

Study Report

SR448 [2021]



Physical characteristics of new non-residential buildings 2019

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Preface

This is the fifth annual report providing the results of the BRANZ Non-Residential Survey. BRANZ surveys builders and designers of non-residential buildings on the physical characteristics of the building. The purpose is to obtain data on non-residential buildings that is not available from official sources. This data includes what type of materials are used. The data is useful for studies in the fields of sustainability, energy efficiency, durability and engineering.

Acknowledgements

This work was funded by the Building Research Levy. We would like to thank all of the builders and designers who filled in the survey form and returned it to BRANZ.

Physical characteristics of new non-residential buildings 2019

BRANZ Study Report SR448

Author(s)

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Reference

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Abstract

Official data on the characteristics of non-residential buildings is limited. Building consents data held by Statistics New Zealand gives numbers by building type, value and floor area, aggregated into territorial authorities and regions. However, there is no data on materials used.

BRANZ began surveying builders and designers in 1998 to obtain data on materials used. We have since compiled a database of approximately 400 non-residential buildings per year containing information on the materials used by building component.

This report contains the results of these surveys on the materials used in new non-residential buildings. The aim is to provide information useful to building material manufacturers, retailers/wholesalers, builders, designers, researchers and government officials.

Keywords

Materials, building envelope, claddings, floors, framing, insulation.

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1. Introduction

BRANZ surveys about 2,000 non-residential buildings per year in the BRANZ Non-Residential Survey. It collects a variety of data on materials used in new and altered residential buildings.

The survey is a postal survey to the builder or designer identified on the building consent application form, and the questions relate to each individual consent. Generally, 400 returns are received each year. An incentive is offered (a Lotto ticket or book voucher) for the return of each survey form.

The consent information is obtained from the What's On¹ building consent data. BRANZ uses this to determine a sample of non-residential buildings for each period from 31 territorial authorities. The territorial authorities surveyed are:

Auckland	Christchurch	Dunedin	Franklin
Far North	Gisborne	Hutt City	Hamilton
Invercargill	Kapiti	Manukau	Marlborough
Napier	New Plymouth	North Shore	Porirua
Palmerston North	Queenstown	Rodney	Southland
Tauranga	Thames-Coromandel	Tasman	Waikato
Waipa	Wellington	Western Bay of Plenty	Whangarei
Waitakere			

The survey form is constantly evolving to include new questions as required. However, it is important for BRANZ to keep the survey form as simple, concise and clear as possible. Therefore, BRANZ keeps the survey form to a single page.

BRANZ weights the responses by the share of building activity for each building type in the calculation of the market share. This prevents some building types (such as farm buildings) from having a disproportionate share of the total market share should BRANZ receive a larger number of survey returns of one building type.

Using the data collected, representative estimates of the incidence and proportions of many different materials can be made. The components analysed are:

- roof claddings
- wall claddings
- main structure
- partition wall framing
- wall infill framing
- wall insulation
- ceiling insulation
- floor insulation.

¹ *Whats-On report (Monthly)*. BCI New Zealand, Auckland, New Zealand.

A limitation of the survey is that it does not ask why certain materials are selected. This means that the report contains no commentary on why material trends might be changing.

The value of new non-residential consents is presented in Figure 1 broken down into three different building types – institutional, commercial and industrial.

Since 2012, the value of consents for new non-residential buildings has increased to reach a record high in 2019, with the total increasing from \$5,429 million in 2018 to \$5,571 million in 2019.

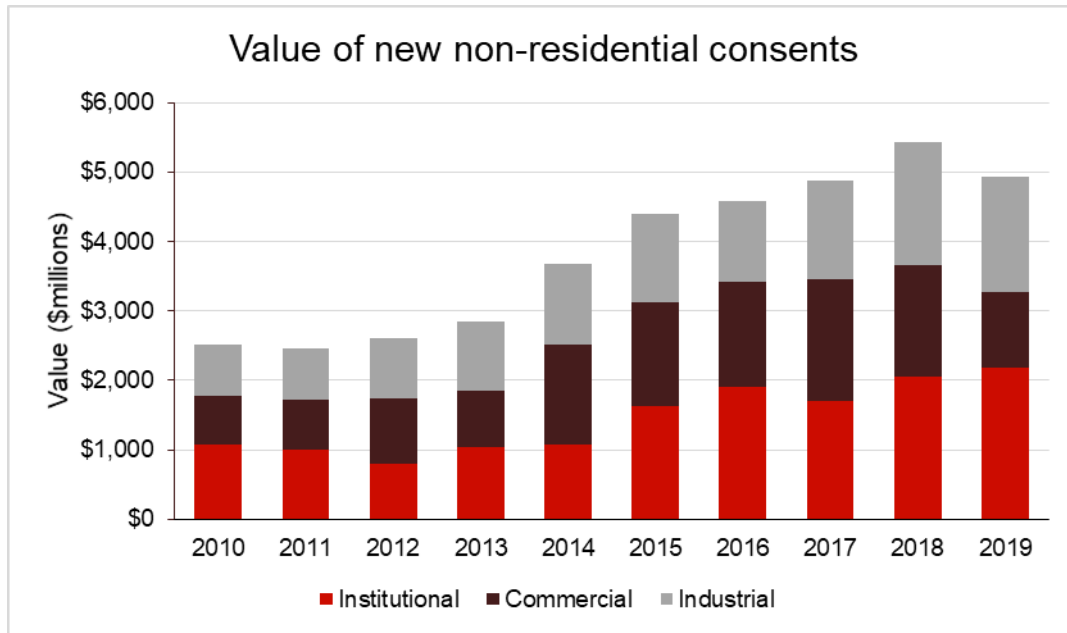


Figure 1. Value of new non-residential consents.

