

# Trends and potential for use of sawn timber in buildings

Ian Page , Manager, Economics, BRANZ

## Introduction

The use of sawn timber in new buildings is described. Survey data on materials used in buildings was analysed to obtain market share and size for sawn timber use by building type. The main data source is a series of surveys undertaken by BRANZ over a number of years, (Page, Curtis 2011). The surveys record framing, flooring and joist types, and claddings. The data enables market share trends to be monitored and it indicates segments where timber products have scope for extending their market share. Wood-based panel products are not considered in this report.

## Summary

The main findings are:

- The approximate volume of local sawn timber consumption is 1.8 million cubic metres. Of this about 0.8 million cubic metres is used in new building works.
- The other 1.0 million cubic metres is believed to be used in the manufacturing sector for items such as joinery, furniture, packaging, crates and pallets, in some civil engineering applications, agriculture and transport.
- Growth in market share for timber framing is available in industrial buildings (warehouse, factory, some retail, and farm working buildings). The latter is a large segment and is worth investigating further.
- The hotel, health, and office sectors have low

timber framing percentages (about 10-15%) and there would appear to be considerable opportunities for timber-based structural systems in low and medium-rise buildings.

- There is further scope for engineered timber joists to gain market share, and the value case depends on ease of handling and possible time savings.
- Outside the building sector there are a large variety of uses of sawn timber and further investigation of these may reveal opportunities and threats.

## Sawn timber in buildings

Figure 1 shows the relationship between sawn timber consumption and building activity. There is a fairly close correlation ( $r = 0.58$ ) but well short of complete correlation ( $r = 1.0$ ) due to the other uses of sawn timber outside of the building industry.

Further details of consumption and building activity are in the appendix.

The estimated current volume of sawn timber use by component is shown in Table 1. Framing is the largest segment followed by sub-floors (floor joists and timber piles). Further details of the modeling are in the appendix.

## New housing

Time trends in the structural frame types are in Figure 2 and Figure 3. Timber frame share in new

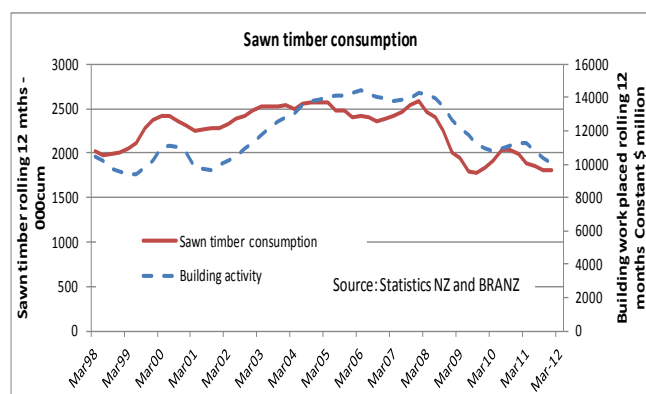


Figure 1 Sawn timber consumption and building works

Table 1 Sawn timber use by building component

Sawn timber volumes (000cum) in building work Year ending December 2011			
	Residential	Non-residential	Total
Subfloor	48	37	85
Framing	453	148	602
Weatherboards	21	1	22
Fencing	20	na	20
Formwork	8	32	40
Retaining wall	7	na	7
Decking	6	na	6
Finishing	39	11	50
	603	229	832
Source: BRANZ.		na= not available.	

housing has declined slightly in recent years, mainly due to rises in light steel framing and the “other” category (concrete masonry, earth-brick and straw-bale).

Most new housing in recent years has been

constructed on concrete floor slabs. However about 9% of new houses were on timber foundations, see Table 2. About 76% of new housing is single storeyed leaving 24% with upper floors supported by joists. Joist types for single and multistorey houses are shown in the table. Traditional solid timber joists have the largest share, but engineered joists such as timber I-beams (23%) and “other” (i.e. light steel, diagonal steel webs, etc, 13%) are significant in size. I-beam joists gained market share rapidly from about 2002 but have been steady in recent years.

Sawn timber is used as claddings (weatherboard) on buildings. Market shares for wall claddings in new housing are shown in Table 3. Since leaky buildings awareness increased after 2002 there was a return to traditional claddings including timber weatherboard, from about 4% share pre-2002 to about 14% now. A similar trend occurred for fibre cement weatherboard from about 3% in 2002 to 14% now.

