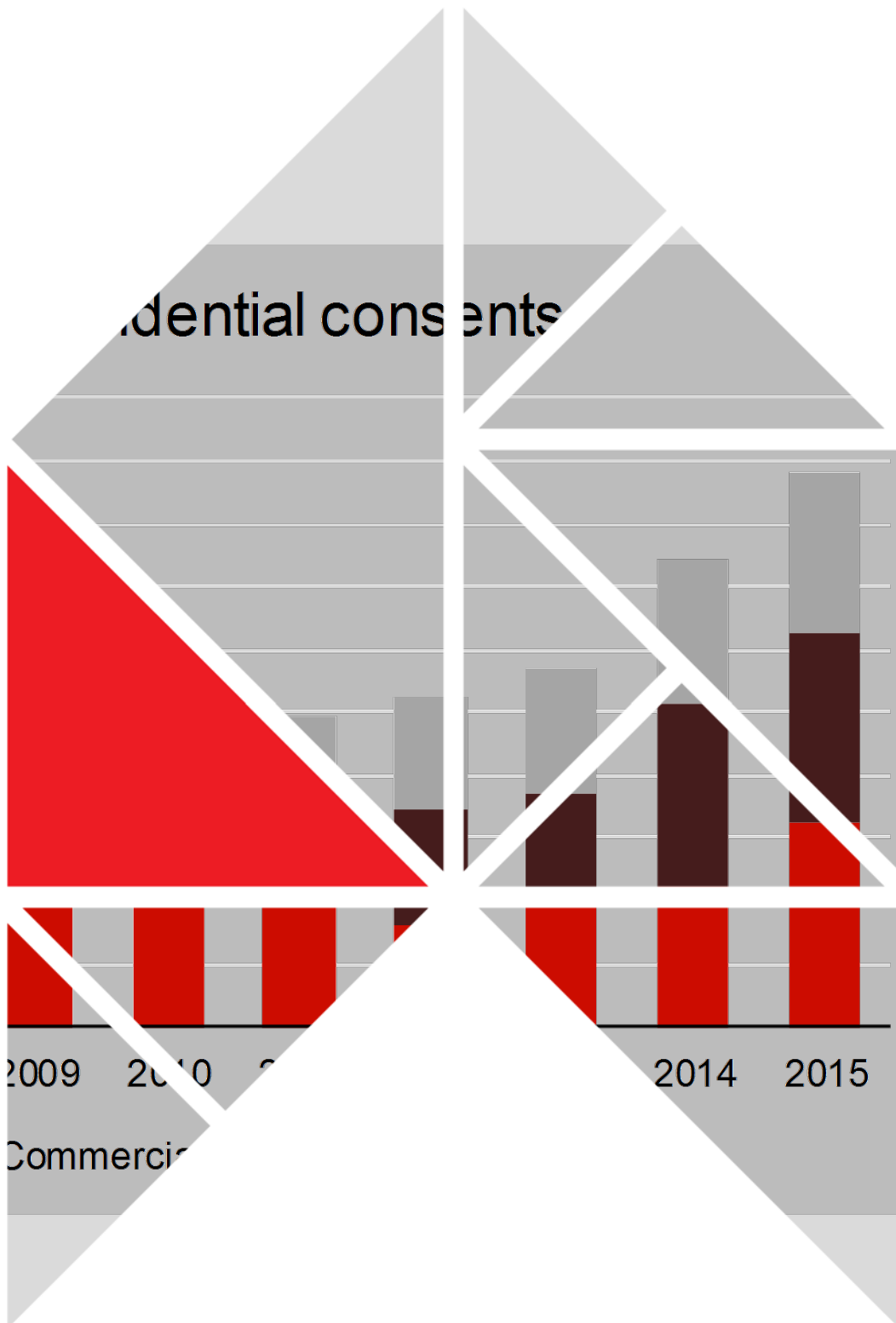


Physical characteristics of new non-residential buildings 2015

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Preface

This is the second 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 includes what type of materials are used. The data is useful for studies in the fields of sustainability, energy efficiency, durability and engineering.

Acknowledgements

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 2015

BRANZ Study Report SR368

Author(s)

Martin Rosevear and Matthew Curtis

Reference

Rosevear, M. & Curtis, M. (2017). *Physical characteristics of new non-residential buildings 2015*. BRANZ Study Report SR368. Judgeford, New Zealand: BRANZ Ltd.

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. 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. This survey 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, around 400 returns are received each year. An incentive is offered (a Lotto ticket, book voucher or reduced price on BRANZ publications) 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:

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 cladding
- wall cladding
- main structure
- partition wall framing
- wall infill framing
- wall insulation
- ceiling insulation
- floor insulation.

