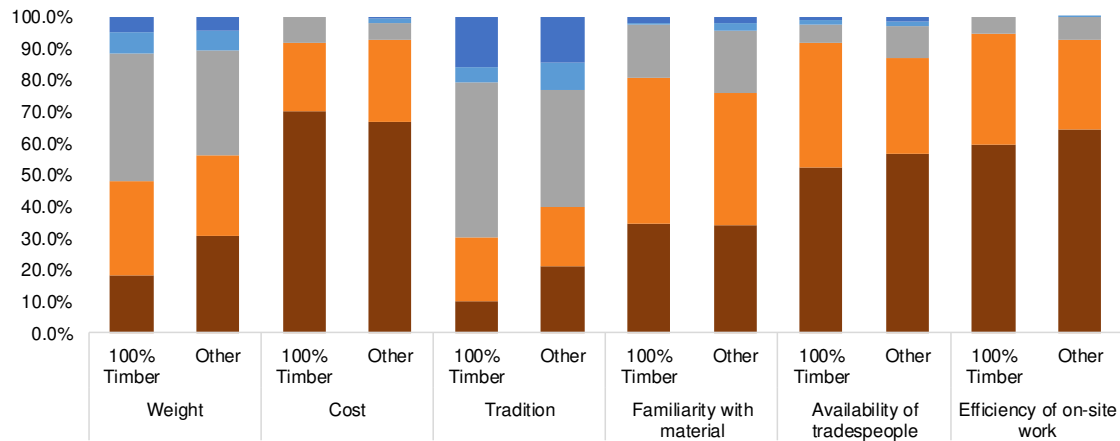
## Factors influencing material choice

- Respondents were asked to indicate the importance of a number of factors with respect to their decision to use a particular material. The factors spanned properties of materials, practicalities in the building process, business considerations and the supply chain. The importance of each factor was ranked on a five-tier Likert type scale.
- The following charts present the survey results contrasting the rankings by two distinct groups: those who build exclusively with timber frames with those who build with other materials and systems (including those who use a variety of materials and systems).
- Whether the respondents use timber frame construction for all jobs or used other materials does not appear to be a decisive issue in many of the factors.
- Those who build a variety of materials and systems had a slightly greater propensity to assign importance. This may suggest that this group may be more inclined to seek to optimise aspects of the build.
- There were a number of factors where there was a notable difference between the two groups:
  - A much larger share of those building with a variety of materials rated ‘termites/fire resistance’ as very important (56.4 per cent) compared with those using timber frame construction (32.3 per cent).
  - A greater proportion of those using a variety of materials rated having their structural framing material or system as ‘point of differentiation’ as highly important (31.1 per cent). Only 9 per cent of those using timber frame construction assigned the ‘very important’ rating to this factor.
  - There was also a larger share of those using a variety of materials who assigned a ‘very important’ rating to ‘acoustics’, ‘material appearance’, ‘weight’, ‘site access’, ‘customer preference’, ‘supplier incentives’, ‘ability to negotiate price’ and transport costs.
  - ‘Cost’, ‘familiarity with material’ and ‘reliability’ were the only factors where a greater share of those using timber frame construction assigned the ‘very important’ rating when compared to share of those using a variety of materials.

### Importance of the following factors in the decision to use a particular material for vertical load bearing walls:

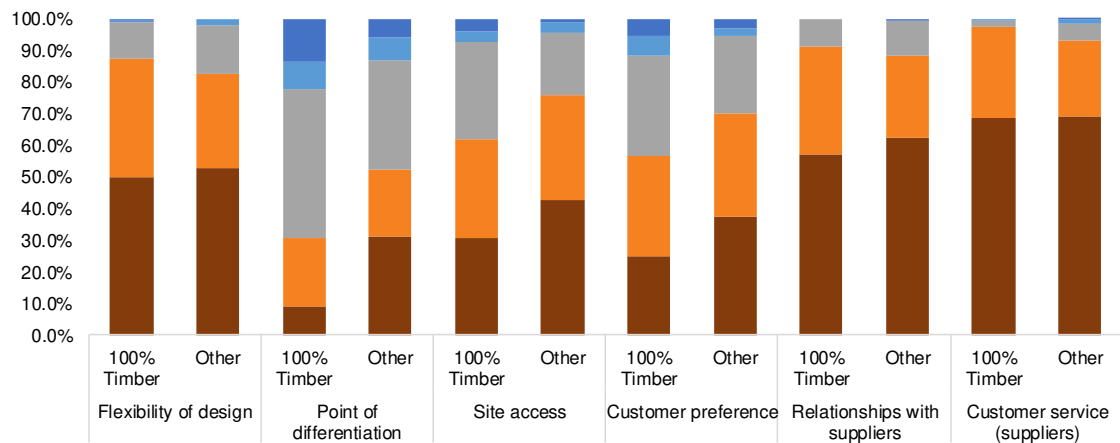


Importance of the following factors in the decision to use a particular material for vertical load bearing walls:



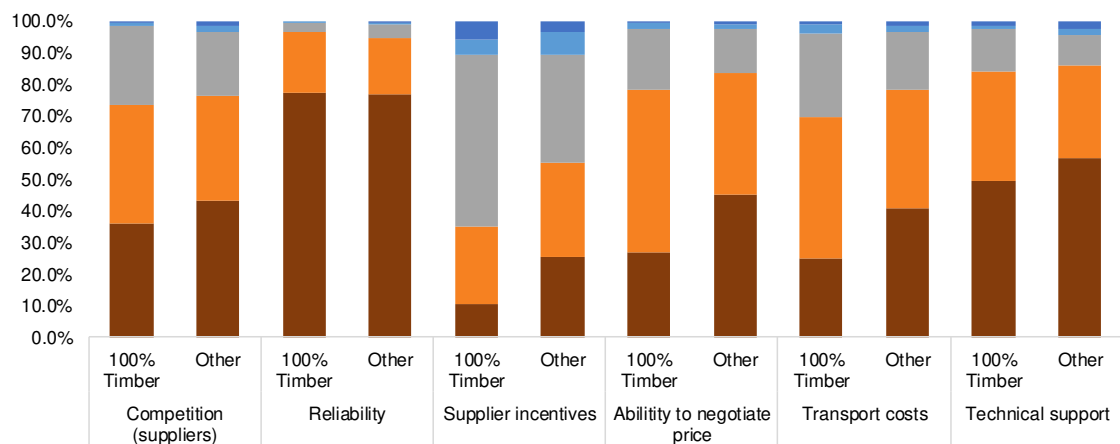
Source: ACI/HIA    ■ Very Important    ■ Important    ■ Neutral    ■ Minor consideration    ■ Not a consideration

Importance of the following factors in the decision to use a particular material for vertical load bearing walls:



Source: ACI/HIA    ■ Very Important    ■ Important    ■ Neutral    ■ Minor consideration    ■ Not a consideration

Importance of the following factors in the decision to use a particular material for vertical load bearing walls:



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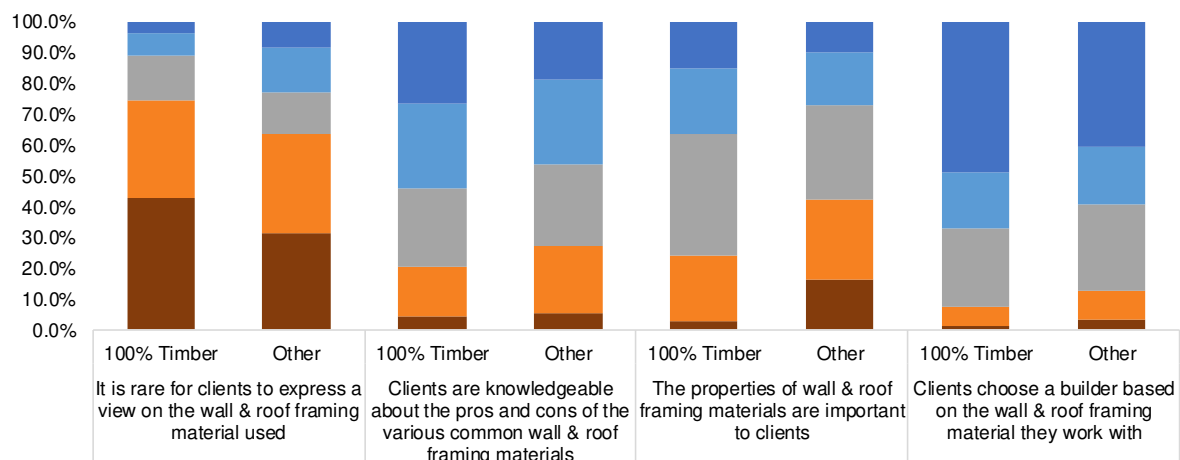
## Perceptions of consumer preferences

This section seeks to assess the preferences and attitudes of new homebuyers with respect to the materials used for the load bearing elements. Survey respondents were presented with a number of statements and were asked to rate their level of agreement using a five-tier Likert type scale.

As in the previous section, responses were divided into two groups: those who build exclusively with timber frames with those who build with other materials and systems (including those who use a variety of materials and systems).

- A large share of respondents agreed that it was rare for clients to express a view on the wall and roof framing materials used in their homes. There was a higher share of those who 'strongly agreed' amongst the respondents who work exclusively with timber frame construction.
- Across both groups there were a large share of respondents who disagreed with the statement that clients chose a builder based on the materials used.
- There was little agreement with the statement that 'clients are knowledgeable about the pros and cons of the various common materials', this was comparable across both groups.
- A greater share respondents using a variety of materials for structural framing elements believed that the properties of the structural framing materials are important to clients. Only 2.7 per cent of those using timber framing strongly agreed compared with 16.0 per cent on those using a variety of materials.

### Do home buyers have preference for materials:



Source: ACI/HIA

Legend: Strongly agree (dark brown), Agree (orange), Neutral (grey), Disagree (light blue), Strongly disagree (dark blue)



## INNOVATION IN STRUCTURAL FRAMING MATERIALS

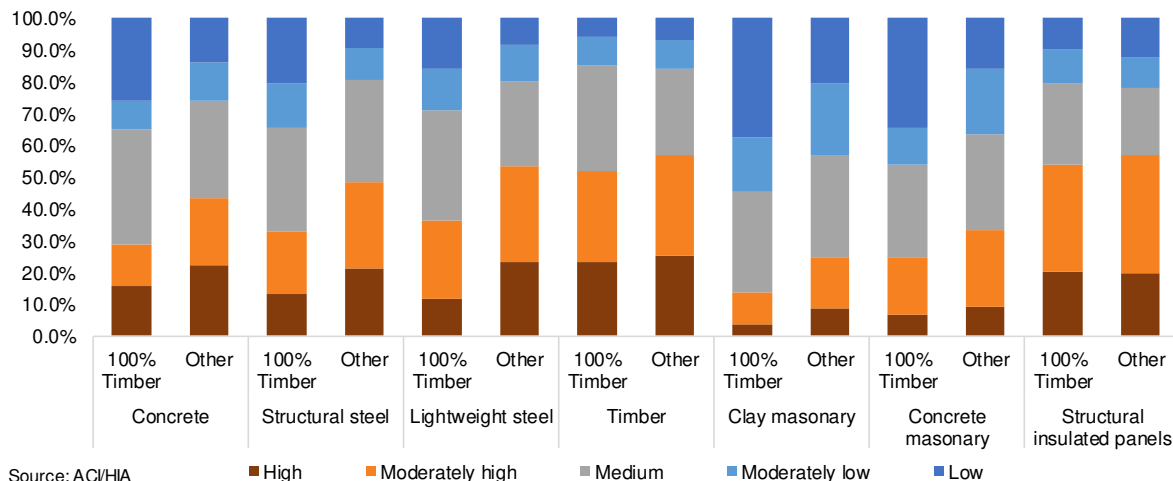
This section of the report discusses the findings of questions relating to innovation in materials and systems used as load bearing elements. Lines of questioning investigated the extent of innovations over the last five years and their perceptions where the greatest opportunities are for innovation in the future.