2. Summary

In general, many of the market shares of materials have been relatively steady over the years surveyed.

In 2019, partition wall framing market shares became relatively even, with steel, timber and 'other' ranging from 30–39%. Steel remains the primary material for main structural framing. Steel and other metals are also the most common roof and wall cladding.

Timber remains the most common material for infill framing – the framing between the main structural elements – closely followed by steel.

For insulation, fibreglass is no longer as dominant, with the 'polyester and other' category now ahead for wall insulation. Polystyrene is still the most common insulation in insulated floors.

3. Main results

Key results are shown in the following charts. The data for these charts is in the tables in Appendix A.

Due to the variations in the mix of buildings year to year, market shares can be highly variable. Therefore, changes in share may be due to a change of building types rather than a change in preference for any particular building material.

3.1 Roof claddings

Sheet metal is the dominant roof cladding for new non-residential buildings, with an increase in 2019 to 91% (Figure 2).

The 'other' category consists of membrane roofing, insulated panels and plastic film used on farm shelters. Use of plastic film on farm shelters has continued to drop from a peak in 2016, falling to its lowest levels over the analysis period for this survey. Metal and concrete tiles are relatively uncommon in non-residential buildings.

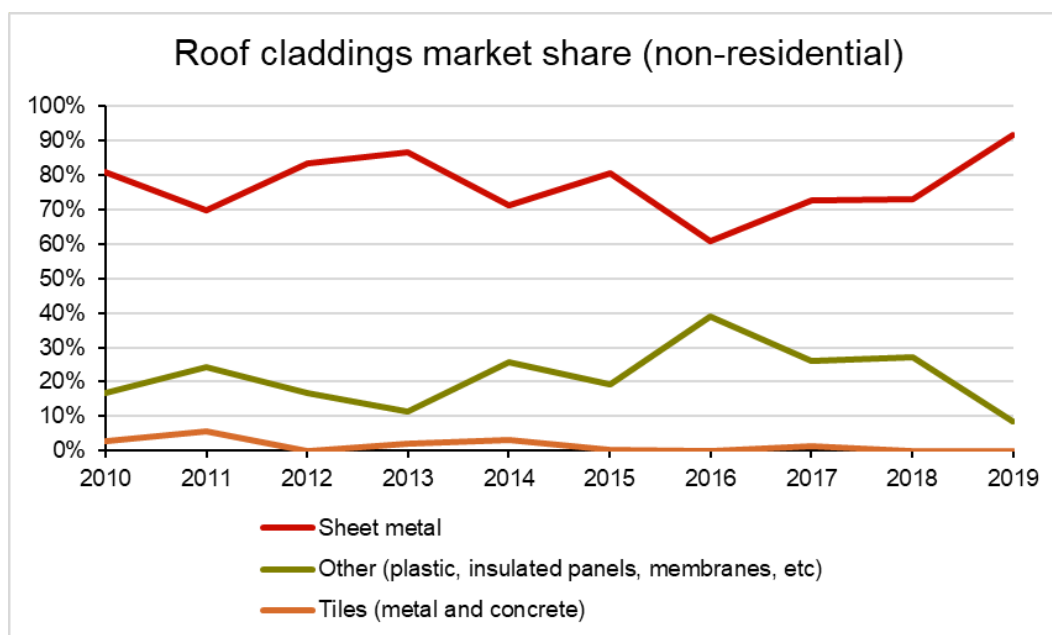


Figure 2. Roof claddings market share.

3.2 Wall claddings

Steel, aluminium and other metals are the dominant wall cladding material, continuing to hold around 50% market share due to their dominance on industrial and farm buildings (Figure 3).

Concrete (mainly precast panels) tends to be variable but remained steady in 2019. The 'other' category also remained the same as in 2018 and will be a trend to watch out for in future years to see if this range of claddings, including glazing, fibre-cement and autoclaved aerated concrete (AAC), remains steady after a consistent climb from 2015–2018.