¹ *Whats On report (Monthly)*. TF Stevens & Co Ltd, 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.

The trend captures the growth period from 2006 through to 2009, as well as the decline following the global financial crisis in 2010. Since 2012, the value of consents for new non-residential buildings has increased across all sectors, especially commercial and institutional, to reach a historical high in 2015.

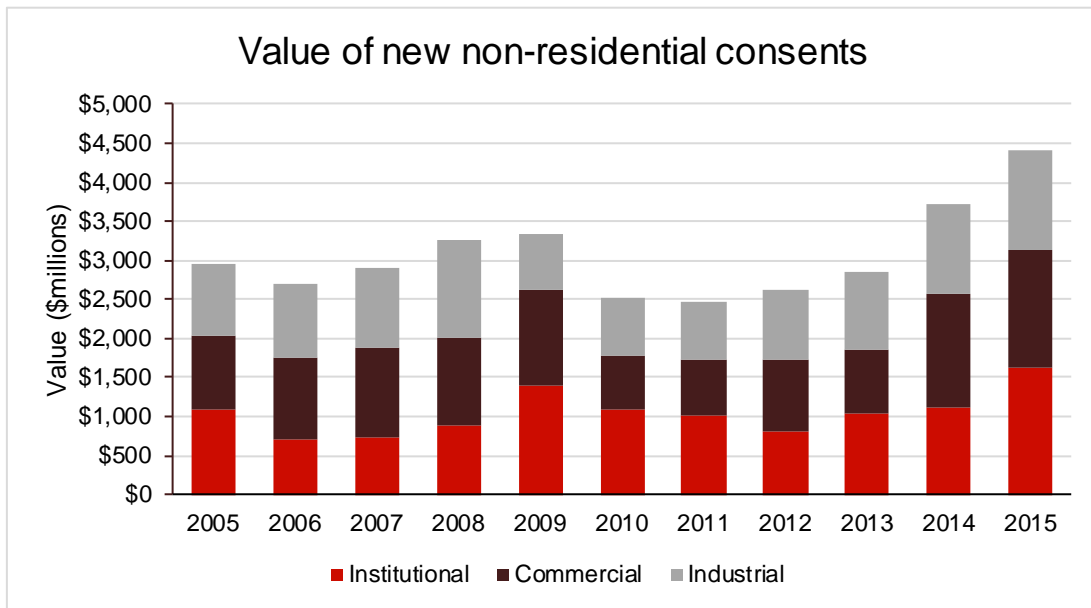


Figure 1. Value of new non-residential consents.

Samples of survey forms are shown in Appendix A.

2. Summary

In general, many of the market shares of materials have been relatively steady over the years surveyed. The major exception to this has been the increased use of prefabricated concrete tilt slabs and panels in 2015, which features in a number of areas:

- Wall claddings: concrete increased in 2015 and now shares the market equally with metal as the dominant materials in the wall claddings market.
- Wall infill framing: concrete partitions and other materials (steel etc.) now dominate the infill framing market as timber declines to second place.

3. Main results

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

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 a long-term share sitting around 80% ($\pm 5\%$).

'Other' (largely plastic) has seen large swings but appears to be trending upwards, in part due to the increased use of plastic on farm buildings.