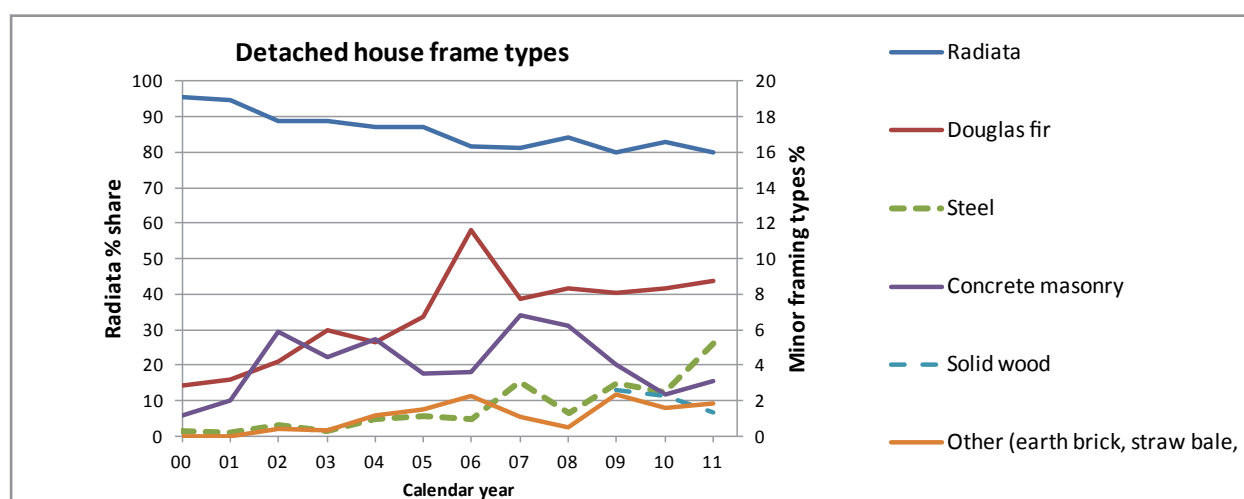


Figure 2 Trend in house frame types

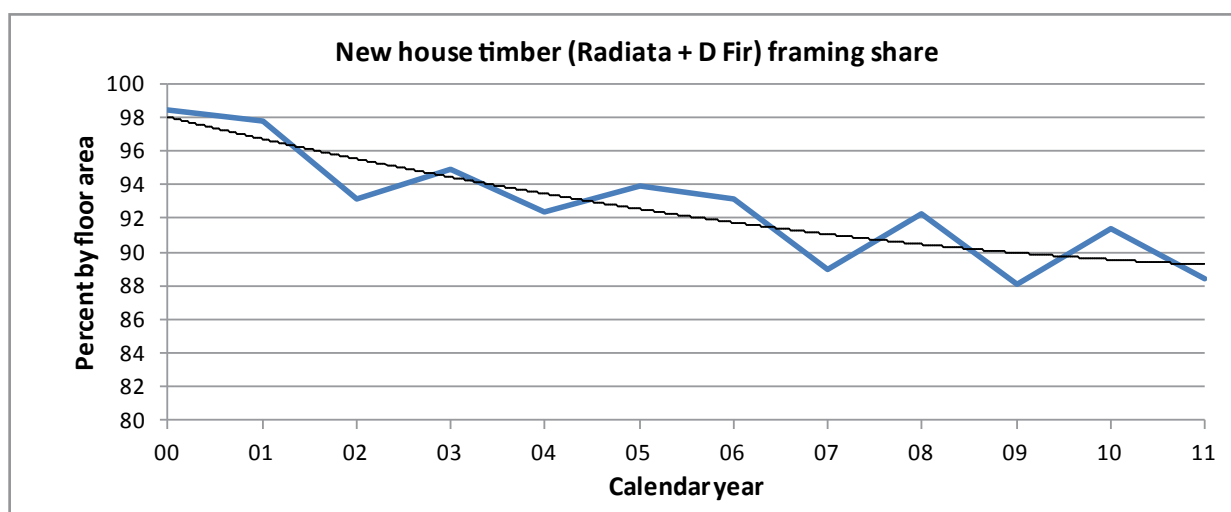


Figure 3 Timber framing in new housing

Table 2 Floor joists in new housing

Floor joists in new houses						
Calendar year	07	08	09	10	11	Average
Houses with all	Percentage					
timber floors	7.4	12.8	9.4	7.5	9.6	9.3
Single storey houses	74.1	73.9	76.9	78.2	78.3	76.3
<b>Timber floor joists</b>						
Solid timber	63.4	62.7	64.7	63.7	64.8	63.9
Timber I-beams	24.7	23.7	23.7	24.3	20.0	23.3
Other	11.9	13.6	11.6	12.0	15.3	12.9
Source: BRANZ New Dwellings Survey						