### Innovations in structural framing materials over the last five years

Respondents were asked to rate the degree of innovation in each of the seven common materials used for structural load bearing elements using a five-tired rating scale spanning 'high' to 'low'.

- As a group, respondents who use a variety of materials had a greater propensity to report higher levels of innovation across all materials.
- Timber had the largest share of respondents reporting a 'high' degree of innovation over the last five years. This was consistent across both respondents building exclusively with timber frame construction and those using a variety of materials.
- SIPs had a slightly lower share of respondents assigning a high rating, but had the highest share of respondents reporting 'moderately high' innovation. When the 'high' and 'moderately high' rankings for SIPs are combined it provides the largest share of affirmative responses across the seven materials.
- A larger share of the group of respondents using a variety of materials indicated a 'high' degree of innovation in lightweight steel framing. Around 11.5 per cent of respondents who exclusively use timber reported a 'high' degree of innovation in lightweight steel framing compared with 23.1 per cent of the respondents using a variety of materials.

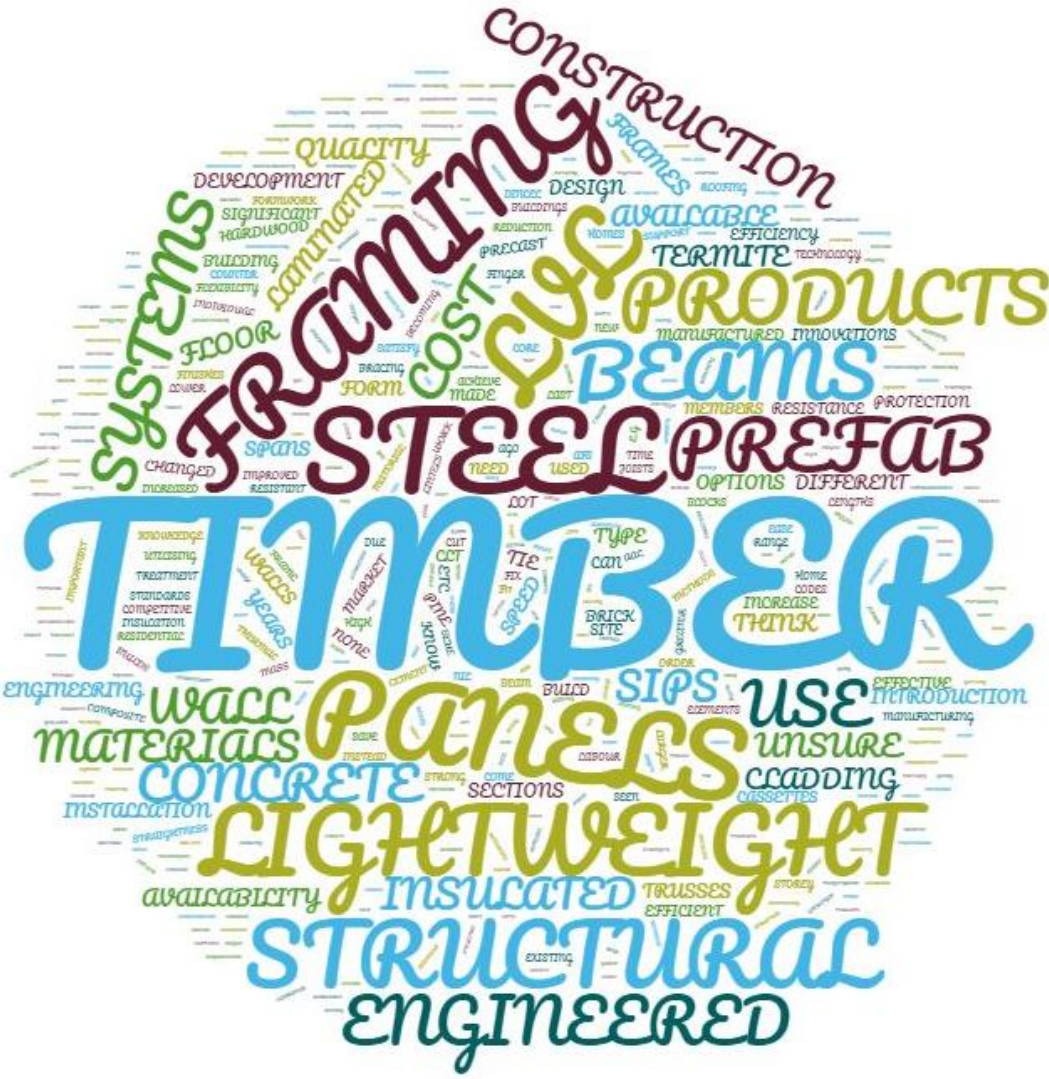
Rate the common wall & roof framing materials in terms of the degree of innovation you have seen over the last five years:



# What have been the most significant or important innovations in structural framing materials over the last five years?

Respondents were also asked to note the most important or significant innovations in materials over the last five years. Responses are presented in the word cloud below (the responses to this question are included in an appendix), the size of the text correlates with the frequency that the word appeared in responses.