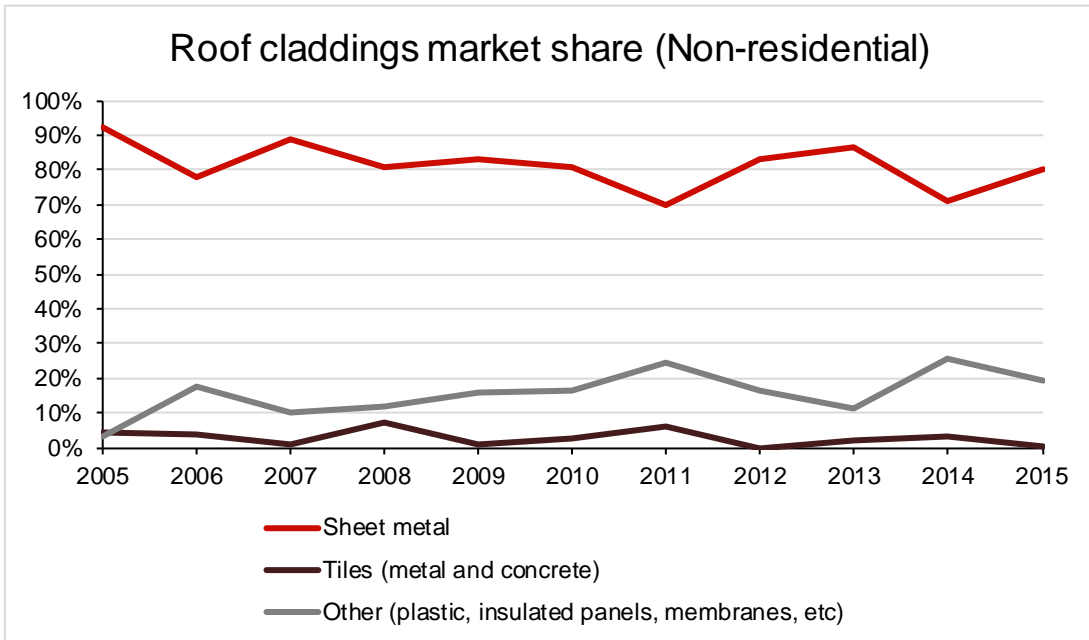


Figure 2. Roof claddings market share.

3.2 Wall claddings

Steel, aluminium and other metals have been the dominant wall cladding material, with close to 50% share, largely due to its dominance on farm buildings. By contrast, concrete (mainly prefabricated tilt-up panels) has historically been slowly losing share, but in 2015, it increased significantly, due to greater use in storage and commercial sites.

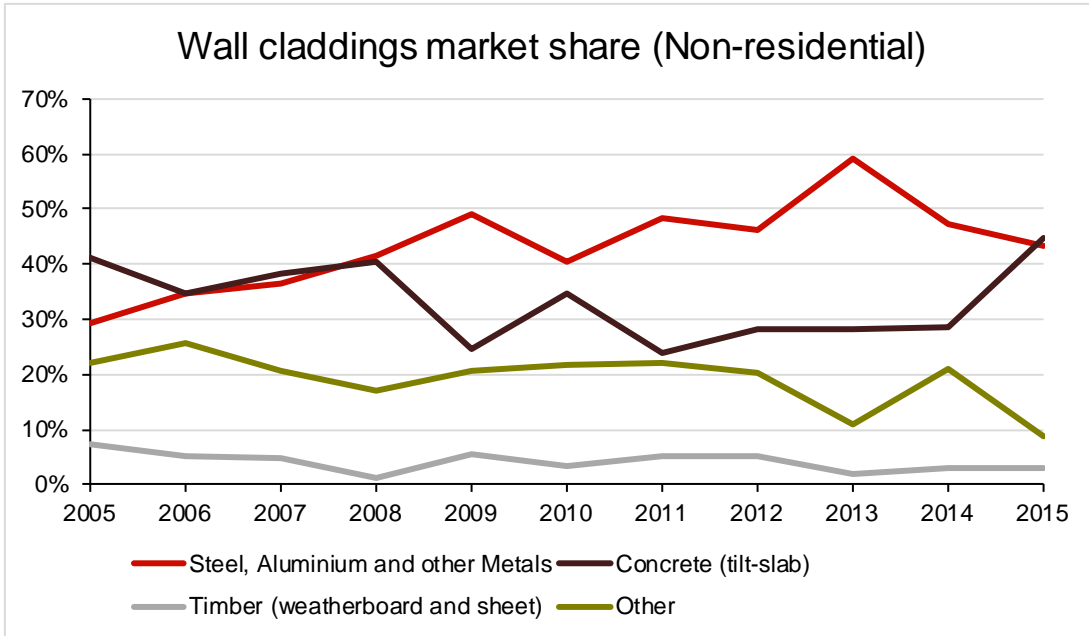


Figure 3. Wall claddings market share.

3.3 Main structure

Steel structural frames have been trending largely upwards since 2005 despite a downward move in 2015. The international price of steel has declined over recent times,² and it is expected to hold steady into the future, although many of these price reductions do not reach the local market. By contrast, concrete and timber have largely been trending downwards over the period shown in Figure 4, although both concrete and timber increased in share in 2015.