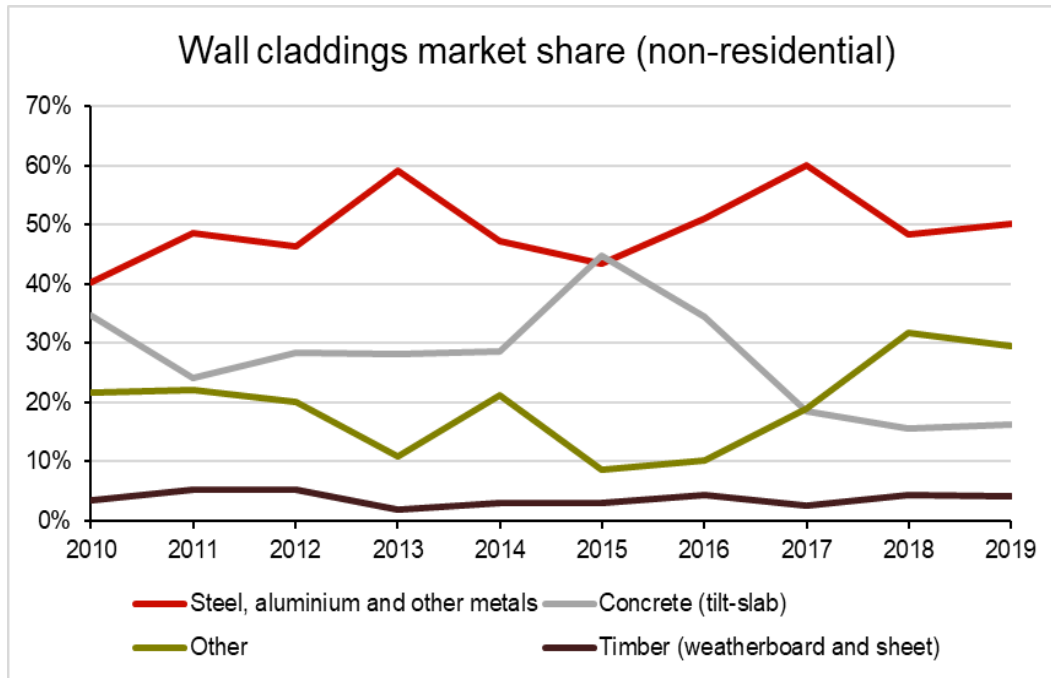


Figure 3. Wall claddings market share.

3.3 Main structure

Use of steel in main structural frames increased again in 2019, following a dip in 2018 (Figure 4).

Concrete has only slightly increased from 12% to 14%, and timber framing decreased its market share in 2019.

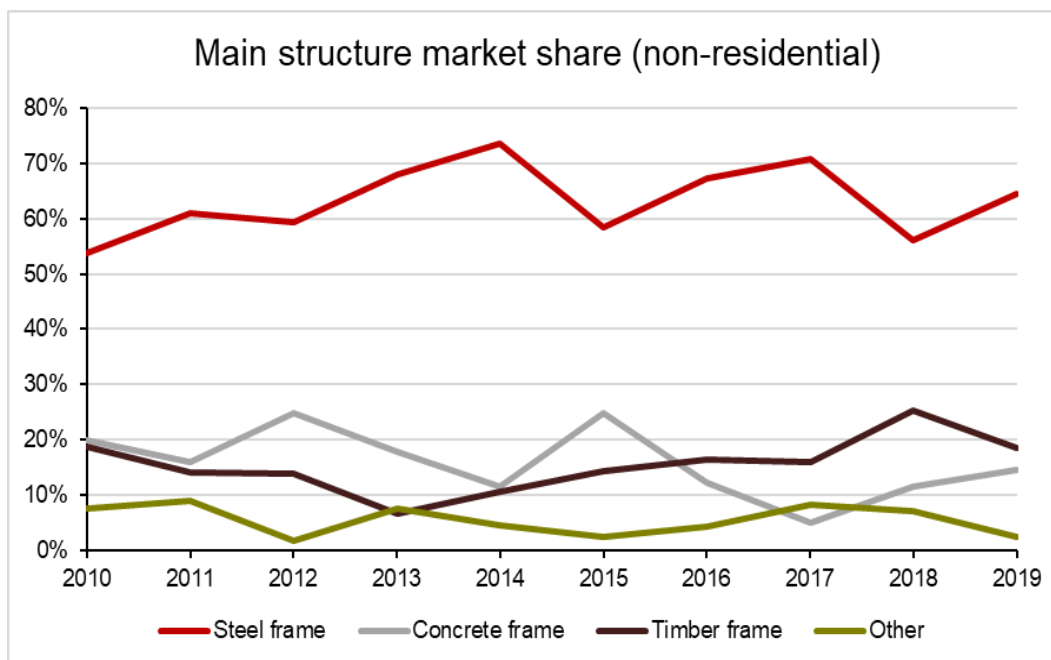


Figure 4. Main structure market share.

3.4 Wall infill framing

Wall infill framing is the framing between the main structural frames. Timber framing remains the main material type for this application, although this has dropped from a 54% share in 2018 to 37% in 2019 with concrete and 'other' both increasing. Steel is in second place and retained the same share as 2018 (Figure 5). The 'other' category often includes glazing.

