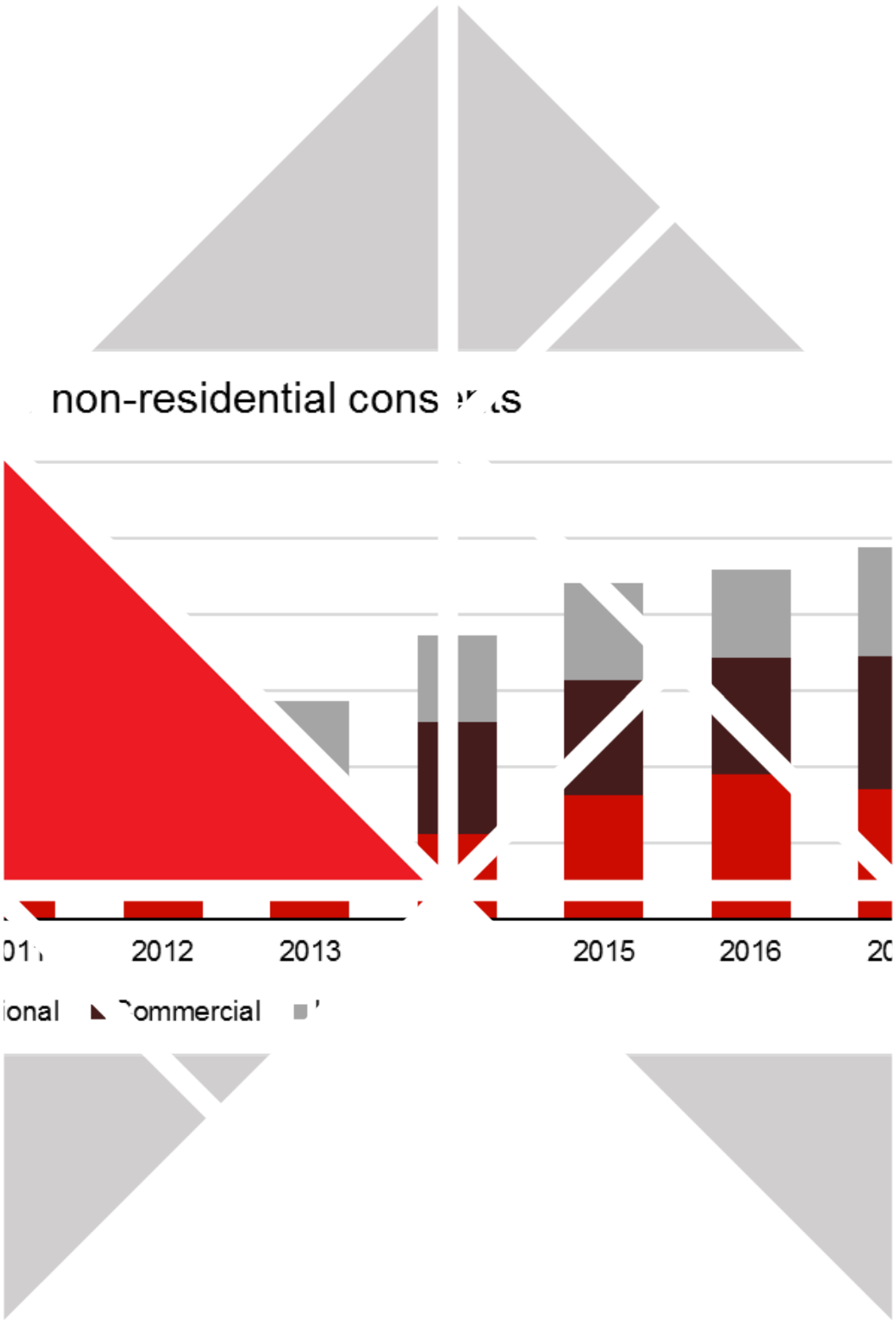
BRANZ

Study Report

SR397 [2018]

Physical characteristics of new non-residential buildings 2017

Nick Brunsdon and Caleb Magan



1222 Moonshine Rd
RD1, Porirua 5381
Private Bag 50 908
Porirua 5240
New Zealand
branz.nz

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Preface

This is the fourth 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 2017

BRANZ Study Report SR397

Authors

Nick Brunsdon and Caleb Magan

Reference

Brunsdon, N. & Magan, C. (2018). *Physical characteristics of new non-residential buildings 2017*. BRANZ Study Report SR397 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. 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, book voucher or reduced price on BRANZ publications) for the return of each survey form.

The consent information is obtained from the What's On[1] 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).* 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.

Since 2012, the value of consents for new non-residential buildings has increased to reach a record high in 2017.