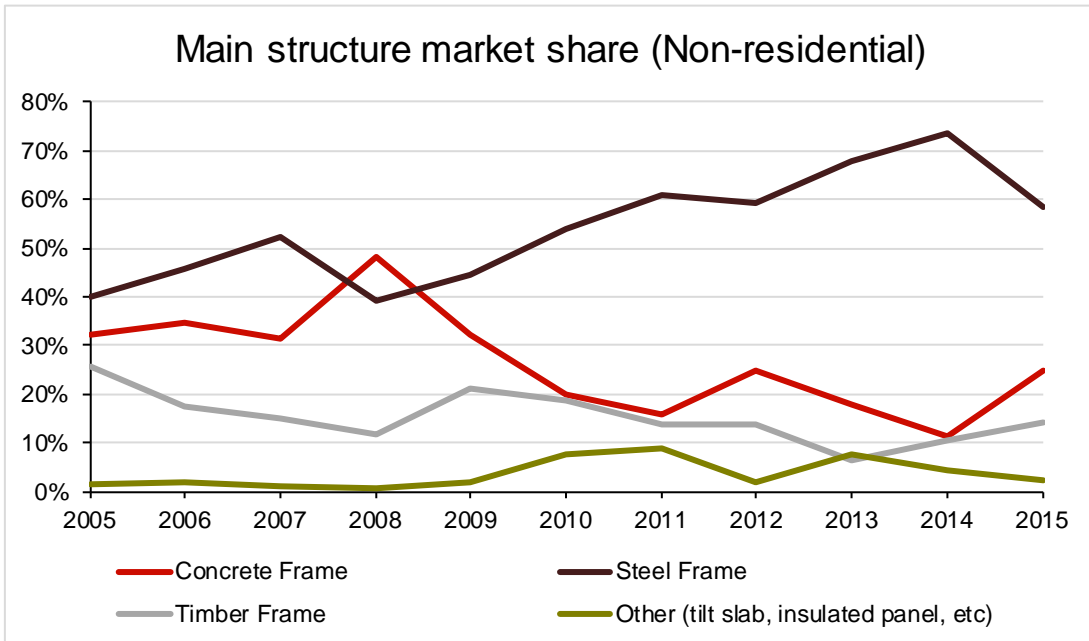


Figure 4. Main structure market share.

² See <https://knoema.com/wxgcxde/commodity-prices-forecast-2015-2019-charts-and-tables?variable=Steel%20%28US%24%2Ftonne%29>

3.4 Wall infill framing

Wall infill framing is the framing between the main structural frames. Timber framing has been the dominant material for this application, but it has been losing share over this timeframe, although the data also appears to be affected by sampling issues. Steel has been competing strongly with timber, but in 2015, both steel and timber lost share to concrete and 'Insulated panel and other'.

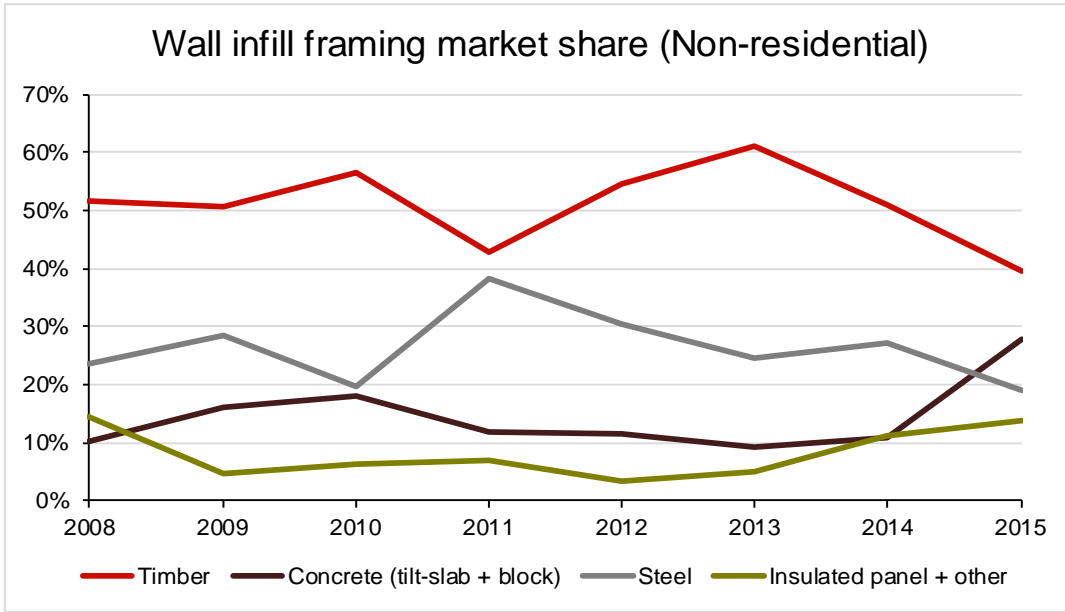


Figure 5. Wall infill framing market share.

3.5 Partition wall framing

Timber is the dominant partition wall framing material at around 55% ($\pm 5\%$) market share. Steel increased its share up to 2012 but has been in decline since then.