- Responses including the term 'timber' occurred with the greatest frequency. Innovations in timber were most frequently cited and related to engineered timber products such as CLT, LVL and GL products.
- It is interesting to note the relatively high frequency with which the term 'systems' appeared in responses. There were also numerous others that cited the proprietary names of building systems.
- Structural insulated panels were also mentioned with a relatively high frequency. These were also mentioned with phrasing such as 'SIPs' and were also referred to as 'panel' or 'prefab' systems.

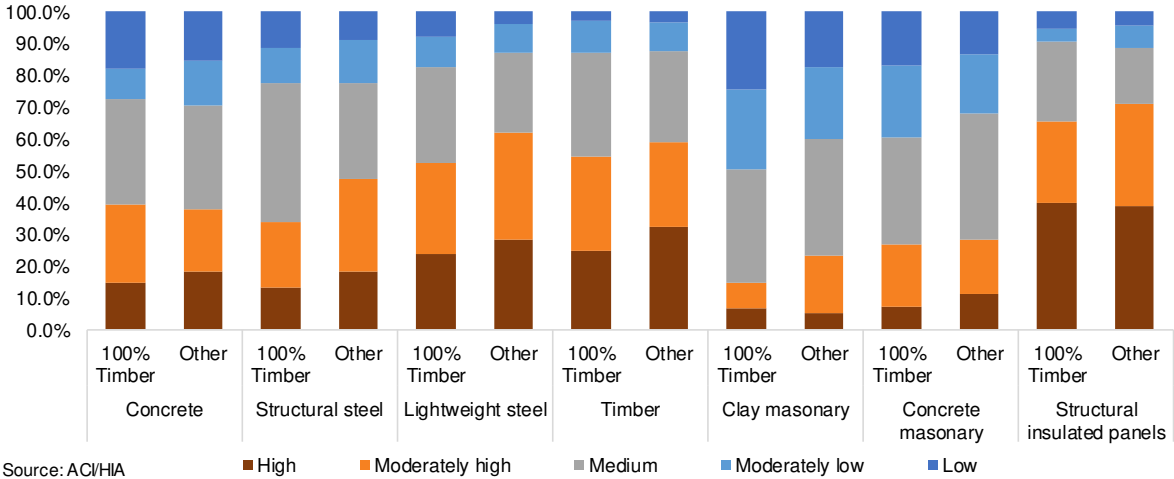


### Where are the greatest opportunities for innovation?

Respondents were asked to rate materials used for structural elements in terms of where they see the greatest opportunities for innovation. As in the previous section, respondents were asked to provide ratings using a five-tiered (high to low) Likert type scale.

- The profile of responses from both groups of respondents convey the opinion that the greatest opportunities for innovation are in 'structural insulated panels'.
- The second highest proportion of affirmative responses (a high rating) were for timber. Interestingly, a larger share of respondents who build with a variety of materials there was how indicated a high degree of opportunity for innovation in timber construction than there was amongst respondents who build exclusively with timber frame construction.
- The proportion of respondents providing a 'high' rating for opportunities for innovation in light weight steel frame construction were only narrowly behind those of timber frame construction.

### Where do you see the greatest opportunities for innovation in common wall & roof framing materials?



Respondents were also asked to note the types of innovations that they would like to see in building materials and systems. The full responses are presented in an appendix.

## APPENDIX A: WHAT HAVE BEEN THE MOST SIGNIFICANT OR IMPORTANT INNOVATIONS IN STRUCTURAL FRAMING MATERIALS OVER THE LAST FIVE YEARS?

- AAC panels
- AAC products Alucabond or similar products Brick & block work
- Ability to pre-fabricate
- Adding external finishes to structural elements off-site (i.e. panelised walls) mass timber options (i.e. CLT/ LVL and Glu-lam timbers) becoming more available and more cost competitive the changes to the code to allow timber framed construction to 25m as deemed to satisfy rising cost of concrete and low availability of concrete labour have necessitated a need to review alternative methods in mid-rise construction
- Advances with engineered timber products
- AFS systems
- AFS type concrete in fibre cement sheet formwork
- All the different options available
- Analytical computing methods to uncover means of further heightening the efficiency & resilience of structural steel frames
- Availability of lightweight steel framing
- Boundary wall details and cladding materials
- Cladding
- Composite housing and CLT
- Concrete
- Concrete
- Concrete counter levers Steel framing materials
- concrete slabs
- Cost
- Cost effective LVL sections. Termite resistant timbers. Incredible lengths available in engineered timbers. High quality and straightness of engineered timbers.
- Development of building techniques utilising thermal mass internally...i.e. reverse brick veneer
- Development of residential steel framing - price competitive with timber alternatives.
- Different appearances and lower costs
- Different type of concrete masonry wall panels and the type of finishings.
- Dintel Wall System
- Diversity in options, more so for cladding materials
- Double brick
- Ease of construction
- Engineered products
- Engineered timber beams e.g. LVL's & GL beams, to counter the shortage of previously available solid timber sections for lintels & beams
- Engineered Timbers
- Engineering
- Energy efficiency
- Expansion of steel framing into the market.
- Factory manufacturing
- Fall through the roof protection
- Flexibility and design technology used in timber trusses
- Flexibility in materiality finishes
- Floor joists, the I-beam. LVL beams and lintels. Bracing
- Floor sections made offsite and fire rated wall panels
- Floor trusses for upper level