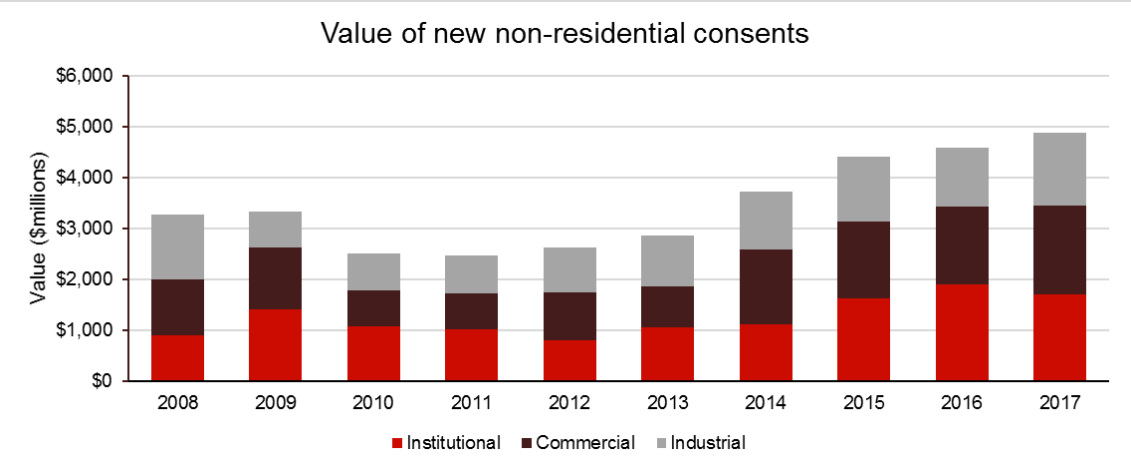

Figure 1. Value of new non-residential consents.

2. Summary

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

Steel experienced a notable increase in market share in 2017 for wall claddings, main structure and infill framing. This gain in share has primarily come at the expense of concrete tilt panels and blocks.

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 a long-term share sitting around 80% (Figure 2).

Despite a 13% drop this year, the 'Other' category (largely plastic) appears to be trending upwards, partly due to increased use of plastic film on farm buildings, particularly shelters for dairy cattle.

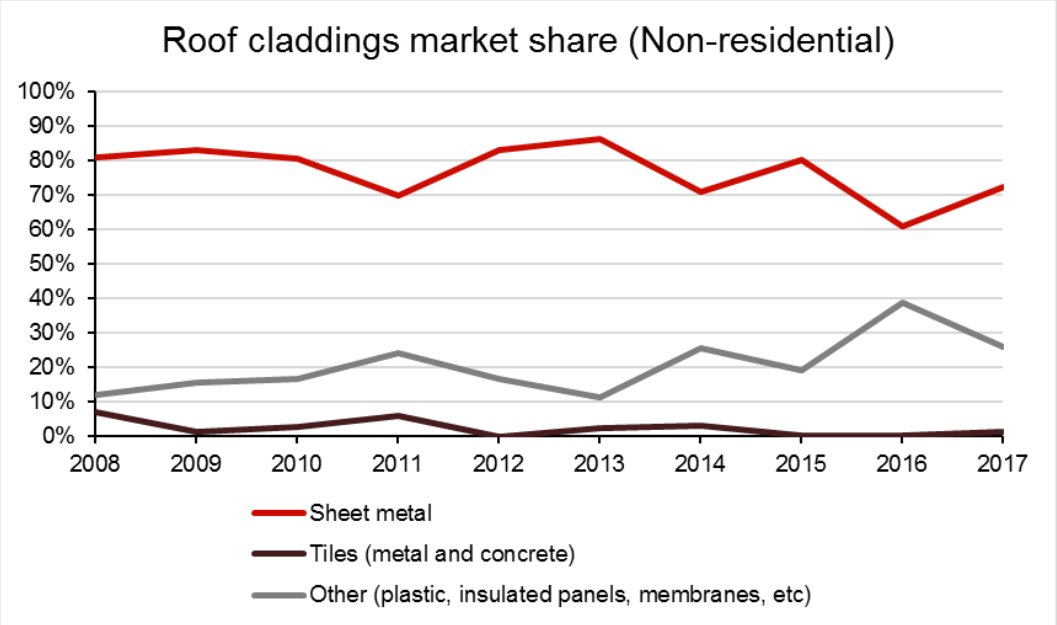

Figure 2. Roof claddings market share.

3.2 Wall claddings

Steel, aluminium and other metals have been the dominant wall cladding material, surging to close to 60% share, largely due to their dominance on industrial and farm buildings (Figure 3).

Concrete (mainly precast panels) tends to be variable and this year continued a steep drop from last year. The increase in the 'Other' category has primarily been driven by an increase in use of plastic films on farm buildings.