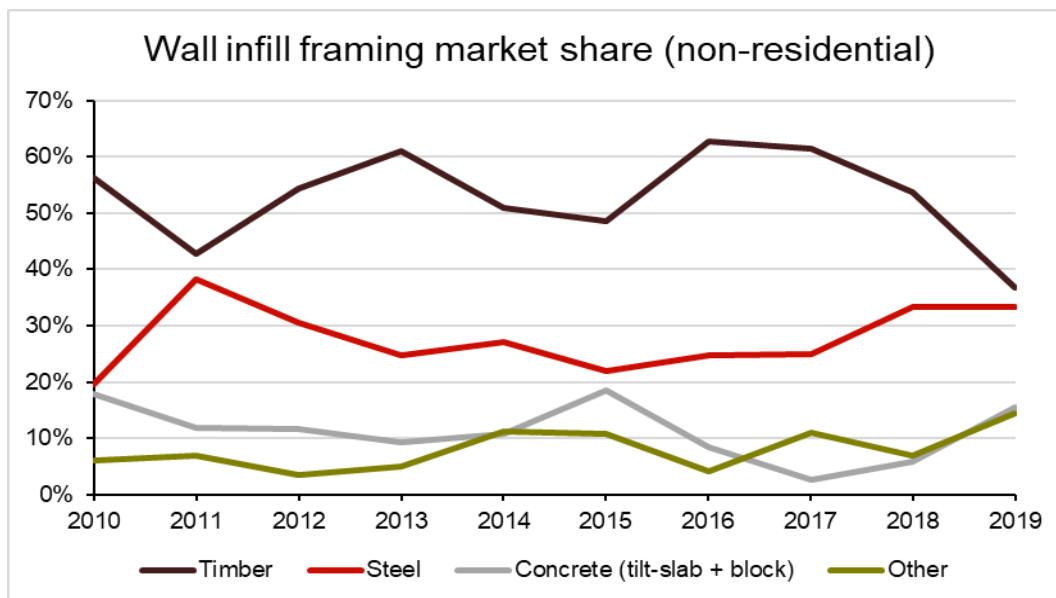


Figure 5. Wall infill framing market share.

3.5 Partition wall framing

Timber continues to decrease its market share for partition wall framing, falling to 31% in 2019, sharing a similar market share to 'other' (Figure 6). The 'other' category includes insulated panels and glazing and has increased from a 17% market share in 2018 to 30% in 2019. Steel's market share dropped but remains the highest at 39%.

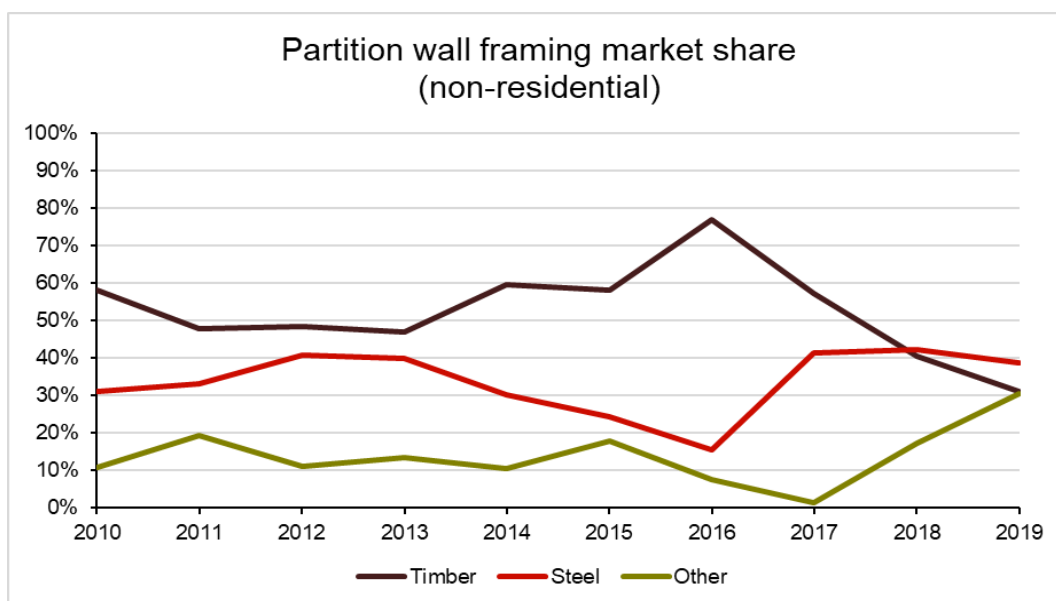


Figure 6. Partition wall framing market share.

3.6 Insulation

Wall insulation, ceiling insulation and floor insulation are dealt with separately in this section.

Farm buildings have not been included as it is uncommon for farm buildings to use insulation and they have a large share of the non-residential building market.

3.6.1 Wall insulation

For the first time since 2010, fibreglass is no longer the dominant wall insulation material with a share of 45% (Figure 7). The use of polyester has been slowly growing over the past decade, and after a brief drop in share in 2018, the 'polyester and other' category now has the highest market share at 55%.