- Framing panels, either CLT or insulation panels. However, the technical, engineering and installation criteria with some of these products leaves a lot to be desired.
- Greater knowledge and perception of different construction methodologies
- H2 pine
- I am still of a strong belief that timber is the best framing product because it is renewable, strong and easy to fix into. I believe the biggest innovation is polystyrene ICF type construction.
- I don't think it's changed a great deal
- I don't think there has been many innovations per se, perhaps the cost reduction in treated timber. The increase in the range of cladding going on to the structural framing has improved from an architectural, acoustic and thermal point of view.
- I have no knowledge of any innovations in this period that has made any difference to how we build or save dollars - all systems we use have been around for at least 10 years
- I have not seen any innovations in structural framing materials.
- I haven't seen or heard of any. Nothing significant has changed that I know of since steel framing was introduced 30 years ago.
- I joists
- I would think Structural insulated panels will be a game changer just not that well know about in home builds and might not be as cost efficient yet
- Improved engineered timber beams. Permanent form work systems Dincel, Rediwall, etc.
- Improvements in quality and strength standards and material availability.
- Increase in length of products available.
- Increase in spans and the variety of structural timber cut to order e.g. LVL's in longer lengths
- Increased range of available light weight products
- Individual Structural LVL timber framing members and pre-fabricated timber cassettes.
- Insulated panels
- Insulated panels
- Insulated panels which are load bearing and acoustically superior.
- Insulated structural panelling
- Insulation values – better understanding of heat soak and retention.
- Introduction of H2 timber
- Lam beams
- Laminated beams
- Laminated timber
- Laminated timber products
- Less hardwood and more LVL
- Light weight
- Light weight and water resistant materials entering the market to improve efficiency of installation
- Light weight cladding
- Lightweight foam.
- Light weight insulated panels and blocks that are core filled with concrete after erection
- Light weight plaster board
- Light weight steel
- Light weight steel
- Lightweight steel frames becoming more popular.
- Light weight structural panel
- Lighter and stronger steel framing members
- Lightweight engineered products
- Lightweight manufactured elements.
- Lightweight panels
- Lightweight wall & roofing panels
- Lvl
- LVL & I beam usage
- Lvl availability
- Lvl timber for larger spans

- LVL/high beams
- LVL'S
- LVL'S
- LVLs and I joist systems , have cut down lead times F17 timber beams finger jointed rather than gang nailed
- Lvl's and I-beams
- Lvl's finger joining hardwood together to form new structural f17 s
- Manufactured structural beams
- Manufactured Timber products. Insulated panels.
- Material availability and installation time on site
- Metal noggings
- Modular systems instead of bespoke made to order
- More cost effective
- More development with engineered timbers
- More efficient ways of utilising the existing materials and designs. E.g. Pryda manufacturing 'floor cassettes' in lieu of sending out individual components for onsite construction. Really if it isn't broken, don't try to fix it...
- More LVL used
- More use of lvl beams etc.
- Not a lot has changed in the last 5 years
- Off site design & prefabrication
- Off Site Prefabricated Wall systems
- Over the last five years I cannot think of any significant change
- Panelled systems have increased in popularity
- Perform panels
- Plastic core fill formwork
- Poor quality
- Pre cast
- Pre Fab
- Pre fab cement panels
- Pre fab Frame and trusses, the quality and labour costings save a lot of time and money.
- Pre fab panel options
- Precast panels
- Prefab lightweight steel floor cassettes
- Prefab timber Pre cast panels Concrete walls
- Prefab wall systems
- Prefab walls to speed construction and satisfy structural codes
- Pre-fabricated engineered framing systems
- Prefabricated wall framing
- Quality of materials
- Rapid wall system
- Removing Products From the market which do not come up to standards
- Shear Walls
- Sip
- Sip panels
- SIPS
- SIPS and engineered timber
- Speed
- Speed of construction
- Speed of installation
- Stand up concrete
- Steel
- Steel and tools
- Steel frames from blue scope



- Steel Frames.
- Steel framing but cost a bit high to compete with timber
- Structural insulated panels
- Structural Insulated Panels
- Structural insulated panels
- Structural insulated panels seems to be gaining more awareness.
- Structural insulated panels, light weight timber framing and engineered laminated beams
- Structural light weight panels
- Structural light weight products
- Structural support for products engineering design
- Sustainability
- T2 timber
- T2 treatment to framing timber
- Technology for tie down
- Termite protection
- Termite resistance
- Termite resistance timber
- Termite treatment and flame resistance
- That I know of would be insulated roofing panels, long span steel box sections and laminated timber products
- The advancement in composite framing materials
- The amount of choices
- The combination of products in the one build to achieve an efficient cost effective structure
- The design and engineering of LVLs, beams etc. and the development of cladding materials to complement timber frame construction.
- The introduction of blue steel frames instead of the traditional timber.
- The introduction of LVL beams & FJ primed pine along with FJ structural pine framing
- The introduction of LVL's and Hyspan timber. The termite protection of structural timber. The reduction in the need for KD hardwood (cost and weight)
- The laminated timber industry. LVL etc.
- The only relevance of steel
- The spans they can achieve in relation to sectional size
- The straightness
- The use of engineered timber beams enabling larger spans without the need to use structural steel
- The use of engineered timbers.
- The use of steel
- The use of Tilt slabbing which isn't new but trending in most buildings of late. Pre-Fab is also a massive trend and easier for tradies to install, as all products pre-fabbed come with strict rules and clearances which puts the builders mind at ease, we ensure that all form 15 & form 16 are always supplied, which is VERY IMPORTANT anything structural., this plus audits and engineers sign off.
- The use of timber in multi-story buildings - cassette floor systems
- There hasn't been any framing has remained unchanged basically since trusses came into the picture 20 odd years ago
- There is a greater use of structural steel members in homes due to Council's planning regulations and the smaller allotment sizes, in particular when building two storey homes. This adds a cost of up to \$20k to a two-storey home because we can't use the existing lower wall framing for floor/wall support.
- Tie down and bracing
- Tie down fixings
- Tie downs , fixtures
- Timber
- Timber
- Timber