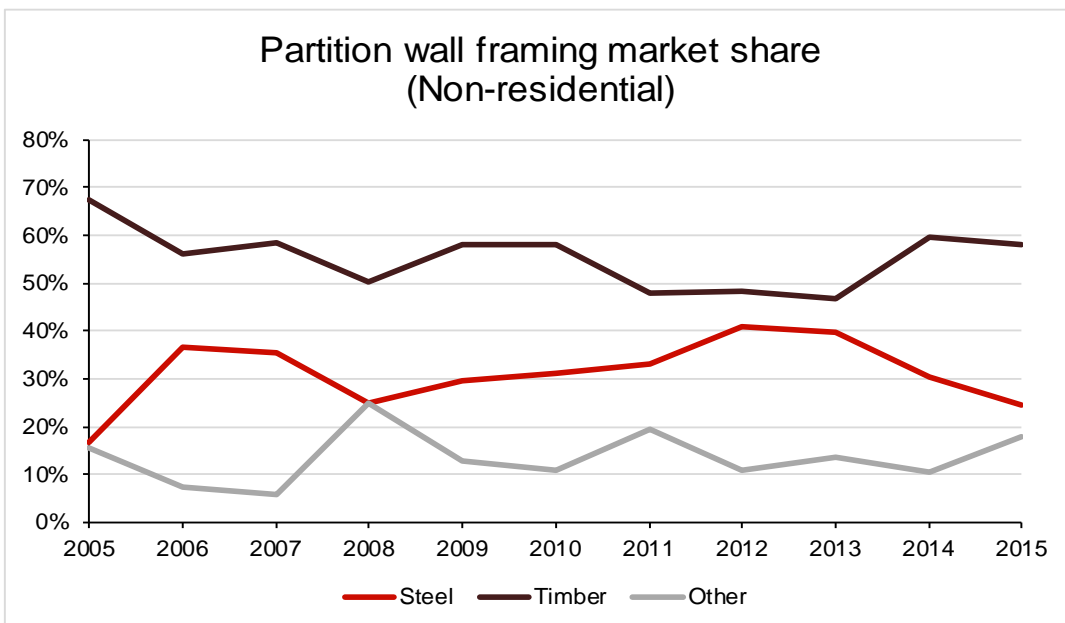


Figure 6. Partition wall framing market share.

3.6 Insulation

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

Farm buildings have not been included in the following market shares 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

Fibreglass has been the dominant wall insulation material, but its share has been in decline. Since 2012 'Polyester and other' has gained share at its expense.

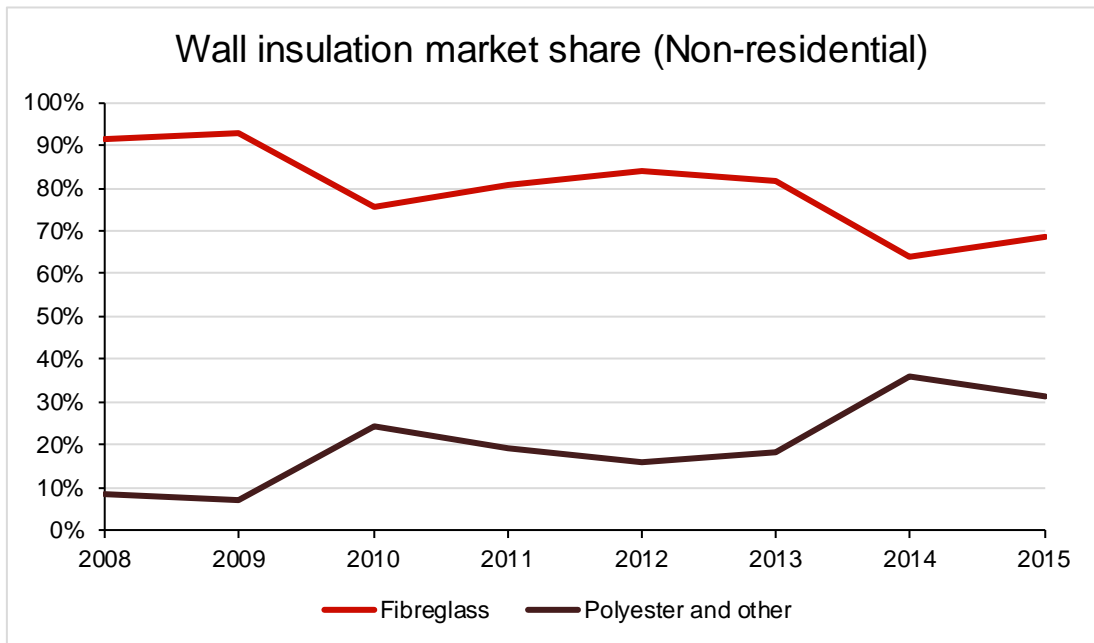


Figure 7. Wall insulation market share.

3.6.2 Ceiling insulation

Fibreglass has been the dominant ceiling insulation material, but its share has also been in decline (with a brief recovery in 2013), and by 2015, it has a similar share to 'Polyester and other'.

Polyester had increased use in storage buildings, which was a factor in the growth from 2014 to 2015.