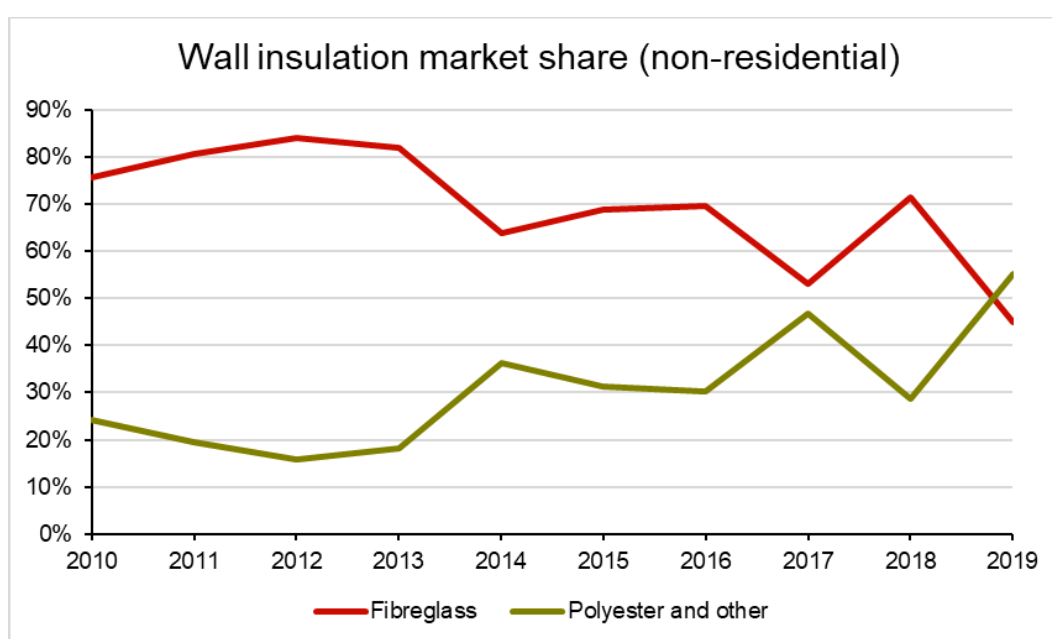


Figure 7. Wall insulation market share.

3.6.2 Ceiling insulation

Normally most buildings use the same insulation material in the wall and ceiling, which means that market share in each market tends to follow the other.

Fibreglass remains the dominant insulation material but experienced a decrease to 58% in 2019 with the 'polyester and other' category increasing to a similar level to 2017 (Figure 8).

'Other' primarily consists of polystyrene, which is common as part of insulated panels in industrial buildings.

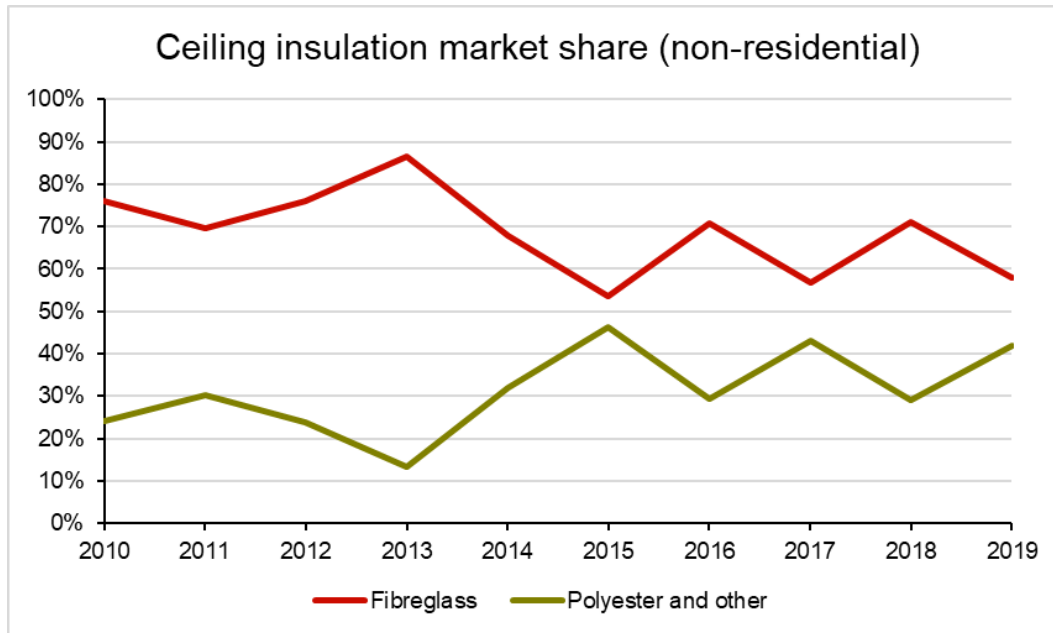


Figure 8. Ceiling insulation market share.

3.6.3 Floor insulation

For those buildings with floor insulation, sheet polystyrene is still the most common floor insulation material (Figure 9).

Note that the question on insulation of concrete slabs was changed in 2015. This chart assumes that all buildings that selected underslab full/partial used sheet polystyrene, although non-polystyrene waffle pod systems have entered the market.