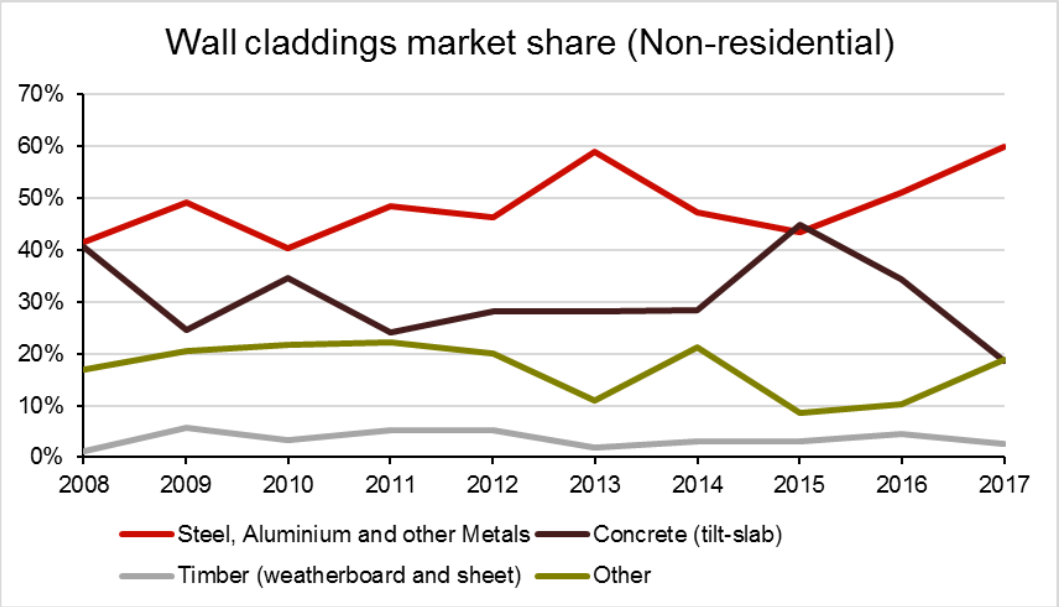

Figure 3. Wall claddings market share.

3.3 Main structure

Steel structural frames have been trending largely upwards since 2005 despite a downward blip in 2015 (Figure 4). The international price of steel has picked up off recent lows but is projected to sit around the historical average in the medium term.[2] It should be noted that reductions in global commodity prices may not transfer to cheaper pricing in the local market.

By contrast, concrete has largely been trending downwards over the period shown below.

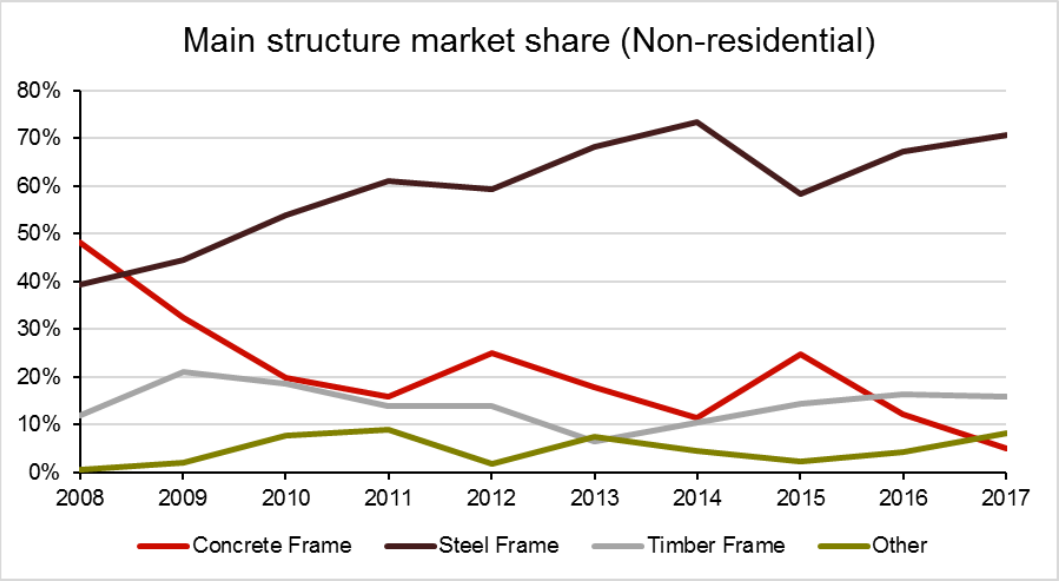

Figure 4. Main structure market share.

[2] www.tradingeconomics.com/commodity/steel/forecast

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, with steel a distant second (Figure 5). Concrete typically maintains around 10% market share each year, although it has experienced a dip for the past 2 years. 'Other' primarily consists of insulated panels.