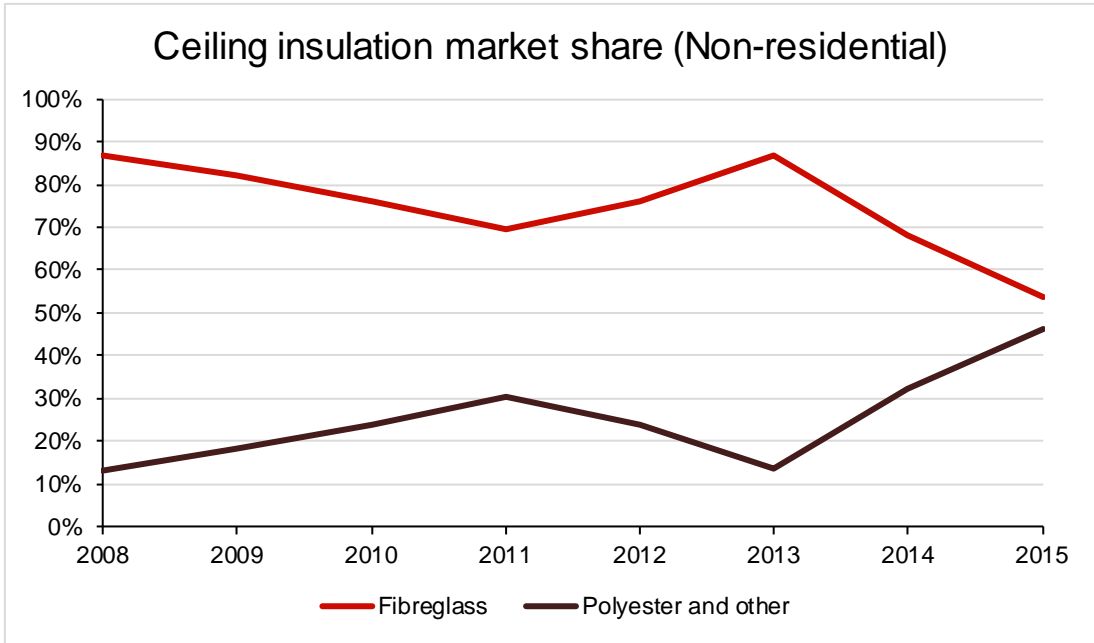


Figure 8. Ceiling insulation market share.

3.6.3 Floor insulation

The majority of non-residential buildings do not have floor insulation. For those buildings with floor insulation, sheet polystyrene is the most common floor insulation material.

Note: In 2015, the question on insulation of concrete slabs was changed. This chart assumes that all buildings that selected underslab full/partial used sheet polystyrene.

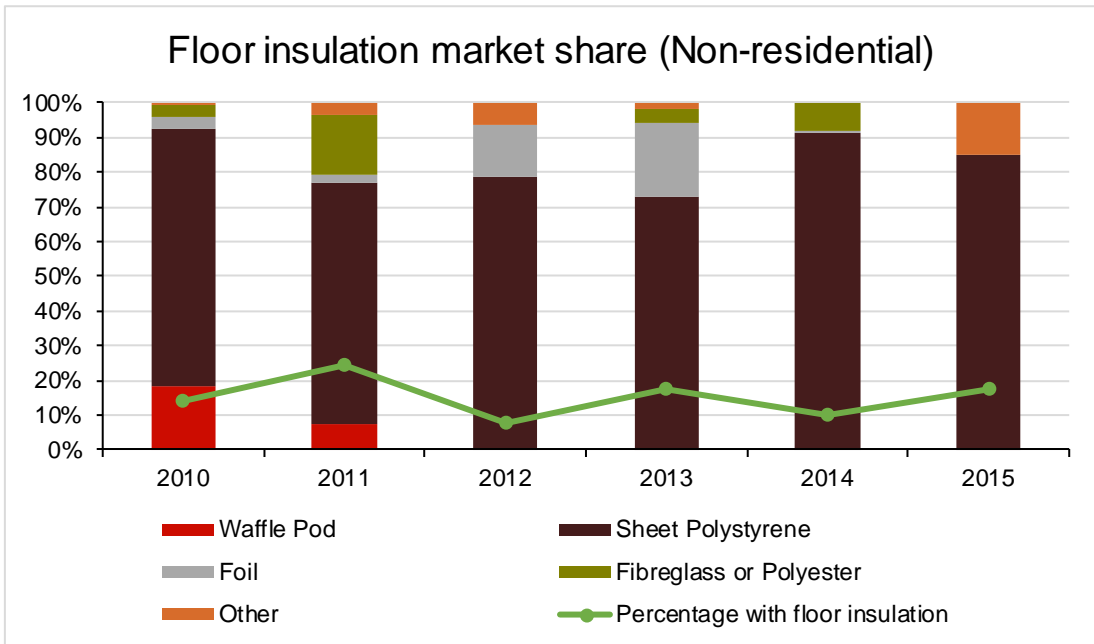


Figure 9. Floor insulation.