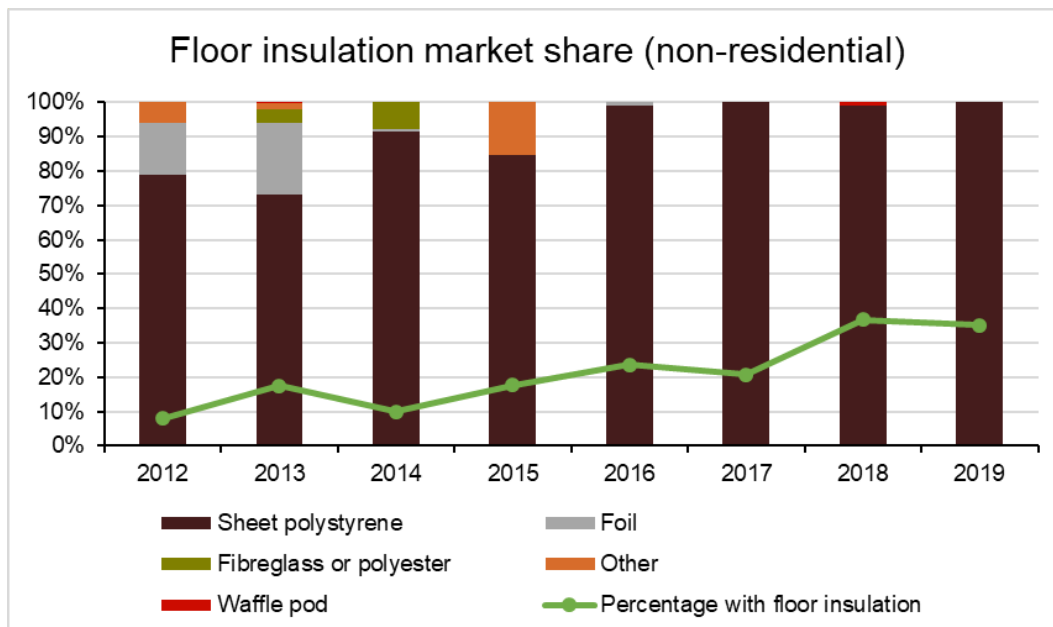


Figure 9. Floor insulation.

Appendix A: Tables of data and survey forms

A.1 Tables of data for the charts

Table 1. Roof claddings market share.

Roof claddings market share in new non-residential buildings										
Yearly data 2010-2019										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Sheet metal	81%	70%	83%	86%	71%	80%	61%	73%	73%	91%
Tiles (metal and concrete)	3%	6%	0%	2%	3%	0%	0%	1%	0%	0%
Other (plastic, insulated panels, memb	17%	24%	17%	11%	26%	19%	39%	26%	27%	9%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Note: Percentages weighted to allow for different building types

Table 2. Wall claddings market share.

Wall claddings market share in new non-residential buildings										
Yearly data 2010-2019										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Steel, Aluminium and other Metals	40%	49%	46%	59%	47%	43%	51%	60%	48%	50%
Concrete (tilt-slab)	35%	24%	28%	28%	29%	45%	34%	19%	16%	16%
Timber (weatherboard and sheet)	3%	5%	5%	2%	3%	3%	4%	3%	4%	4%
Other	22%	22%	20%	11%	21%	9%	10%	19%	32%	29%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Note: Percentages weighted to allow for different building types

Table 3. Main structure market share.

Main structure market share in new non-residential buildings										
Yearly data 2010-2019										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Concrete Frame	20%	16%	25%	18%	11%	25%	12%	5%	12%	14%
Steel Frame	54%	61%	59%	68%	73%	58%	67%	71%	56%	65%
Timber Frame	19%	14%	14%	7%	11%	14%	16%	16%	25%	18%
Other	8%	9%	2%	8%	4%	2%	4%	8%	7%	3%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Note: Percentages weighted to allow for different building types

Table 4. Wall infill framing market share.

Wall infill framing market share in new non-residential buildings										
Yearly data 2010-2019										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Timber	56%	43%	54%	61%	51%	49%	63%	61%	54%	37%
Concrete (tilt-slab + block)	18%	12%	12%	9%	11%	18%	9%	3%	6%	15%
Steel	20%	38%	31%	25%	27%	22%	25%	25%	33%	33%
Other	6%	7%	3%	5%	11%	11%	4%	11%	7%	14%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Note: Percentages weighted to allow for different building types. Does not include farm buildings

Table 5. Partition wall framing market share.

Partition wall framing market share in new non-residential buildings										
Yearly data 2010-2019										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Steel	31%	33%	41%	40%	30%	24%	15%	41%	42%	39%
Timber	58%	48%	48%	47%	59%	58%	77%	57%	41%	31%
Other	11%	19%	11%	13%	10%	18%	8%	1%	17%	30%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Note: Percentages weighted to allow for different building types

Table 6. Wall insulation market share.

Wall insulation market share in new non-residential buildings										
Yearly data 2010-2019										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Fibreglass	76%	81%	84%	82%	64%	69%	70%	53%	71%	45%
Polyester and other	24%	19%	16%	18%	36%	31%	30%	47%	29%	55%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Note: Percentages weighted to allow for different building types

Table 7. Ceiling insulation market share.

Ceiling insulation market share in new non-residential buildings										
Yearly data 2010-2019										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Fibreglass	76%	70%	76%	87%	68%	54%	71%	57%	71%	58%
Polyester and other	24%	30%	24%	13%	32%	46%	29%	43%	29%	42%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Note: Percentages weighted to allow for different building types

Table 8. Floor insulation market share.

Floor insulation market share in new non-residential buildings									
Yearly data 2012-2019									
	2012	2013	2014	2015	2016	2017	2018	2019	
Waffle Pod	0%	0%	0%	0%	0%	0%	1%	0%	
Sheet Polystyrene	79%	73%	91%	85%	99%	100%	94%	100%	
Foil	15%	21%	1%	0%	1%	0%	0%	0%	
Fibreglass or Polyester	0%	4%	8%	0%	0%	0%	0%	0%	
Other	6%	2%	0%	15%	0%	0%	0%	0%	
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	
Percentage with floor insulation	8%	18%	10%	18%	24%	21%	37%	35%	

Note: Percentages weighted to allow for different building types

Table 9. Value of building consents by sector.