- Timber farming
- Timber framing
- Timber quality is getting poorer!
- Timber truss development
- Use of LVL beams in construction
- Use of steel Beams
- Using T2 as a standard with all my builds
- Versatility
- Very little in residential markets
- We have to build with Steel we do not have an option due to Cyclone Coding and complying with the BCA and Building Act and Codes
- We have used a system called Dincel which takes away the use of masonry blocks
- Zego, SIPS, colorbond matt, PVC windows



## APPENDIX B: WHAT TYPES OF INNOVATION WOULD YOU LIKE TO SEE?

- 3D printing uses in pre-frame, plastic products for cyclone areas that are flexible with the strength.
- Cost effective environmental friendly products which are easily sourced and are attractive.
- All that save time & money.
- Alternate floor systems.
- Alternatives to brick build.
- Any innovation that controls and / or reduces costs to the end client. Innovation that reduces width of the external wall. Innovation that reduces or eliminates the need for applied finishes in tight spaces such as on built to boundary walls (e.g. Garages on boundaries).
- Any innovation that is efficient to install, cost effective, safe to all workers and the environment and allows flexibility when changes are required by the customer (either during the building process or in the future). Information on the internet has been invaluable to us to source and supply options for customers throughout the building process.
- Anything that saves on labour we will always look at. Insulation in wall framing a batt with a higher R-value that can be used in a 90mm stud.
- Architectural challenges in design.
- Availability
- Better acoustic properties for framed construction methods while keeping costs down.
- Better energy rated wall and roof panels.
- Better energy rated products.
- Better innovation with timber products.
- Better insulation qualities.
- Better materials.
- Better R ratings.
- Better termite resistance warranty for treated pine.
- Better use of timber fabricated structural products.
- Concrete built structures like overseas.
- Concrete tilt-up in smaller scale residential buildings.
- Concrete masonry.
- Continued development of products to improve sustainability factors and reduced carbon footprint, including lifespan.
- Cost effective.
- Cost effective engineered timber options.
- Cost effective off site prefabricated wall systems.
- Cost effective ones.
- Cost effectiveness.
- Cost improvements in new technologies.
- Cost less.
- Cost reductions.
- Cost saving.
- Cost, stable timber i.e. laminated timber.
- Deletion of masonry works.
- Design and fire ratings are always things that do not always work as one... a better combination of the two.
- Design facilities and detailed shop drawings from the manufacturers.
- DG UPVC windows and SIP walls and roofs.
- Different tie down systems.
- Do not see many innovations. It has been the same for years.
- Easier installation and lower cost.
- Easier to install products that have a good visual appearance.
- Economic and efficient materials that reduce the labour cost to install. Labour is expensive and at times unreliable.

- Efficiency quicker turnaround times.
- Energy efficacy in walling.
- Energy efficient & environmentally friendly.
- Engineers and building surveyors actually look at the jobs, not just design something.
- Environmental and lightweight.
- Expansion of alternative materials such as mud brick and rammed earth, particularly in bush fire areas. Greater recognition of the use of re-cycled materials.
- External cladding to minimize scaffolding cost compared with brick work.
- External wall panels.
- Factory fabricated and finished modular panels. Attractive, roof covering materials incorporating solar collectors built-in.
- Faster erection with better external pre finished materials.
- Formed concrete and structural steel design
- Fully finished institute concrete panels
- Fully manufactured timbers.
- Fire Zone (FZ) rated products.
- Getting away from brick veneer construction to more insulating type construction like insulated panels.
- Given I am based in WA and Perth in particular our market has been brainwashed over the years that anything other than double brick is inferior. The innovation needs to come from a marketing point of view to overcome this mindset.
- Go back to building solid brick homes that last 80 years and are termite resistant.
- Greater consideration for environmental impact.
- Happy with what we use now! But always interested to learn new products as they become available.
- Higher rated structural softwoods rather than expense & heavy F27 etc.
- I am of the opinion that the industry will benefit the use of more lightweight pre-fabricated engineered roof, sub-floor and wall framing.
- I think insulated panels are on the mark.
- I would like to see the greater use of structural insulated panels used as party walls between residences.
- Increased capacity for off-site pre-fabrication – greater use of panelised systems (i.e. look at the wall as a complete system, not just part of the structure) more mass timber.
- Innovative timber products become more available.
- Installation efficiency. Cost reducing innovations.
- Insulated concrete panels.
- Item cost, skilled onsite labour requirements and time onsite efficiency, would be my three largest items.
- Just more options & availability on new products.
- Large sections pre-fabricated off site LVLs and manufactured beams that could be used as features.
- Large span floor joist systems for first floors large span bearers and joists for ground floors.
- Larger spanning materials, for smaller costs.
- Less red tape from councils who do not understand the innovation undertaken by the building industry.
- Less red tape on the design aspects.
- Lightweight advances.
- Lightweight for installers.
- Lightweight insulated concrete tilt up panels for external walls and party walls
- Lightweight insulated panels at good price.
- Lightweight insulated panels for large span floor applications.
- Lightweight same strength, better insulation, construction speed, lower costs
- Lightweight beams for carpenters to erect.
- Lighter timber beams/LVL with higher strength.
- Lighter weight composite material.
- Lightweight bricks with the same structural qualities.
- Lightweight concrete roofing materials.