Appendix A: Survey forms

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"/> tick Addition <input type="checkbox"/> Alteration <input type="checkbox"/>	Floor area sqm sqm (describe alterations)
Main Structure tick one or more tick tick tick	
Concrete frame <input type="checkbox"/> Timber frame <input type="checkbox"/> Conc block <input type="checkbox"/> Laminated wood <input type="checkbox"/> Steel frame <input type="checkbox"/> Tilt slab <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 or Wall/floor area with Sizes/spacing Walls <input type="checkbox"/> or <input type="checkbox"/> with Walls <input type="checkbox"/> or <input type="checkbox"/> with Floors <input type="checkbox"/> or <input type="checkbox"/> with Roof <input type="checkbox"/> or <input type="checkbox"/> with Roof <input type="checkbox"/> or <input type="checkbox"/> with cum sqm	
Example Walls and Roof 550sqm with 150x50mm @600 ctrs. 2000sqm with 100x50mm @450 ctrs. 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 <input type="checkbox"/> State where used (eg outer walls, subfloor, etc)	Please tick one or more Untreated Wet <input type="checkbox"/> H1.2 <input type="checkbox"/> T1.2 (orange) <input type="checkbox"/> H3.1 <input type="checkbox"/>
Building wraps (tick one or more)	
Roof Flamestop® <input type="checkbox"/> Thermakraft <input type="checkbox"/> Bitumac® <input type="checkbox"/> Greencap <input type="checkbox"/> Pauloid <input type="checkbox"/> Black Paper <input type="checkbox"/> Other (state) <input type="checkbox"/> (tick one or more)	
Wall Flamestop® <input type="checkbox"/> Tyvek® <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="checkbox"/>	
Wall cladding (only applicable if there is new wall cladding)	
State type	
Type	% area..... e.g. tilt slab, 60% also plywood, solid plaster(min 18mm),
Type	% area..... concrete block, 15% plaster on polystyrene, sheet
Type	% area..... glazing, 10% steel, PVC weatherboard, etc.
Type	% area..... fibre cement, 15%
Total 100%	
If yes to Fibre Cement cladding what is the Manufacturer? (tick one or more)	
Hardies <input type="checkbox"/>	BGC <input type="checkbox"/> CSR <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, FC weatherboard/Linea	
If solid plaster, what backing? (circle one if solid plaster)	
fibre cement, plywood, paper, Triple S, block/brick, metal lathe	
Wet area linings (bathroom, kitchen, laundry etc)	
Please tick one or more and the approximate square meters used.	
Formica Aquapanel <input type="checkbox"/> m2	Seratone <input type="checkbox"/> m2 Villaboard <input type="checkbox"/> m2 Hardiglaze <input type="checkbox"/> m2 GIB <input type="checkbox"/> m2 Aqualine <input type="checkbox"/> m2 Other <input type="checkbox"/> (state)
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	
Mar-07	

Survey form November 2011

NON-RESIDENTIAL																																																	
<p>Please give this form to the builder or designer to fill out for the building consent listed over the page.</p> <p>Contract value of work (incl sub-trades) \$ incl GST</p>																																																	
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<p>Thank you. Please fold this form, and freepost it in the return envelope Nov-11</p>																																																	