Value of new non-residential consents (\$millions)										
Yearly data 2009-2018										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Institutional	1,077	1,003	803	1,043	1,073	1,628	1,903	1,706	2,061	2,190
Commercial	704	720	930	816	1,436	1,496	1,513	1,742	1,601	1,075
Industrial	726	739	880	996	1,160	1,280	1,162	1,427	1,767	1,676
Total non-resid	2,507	2,463	2,613	2,854	3,724	4,404	3,416	4,875	5,429	4,941

Table 9. Value of building consents by sector.

Source: StatsNZ



A.2 Survey form March 2007

NON-RESIDENTIAL BUILDINGS					
Please give this form to the builder or designer to fill out for the building consent listed over the page. Contract value of work (incl sub-trades) \$ incl GST.					
Type of Building (state type) e.g. Office, school, farm building etc					
New <input type="checkbox"/>	Addition <input type="checkbox"/>	Alteration <input type="checkbox"/>	Floor area sqm	Number of storeys	Average storey heightm
		 (describe alterations)		
Main Structure tick one or more					
Concrete frame <input type="checkbox"/>		Timber frame <input type="checkbox"/>		Conc block <input type="checkbox"/>	
Steel frame <input type="checkbox"/>		Tilt slab <input type="checkbox"/>		Laminated wood <input type="checkbox"/>	
Other.....(state)					
Floor base material					
Concretesqm		Particle Boardsqm		Plywoodsqm	
Other (state) sqm					
Partition Wall Framing tick one or more					
Timber <input type="checkbox"/>		Steel <input type="checkbox"/>		Other(state)	
Amount of Timber Framing (only applicable if framing work is done)					
Cub metres		Wall/floor area		Sizes/spacing	
Walls	<input type="checkbox"/>	or	<input type="checkbox"/>	with	<input type="text"/>
Walls	<input type="checkbox"/>	or	<input type="checkbox"/>	with	<input type="text"/>
Floors	<input type="checkbox"/>	or	<input type="checkbox"/>	with	<input type="text"/>
Roof	<input type="checkbox"/>	or	<input type="checkbox"/>	with	<input type="text"/>
Roof	<input type="checkbox"/>	or	<input type="checkbox"/>	with	<input type="text"/>
cum		sqm			
Example Walls 550sqm with 150x50mm @600 ctrs. and 2000sqm with 100x50mm @450 ctrs. Roof 300 sqm with 100x50mm truss @900 ctrs.					
Secondary Wall Framing tick one or more					
Radiata <input type="checkbox"/>		Steel <input type="checkbox"/>		Douglas fir <input type="checkbox"/>	
				Concrete block <input type="checkbox"/>	
Other <input type="checkbox"/> (state)					
Timber treatment (for framing)					
Untreated kiln dry		Please tick one or more			
<input type="checkbox"/>		Untreated Wet		H1.2	
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
State where used (eg outer walls, subfloor, etc)					
Building wraps (tick one or more)					
Roof		Thermakraft		Bitumac®	
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
				Greencap	
				<input type="checkbox"/>	
				Pauloid	
				<input type="checkbox"/>	
				Black Paper	
				<input type="checkbox"/>	
				Other (state)	
				<input type="text"/>	
(tick one or more)					
Wall		Flamestop®		Tyvek®	
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
				Thermakraft coverup	
				<input type="checkbox"/>	
				FrameGard II	
				<input type="checkbox"/>	
				Greenwrap	
				<input type="checkbox"/>	
				Fastwrap	
				<input type="checkbox"/>	
				Black Paper	
				<input type="checkbox"/>	
				Other (state)	
				<input type="text"/>	
Wall cladding (only applicable if there is new wall cladding)					
State type					
Type		% area.....		e.g. tilt slab, 60%	
Type		% area.....		concrete block, 15%	
Type		% area.....		glazing, 10%	
Type		% area.....		fibre cement, 15%	
				Total 100%	
If yes to Fibre Cement cladding what is the Manufacturer? (tick one or more)					
Hardies		BGC		CSR	
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
				PRIMA	
				<input type="checkbox"/>	
				Other	
				<input type="checkbox"/>	
Fibre Cement Product was used as (Circle one or more)					
Applied texture finish sheet,		Flat sheet,		FC plank,	
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
				FC weatherboard/Linea	
				<input type="checkbox"/>	
If solid plaster, what backing? (circle one if solid plaster)					
fibre cement, plywood,		paper,		Triple S,	
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
				block/brick,	
				<input type="checkbox"/>	
				metal lathe	
				<input type="checkbox"/>	
Wet area linings (bathroom, kitchen, laundry etc)					
Please tick one or more and the approximate square meters used.					
Formica Aquapanel		Seratone		Villaboard	
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
				Hardiglaze	
				<input type="checkbox"/>	
				GIB	
				<input type="checkbox"/>	
				Aqualine	
				<input type="checkbox"/>	
				Other (state)	
				<input type="checkbox"/>	
				<input type="text"/>	
Roof cladding (only applicable if there is new roof cladding)					
Type Roof areasq metres.					
eg pre-coated steel shallow profile, trough steel profile, aluminum sheet, metal tiles, butyl rubber sheet, bitumen asphalt sheet, etc					
Thank You. Please fold this form, and freepost it in the return envelope					