Table 3 Wall claddings in new housing

Wall cladding for new houses						
Year end December	Percentage					Average
	07	08	09	10	11	
Fibre cement sheet	4.7	2.7	3.1	2.0	2.2	2.9
Clay Brick	42.4	44.3	44.2	44.3	46.1	44.3
Timber Weatherbd	12.8	8.8	10.8	12.3	14.0	11.8
EIFS (1)	7.0	7.9	6.8	4.9	4.9	6.3
Stucco	2.3	2.3	3.7	4.9	3.4	3.3
Fibre cement plank	11.7	13.1	14.6	14.0	13.8	13.5
Concrete blk.brk, panel	9.8	10.8	5.8	7.8	6.3	8.1
Ply sheet	2.9	3.3	3.3	2.9	3.1	3.1
Other (2)	6.3	6.6	7.7	6.8	6.2	6.7
Total	100.0	100.0	100.0	100.0	100.0	100.0
(1) EIFS is coated polystyrene.						
(2) Other includes PVC weatherboard, sheet steel, natural stone, solid timber, log profile, earthbrick, etc						
Source: BRANZ New Dwellings Survey.						
Percentages allow for several cladding types per dwelling, e.g. brick ground floor, fibre cement upper floor, etc.						

## Non-residential buildings

In the non-residential sector the overall timber frame share is about 16% but varies over time depending on the mix of building types, see Table 4. High-rise buildings such as offices, hotels and base hospitals tend to be steel and/or concrete frame, and their incidence varies from year to year as large projects are started. However there are a number of low and medium-rise buildings in these sector which may be suitable for wood-based structural systems. Education, social/cultural and retail buildings have a higher percentage of timber buildings than the other types of non-residential, though their timber share is still quite low.

The floor areas from building consent data are shown in Table 4 by type of building. The largest segment (by floor area) is farm buildings, and though they tend to be simple structures with few internal walls the volume of structural material is large.

The volume of sawn timber by component for 2011 is shown in Table 5. The main segments are framing (walls and roof trusses) and the subfloors (floor joists and timber piles).

The main potential is seen to be in 3 main segments:

- Framing in non-residential buildings

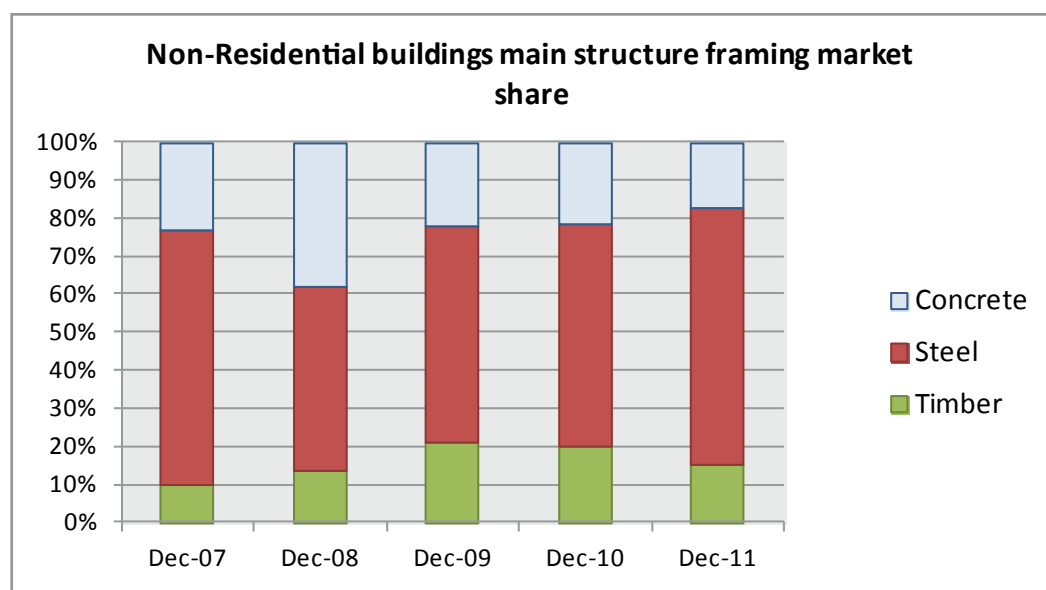


Figure 4 Non-residential building frame types

Table 4 Average framing shares by non-residential building types

Non-Residential buildings main structural frame							
Average market share December 2007-2011 %					5 yr total	Ave timber	
	Concrete	Steel	Timber	Total	Sample size( numb	floor area (000sqm)	vol per yr cum(000)
Hostel	80	0	20	100	48	331	6
Hotel/motel	46	39	15	100	42	453	8
Hospital	20	70	10	100	27	651	11
Education	22	43	35	100	201	1577	32
Social/cultural	30	10	60	100	58	1259	29
Retail	25	50	25	100	122	2391	33
Office/admin	57	33	10	100	159	2319	40
Warehouse	7	88	5	100	250	2690	29
Factory	24	71	5	100	190	2459	20
Farm	4	76	20	100	405	4383	57
Miscellaneous	35	40	25	100	70	304	5
All Buildings	25	59	16	100	1572	18486	272
All buildings is the sum of the weighted share of each building type.							
Market share is based on the floor areas.							