- Lightweight concrete walls.
- Lightweight pre-fabricated wall sections that comply with the structural requirements, including tie-down & which are less labour intensive & more precise.
- Lightweight steel and timber construction.
- Lightweight with good area coverage that is compliant.
- LVL framing timbers to be affordable providing straight frames and trusses.
- Material systems which reduce the labour component for installation.
- Modular framing.
- Modular rooms built of site craned and joined together to form a pre finished house, less site labour.
- More alternatives to masonry.
- More clad frame options to brick veneer.
- More cost effective products using recycled materials.
- More development of PIR panels.
- More development of precast panels.
- More education and training in the use of steel framing.
- More education on insulated panels.
- More efficient and cost effective applications. Less labour.
- More emphasis on off-site manufacture of structural panels. Greater use of lightweight structural elements. More research and development into off site structural modules.
- More focus on sustainable alternatives.
- More insulated panel systems.
- More laminated structural timber.
- More light weight concrete.
- More light weight.
- More lightweight cladding to ensure skilled labour are installing it over unskilled trades.
- More manufactured timber product using renewable resources.
- More options for concrete masonry panels.
- More precast in the residential sector. Greater emphasis on acoustic and thermal considerations in residential décor.
- More products which are innovative but also have a very low carbon footprint.
- More recycled material innovation to decrease landfill.
- More steel/concrete based projects.
- More timber built cladded homes.
- More timber cladding.
- More use of insulated panels as cladding.
- More use of precast concrete as both frame & cladding material in one.
- More variety in Fibre cement wall panelling products.
- Needs to be price competitive, but a more commercial feel where there is less work required onsite and cladding can be almost anything. Allows for more open plan, spanned living that can be changed inside as people desire.
- New materials plastics etc.
- Options flexibility to be creative.
- Panel systems at an affordable rate.
- Panelised and prefab wall products.
- Panelised framing with external substrate already fitted on as well as windows, internal wiring and plumbing fixed at factory before coming to site.
- Pre fab.
- Pre-fab house in factory and assembled onsite.
- Pre fab panels for wall and roof to cut costs.
- Pre finished lightweight cladding systems like Alucabond used in commercial project. Need something that looks residential and real.
- Prefabricated wall panels.
- Pre-finished panel systems.
- Quicker panel systems with higher environmental standards. Products using lower embodied energy to achieve better performance once installed. Panel systems that can simplify the install process and provide a better and easier fire rated system.

- Recycled usage or less building waste.
- Reinforcement of concrete.
- Robotic bricklayers.
- Sips.
- SIPS being more common and affordable.
- SIPS standard designs available.
- Smaller section sizes.
- Solid laminated timber construction.
- Solid walls as a brick alternative.
- Speed of construction.
- Steel frames & panels.
- Stronger lighter weight materials.
- Structural insulated panels.
- SIPs becoming more commonly accepted and more easily sourced in more rural areas, thus more cost effective.
- Sub floors with lightweight steel.
- Sustainable.
- Sustainable timber products.
- Sustainable use of materials, recycling materials (on and offsite), reusing materials in renovations where possible, improvements in waste management of wall / framing materials.
- The development of cost effective LVL studs.
- The use of modular construction that can be added to as the need arises. The councils allowing this to happen in their zonings. The ability for families to live in detached buildings on the one site. This reduces the cost to infrastructure and the need for urban growth. This type of dwelling can adapt to the needs of the community using the site and has the ability to be relocated or make way for a different combination when required.
- The use of steel and timber framing in wall in Western Australia instead of double brick.
- The use of structural engineered plastic beams and components made from recycled materials.
- Thermal.
- 3D printing. Alternative affordable cladding to framed construction.
- Timber.
- Timber & lightweight steel easier to alter, move and fix.
- Timber marked in metre lengths to allow for faster cutting times.
- Timber/concrete flooring combinations to create lightweight and solid flooring. i.e. - Timber cassette pre-fab floor frame with 70mm concrete (in-situ) topping over.
- Training of trades in new products.
- Use recycled materials for some modern systems.
- Using recycled materials for structural purposes.
- Weight reduction, increased efficiency in installation. Straighter pine studs to reduce time spent straightening and planning.
- Whole of system wall floor and roofing materials. Pre finished clip together using sustainable product and practices.

## APPENDIX C: OTHER GENERAL COMMENTS FROM RESPONDENTS

- Again a better awareness of lifespan and sustainability value on products
- Although traditional carpentry is heavily skewed toward working with pine framing, it would be beneficial for carpenters to be taught the basics of working with lightweight steel framing, and follow on trades such as roofers, bricklayers, plumbers, electricians being informed of the relevant considerations for each trade.
- As I mentioned in my answer above overcoming the negative stereotype of framed construction is the biggest hurdle faced by Perth builders. Every builder I talk to would jump at going to fully framed construction given the issues we have with quality in terms of bricklaying and plastering, not to mention how slow double brick construction is. I am actively trying to encourage my clients to consider alternative construction methods. I have been getting raised eyebrows from my potential clients when I tell them my next house will NOT be built in brick.
- Australian companies are quite innovative so better products will continue to arrive on the market.
- Being a Carpenter and all my tools are for working with timber it is hard to change to steel! I enjoy the flexibility timber provides for changes during construction etc.
- Bracing is a big consideration
- Cheaper hardwood pine has taken over will it last
- Connections and fixing tools continue to improve
- Cost saving
- Cut your frame and roof- hasn't changed in 300 years, costs 15-20 points more- suits a modern skillion design and any other design, a meteor can hit one side and because of built in redundancy- everything will be ok- hit a highly stressed truss and it'll all come down like a house of cards. AS1684 was created for a reason, now everything is market driven by price not quality. Dislike tiled roofs
- Easier codes to understand
- Easy to install and needs to last
- Education is holding back implementation of SIPS
- Engineered timbers
- Flexibility in systems and technical supports
- For my business with its architectural focus, timber with its ability to be worked on site and changed is the most effective material.
- Gridded measurements stamped on
- Here in WA the brick manufacturers have done a great job in convincing the public that anything other than double brick construction in an inferior build. Roofs are still constructed as stick roofs, timber trusses would be rare in the WA metro environment. There is however a growing trend towards wall and roof framing systems as more and more people gain knowledge
- Higher energy efficiency
- I am establishing a new product called Perform Panels which are fully insulated finished insitu concrete panel with A1 fireproof abilities and thermal rating of R 2.0
- I believe that timber gives the builder the greatest flexibility especially in terms of what can be carried out on site.
- I believe the industry in general, as we progress through time, is more accepting of change in the use of materials in all applications of construction.
- I don't think it's as much about the materials being used as the way we use them becoming more sophisticated
- I think pine is still the most efficient method.
- I think residential construction is probably developed as far as it can go using timber frames. Of course engineered timber products - LVLs etc. will become relied upon more, and fabricators supplying more complete construction of components instead of sending out individual pieces for onsite construction. We build only custom homes, so material function and flexibility within material choice is very important for us.