A.3 Survey form November 2011

NON-RESIDENTIAL																																																								
Please give this form to the builder or designer to fill out for the building consent listed over the page. Contract value of work (incl sub-trades) \$ incl GST																																																								
Type of Building (state type) e.g. Office, school, farm building etc <table style="width: 100%; border: none;"> <tr> <td style="width: 15%;"></td> <td style="width: 10%; text-align: center;">tick</td> <td style="width: 15%;">floor area</td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> </tr> <tr> <td>New</td> <td style="text-align: center;"><input type="checkbox"/></td> <td>..... sqm</td> <td>Number of storeys:</td> <td>.....</td> <td></td> </tr> <tr> <td>Addition</td> <td style="text-align: center;"><input type="checkbox"/></td> <td>..... sqm</td> <td>Average storey height:</td> <td>..... m</td> <td></td> </tr> <tr> <td>Alteration</td> <td style="text-align: center;"><input type="checkbox"/></td> <td>.....</td> <td colspan="3">(describe alteration)</td> </tr> </table>			tick	floor area				New	<input type="checkbox"/> sqm	Number of storeys:		Addition	<input type="checkbox"/> sqm	Average storey height: m		Alteration	<input type="checkbox"/>	(describe alteration)																																	
	tick	floor area																																																						
New	<input type="checkbox"/> sqm	Number of storeys:																																																				
Addition	<input type="checkbox"/> sqm	Average storey height: m																																																				
Alteration	<input type="checkbox"/>	(describe alteration)																																																					
Are you claiming "green" building features? Yes / No If Yes, what type?																																																								
Main Structure <table style="width: 100%; border: none;"> <tr> <td>Concrete Frame <input type="checkbox"/></td> <td>Timber Frame <input type="checkbox"/></td> <td>Concrete block <input type="checkbox"/></td> <td>LVL <input type="checkbox"/></td> <td>Glulam <input type="checkbox"/></td> </tr> <tr> <td>Steel Frame <input type="checkbox"/></td> <td>Tilt Slab <input type="checkbox"/></td> <td colspan="3">Other (state)</td> </tr> </table>		Concrete Frame <input type="checkbox"/>	Timber Frame <input type="checkbox"/>	Concrete block <input type="checkbox"/>	LVL <input type="checkbox"/>	Glulam <input type="checkbox"/>	Steel Frame <input type="checkbox"/>	Tilt Slab <input type="checkbox"/>	Other (state)																																															
Concrete Frame <input type="checkbox"/>	Timber Frame <input type="checkbox"/>	Concrete block <input type="checkbox"/>	LVL <input type="checkbox"/>	Glulam <input type="checkbox"/>																																																				
Steel Frame <input type="checkbox"/>	Tilt Slab <input type="checkbox"/>	Other (state)																																																						
Floor Base Material Concrete sqm Particle Board sqm Plywood sqm Other (state) sqm If concrete, have any steel deck trays been used? Yes / No (circle one)																																																								
Partition Wall Framing (tick one or more) Timber <input type="checkbox"/> Steel <input type="checkbox"/> Concrete <input type="checkbox"/> Other (state)																																																								
Wall Infill Framing (between main frame) (tick one or more) Radiata <input type="checkbox"/> Steel <input type="checkbox"/> Douglas Fir <input type="checkbox"/> Concrete block <input type="checkbox"/> Other (state)																																																								
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A.4 Survey form October 2015

NON-RESIDENTIAL																																																									
Please give this form to the builder or designer to fill out for the building consent listed over the page. Contract value of work (incl sub-trades) \$ Incl GST																																																									
Type of Building (state type) e.g. Office, school, farm building etc tick floor area New <input type="checkbox"/> sqm Addition <input type="checkbox"/> sqm Alteration <input type="checkbox"/> (describe alterations) Number of storeys: Average storey height: m																																																									
Are you claiming "green" building features? Yes / No If Yes, what type?																																																									
Main Structure Concrete Frame <input type="checkbox"/> Timber Frame <input type="checkbox"/> Concrete Block <input type="checkbox"/> LVL <input type="checkbox"/> Glulam <input type="checkbox"/> Steel Frame <input type="checkbox"/> Tilt Slab <input type="checkbox"/> Insulated Panel <input type="checkbox"/> Other (state)																																																									
Floor Base Material Concrete sqm Particle Board sqm Plywood sqm Other (state) sqm If concrete, have any steel deck trays been used? Yes / No (circle one)																																																									
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Spouting What profile is the SPOUTING? 1/2 round/quad <input type="checkbox"/> 1/2 round <input type="checkbox"/> Old gothic <input type="checkbox"/> Box <input type="checkbox"/> Other (state) What material is the SPOUTING? PVC (White) <input type="checkbox"/> PVC (Colour) <input type="checkbox"/> Steel <input type="checkbox"/> Aluminium <input type="checkbox"/> Copper <input type="checkbox"/> Other (state) Who installed the SPOUTING? Roofer <input type="checkbox"/> Spouting installer <input type="checkbox"/> Builder <input type="checkbox"/> Plumber <input type="checkbox"/> Other (state)																																																									
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