- Engineered floor joists.
- Weatherboard claddings

In non-residential building timber framing has an overall 16% share, and for most building types the timber share is quite low. Social/ cultural, hostels, and primary education buildings often have a domestic scale of construction and use the NZS3604 Timber-framed buildings standard. Hence their timber framing share is quite high. Other simple building types, e.g. industrial buildings (warehouse, factory and

farm, also some retail) have quite low percentages for timber framing. They have good potential for gains in timber share.

For more complex buildings, (e.g. offices, hotels, hospitals) the traditional structural systems are in concrete and steel. However timber based multi-storey framing systems are under development and have been used in a few local buildings. There is considerable scope for these new systems to gain market share in the low and medium rise segments.

Table 5 Timber volumes

Sawn timber Volumes (000cum) in building work Year ending December 2011			
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Subfloor	48	37	85
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The farming sector appears to offer good potential for timber, currently dominated by steel, see Figure 5. It already has large timber volumes but expansion is feasible. One of the main sawmillers, CHH, have developed simple portal frame systems for farming use and provided design manuals, but it is not known how often they are used.

Engineered timber joists commonly use LVL in the flanges of the I-beams. While these are a substitute for solid timber they enable the manufacturers to add value to the sawn timber used in their manufacture, and for the builder the advantages are easier handling and quicker construction compared to solid timber. At about 23% market share in new housing there is some scope for expansion of market share.

In new housing timber weatherboard share is up to 14% and fibre cement weatherboard has a similar share. Whether or not weatherboard has further scope for increasing market share will likely depend

Table 6 New dwelling frame types.

New dwellings framing types												
Calendar year	00	01	02	03	04	05	06	07	08	09	10	11
	Percentage (based on floor areas)											
Radiata	95.5	94.6	88.9	88.9	87.1	87.2	81.5	81.3	83.95	79.9	83.0	79.7
Douglas fir	2.9	3.2	4.2	6	5.3	6.7	11.6	7.7	8.3	8.1	8.4	8.7
Steel	0.3	0.2	0.6	0.3	1	1.1	1	3.1	1.3	3.0	2.5	5.3
Concrete masonry	1.2	2	5.9	4.5	5.5	3.5	3.6	6.8	6.2	4.0	2.3	3.1
Solid wood			prior to 2009 solid wood was in radiata.							2.6	2.3	1.3
Other (earth brick, straw bale, triboard, etc)	0.0	0.0	0.4	0.3	1.2	1.5	2.3	1.1	0.5	2.4	1.6	1.9
	99.9	100.0	100.0	100.0	100.1	100.0	100.0	100.0	100.3	100.0	100.0	100.0
Source: BRANZ New Dwellings Survey												

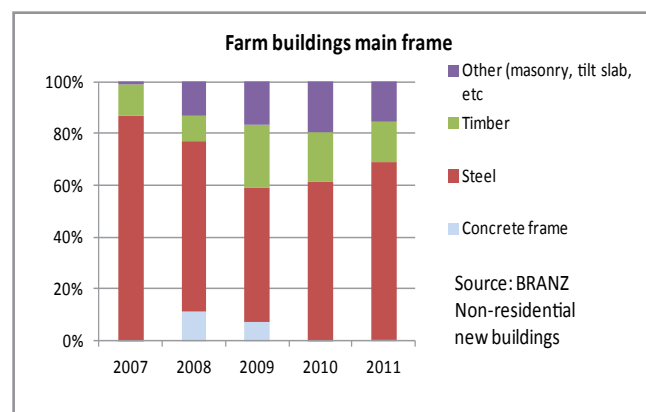


Figure 5 Farm buildings framing types

on aesthetics and cost factors. The main issue is maintenance with the dominant brick cladding (44% share) having some advantage in this.

This report is mainly about timber use in buildings, but the majority of sawn timber is used outside the building industry. Some will be used in civil engineering type structures, i.e. large retaining walls, port structures and as formwork in bridge and other civil concrete structures. But most of the 1.0 million cum identified earlier will be used in manufacturing, agriculture and transport sectors. A study of these uses could reveal threats and opportunities for sawn timber.

## References

Page I, Curtis M (2011) Physical characteristics of new dwellings. Study Report No261, Building Research Association of New Zealand. <http://www.branz.co.nz>, Publications, Study Reports.