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)											
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)											
Prefabrication Are any prefabricated components used? Yes / No If yes, describe applicable component(s) below: Prefab Frame Prefab Floors Prefab Walls Prefab Other											
Insulation (tick one or more) <table style="width: 100%; border: none;"> <tr> <td style="width: 25%;">None <input type="checkbox"/></td> <td style="width: 10%;">Pink Batts <input type="checkbox"/></td> <td style="width: 10%;">Bradford Gold <input type="checkbox"/></td> <td style="width: 10%;">Premier <input type="checkbox"/></td> <td style="width: 10%;">Knauf Earthwool <input type="checkbox"/></td> <td style="width: 10%;">Autex Greenstuf <input type="checkbox"/></td> <td style="width: 10%;">Other Polyester <input type="checkbox"/></td> <td style="width: 10%;">Wool <input type="checkbox"/></td> <td style="width: 10%;">Polystyrene <input type="checkbox"/></td> <td style="width: 10%;">Other (state) <input type="checkbox"/></td> </tr> </table> Wall insulation Ceiling insulation Concrete slab insulation Floor insulation: Underslab full/partial <input type="checkbox"/> Perimeter edge <input type="checkbox"/> Under footing <input type="checkbox"/> Timber sub-floor insulation Polystyrene <input type="checkbox"/> Polyester <input type="checkbox"/> Glasswool <input type="checkbox"/> Foil <input type="checkbox"/> Insulation Installer (name) Builder <input type="checkbox"/> Other (please specify) <input type="checkbox"/>		None <input type="checkbox"/>	Pink Batts <input type="checkbox"/>	Bradford Gold <input type="checkbox"/>	Premier <input type="checkbox"/>	Knauf Earthwool <input type="checkbox"/>	Autex Greenstuf <input type="checkbox"/>	Other Polyester <input type="checkbox"/>	Wool <input type="checkbox"/>	Polystyrene <input type="checkbox"/>	Other (state) <input type="checkbox"/>
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Spouting What profile is the SPOUTING? ¼ round/quad <input type="checkbox"/> ½ 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)											
Downpipes What profile are the DOWNPIPES? 65mm round <input type="checkbox"/> 80mm round <input type="checkbox"/> 100mm round <input type="checkbox"/> 65x50mm rectangular <input type="checkbox"/> 100x50mm rectangular <input type="checkbox"/> Other (state) What material are the DOWNPIPES? 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 DOWNPIPES? Roofer <input type="checkbox"/> Spouting installer <input type="checkbox"/> Builder <input type="checkbox"/> Plumber <input type="checkbox"/> Other (state)											
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Thank you. Please fold this form, and freepost it in the return envelope Oct-15											

Appendix B: Tables of data for the charts

Table 1. Roof claddings market share.

Roof claddings market share in new non-residential buildings											
Yearly data 2005-2015											
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Sheet metal	92%	78%	89%	81%	83%	81%	70%	83%	86%	71%	80%
Tiles (metal and concrete)	5%	4%	1%	7%	1%	3%	6%	0%	2%	3%	0%
Other (plastic, insulated panels, memb	3%	18%	10%	12%	16%	17%	24%	17%	11%	26%	19%
TOTAL	100%	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 2005-2015											
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Steel, Aluminium and other Metals	29%	35%	37%	42%	49%	40%	49%	46%	59%	47%	43%
Concrete (tilt-slab)	41%	35%	38%	41%	25%	35%	24%	28%	28%	29%	45%
Timber (weatherboard and sheet)	7%	5%	5%	1%	6%	3%	5%	5%	2%	3%	3%
Other	22%	26%	20%	17%	20%	22%	22%	20%	11%	21%	9%
TOTAL	100%	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 2005-2015											
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Concrete Frame	32%	35%	31%	48%	32%	20%	16%	25%	18%	11%	25%
Steel Frame	40%	46%	52%	39%	44%	54%	61%	59%	68%	73%	58%
Timber Frame	26%	17%	15%	12%	21%	19%	14%	14%	7%	11%	14%
Other (tilt slab, insulated panel, etc)	2%	2%	1%	1%	2%	8%	9%	2%	8%	4%	2%
TOTAL	100%	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 2005-2015									
	2008	2009	2010	2011	2012	2013	2014	2015	
Timber	52%	51%	56%	43%	54%	61%	51%	39%	
Concrete (tilt-slab + block)	10%	16%	18%	12%	12%	9%	11%	28%	
Steel	24%	29%	20%	38%	31%	25%	27%	19%	
Insulated panel + other	14%	5%	6%	7%	3%	5%	11%	14%	
TOTAL	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 2005-2015											
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Steel	17%	37%	36%	25%	29%	31%	33%	41%	40%	30%	24%
Timber	68%	56%	59%	50%	58%	58%	48%	48%	47%	59%	58%
Other	16%	7%	6%	25%	13%	11%	19%	11%	13%	10%	18%
TOTAL	100%	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 2005-2015								
	2008	2009	2010	2011	2012	2013	2014	2015
Fibreglass	91%	93%	76%	81%	84%	82%	64%	69%
Polyester and other	9%	7%	24%	19%	16%	18%	36%	31%
TOTAL	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 2005-2015								
	2008	2009	2010	2011	2012	2013	2014	2015
Fibreglass	87%	82%	76%	70%	76%	87%	68%	54%
Polyester and other	13%	18%	24%	30%	24%	13%	32%	46%
TOTAL	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 2005-2015						
	2010	2011	2012	2013	2014	2015
Waffle Pod	18%	7%	0%	0%	0%	0%
Sheet Polystyrene	74%	70%	79%	73%	91%	85%
Foil	4%	2%	15%	21%	1%	0%
Fibreglass or Polyester	3%	17%	0%	4%	8%	0%
Other	1%	4%	6%	2%	0%	15%
TOTAL	100%	100%	100%	100%	100%	100%
Percentage with floor insulation	14%	24%	8%	18%	10%	18%

Note: Percentages weighted to allow for different building types