- I try to include hand pitched roofs with raked ceilings in at least the living areas with my builds. It does add a bit of extra cost but when it is all finished you get that real wow factor
- I would like to see all framing components clearly date stamped at time of manufacture in the factory. (as do James Hardie, CSR)
- I would like to see better and more cost effective tie down systems
- In the casuarina area NSW we need speed in construction, so timber seems to meet the costs and speed consideration. Cost always seems to be an issue as the project homes are killing innovation of the home building market with the only option that they push is the standard timber frame and brick veneer. We are trying to change the wall framing type of construction but we are restricted by the influx of project homes on waterfront blocks.
- Insulated panelled roofing
- It is a combination of owners, builders and building designers that make the decision
- It is a concern about the availability. Hardwood to be more accessible
- It is very difficult to change the habits of tradespeople, they get used to using materials and sometimes for a good reason that they just work, a lot of materials seem good but when it comes down to details they are lacking and end up taking longer and costing more than traditional methods. If manufacturers want their product to be successful they need end users tradespeople to get involved with the early design ideas to make sure that all the details are covered early.
- It will be very hard to change
- Keeping cost down & improve trade supply
- Lightweight steel is hyped and over rated.
- Manufacture to more available sizes to avoid waste and consideration to the fact that new building site dimensions are shrinking.
- More colorbond, less roof tiles, less trusses and more pitched roofs with raked ceilings
- More development into making precast concrete wall and floor panels permanently waterproof as there are many developments (particularly apartments) with water ingress problems.
- More FZ rated products e.g. eaves, wall claddings
- More hardwood for frames
- More information on steel framing
- My personal preference is timber framing as I believe that this is the most environmental and acoustic/ thermal solution available. However a lot of clients would prefer steel frame because of a fear that termites can eat the timber (even though is not possible with treatment) and most people want a solid brick construction as it is perceived to be strong, thermally great and secure. I believe there needs to be more education given to the general public in regards to timber construction and its all-round benefits over brick construction.
- New products are not backed up with tried and true weather proofing principals or effective engineering covering construction, hold down or bracing.
- Not enough carpenters have the skills to interpret plans and hand cut wall frames and roofs in a timely manner
- Performance, cost, installation speed and ability.
- Prefab has improved over the last 10 years
- Research into the corrosive aspect of condensation on light weight steel wall and roof frame. You see steel trusses with steel battens and steel roofing without any barriers like anticon. Warm inside cold outside condensation forms under the roof sheet and runs down the steel framing. These frames are so light that you cannot weld them they are riveted or tek screwed together.
- Since the advent of engineered timber there has been slow progress in the improvement of building systems that are both economical and accepted by the building industry. Any new systems must be affordable and provide certainty to builders that they won't cause maintenance & warranty issues.
- So used to traditional methods, change is tuff unless very good marketing is in place to understand better options
- Solar Panel Custom Orb Roof Sheeting.
- Stay with timber
- Steel framing is a hassle, comes in fully engineered panels and can't be easily modified.



- Steel framing is more suited as a wall and roof framing materials. Lack of skilled labour to erect framing.
- Stick roof more workable
- Stoddarts have the most efficient systems available on the current market for steel frames and innovative solutions
- Straightness is very important
- The easier to use and more sustainable the materials, the better for the industry and environment
- The innovative use of modern timbers and systems is an exciting and ever changing field.
- The use of timber wall and roof framing is a renewable resource, flexible in its use and has the ability to be used in multi-residential and commercial high-rise construction. We need to accept this type of construction and adopt it. This allows us to use our renewable resources and to grow more. The by-product of this is the ability of nature to clean up the planet.
- There has been little to nil development in this sector for a long time. In fact, it is my opinion that if the industry cannot get around the constant price increases, quality issues & general supply, then lightweight steel will ultimately surpass, not because it is better, but because it is more predictable.
- There should be a percentage of recycled materials used on every project regardless of size.
- Timber is my preferred material as it is versatile, strong and easy to work with. Combining timber frames with panels for insulation and acoustic is where I would like to see more products to work with.
- Timber seems to be the easiest material to work with. Lighter than steel & more flexible in design
- Too much reliance on engineers who do not know enough about actual framing (i.e. what will work and what won't work). Buildings we framed 30 years ago are still standing without major cracking yet in today's building world engineers say it doesn't work.
- Too many homes are being built out of non-termite resistant timber, leaving the onus on the homeowner for termite protection. As most do not have access to wall and roof frames, considerable damage can occur before termites are detected. It is increasingly difficult to source good timber for framing - the demand is resulting in unstable framing materials, with high moisture content. LVL's avoid this, but it is unclear whether any toxic glues are used in the lamination process.
- Trade Certification in Installation of Claddings and Framing types to increase Trade Base
- Try to use a lot more waste timber or reduce what the leave behind
- Use of lightweight steel can sometimes be restrictive on site where there is little room for error.
- We are always looking for better ways to do things but at the end of the day the most cost effective way for us is to build on site with traditional methods. We are saving time with fixings such as stud screws etc.
- We choose timber as it's easier to amend on site where needed, steel has been known to warp and twist in heat, steel has terrible acoustics and also moves a lot more with heat and element exposure.
- We must continue to teach, facilitate to improve quality. Quality remains after price is forgotten.
- We still cannot build without timber



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