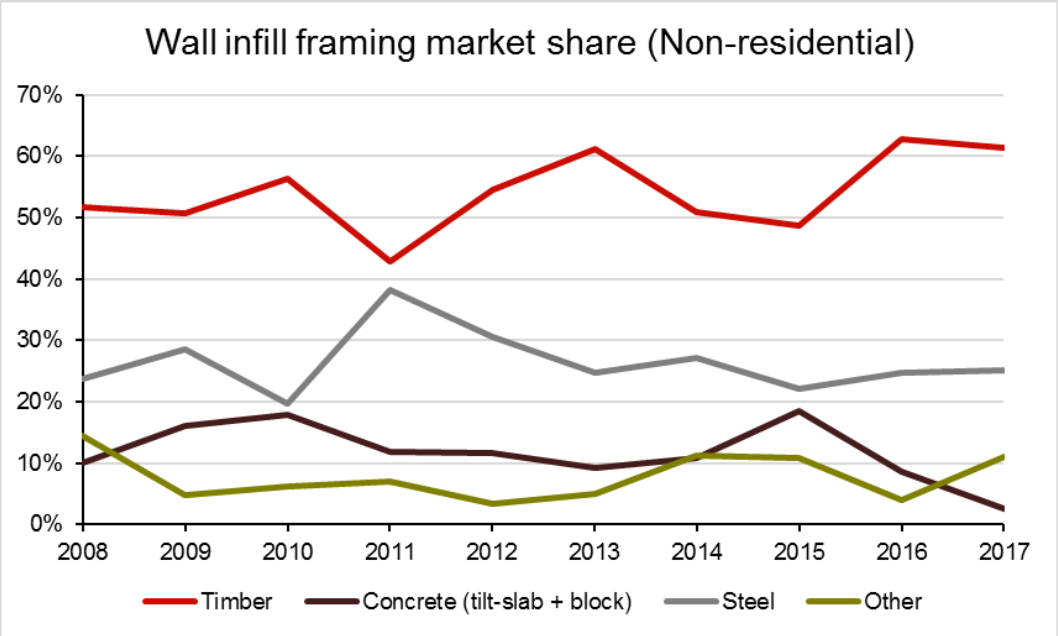

Figure 5. Wall infill framing market share.

3.5 Partition wall framing

Timber is dominant in partition wall framing with over 50% market share (Figure 6). Steel has taken share from timber in the past year with just over 40% share.

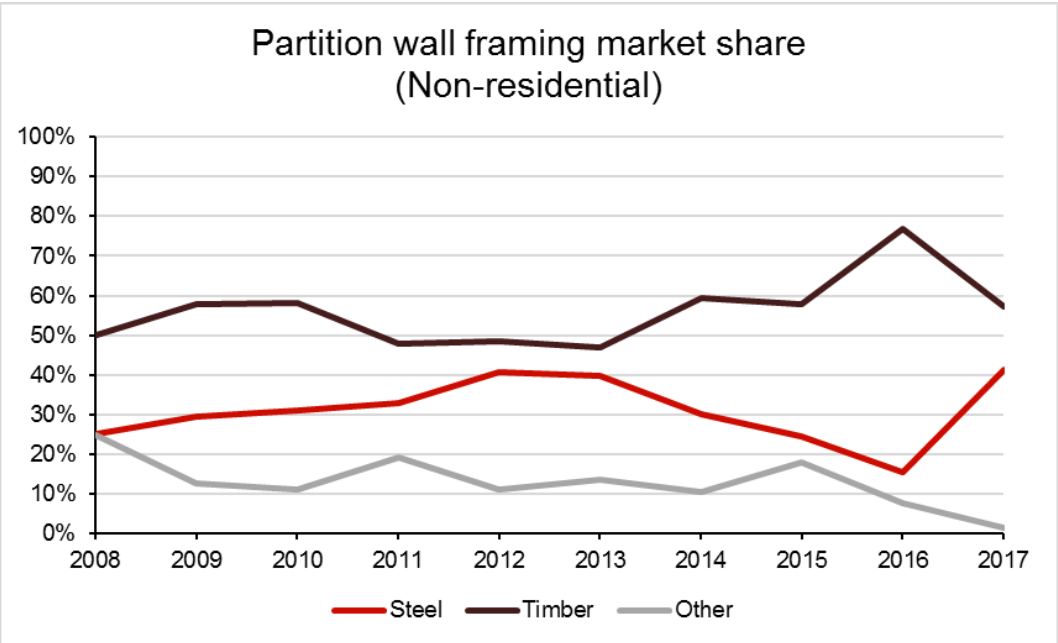

Figure 6. Partition wall framing market share.

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

Fibreglass has been the dominant wall insulation material but its share has been converging with 'Polyester and other' due to increased use of polyester (Figure 7).

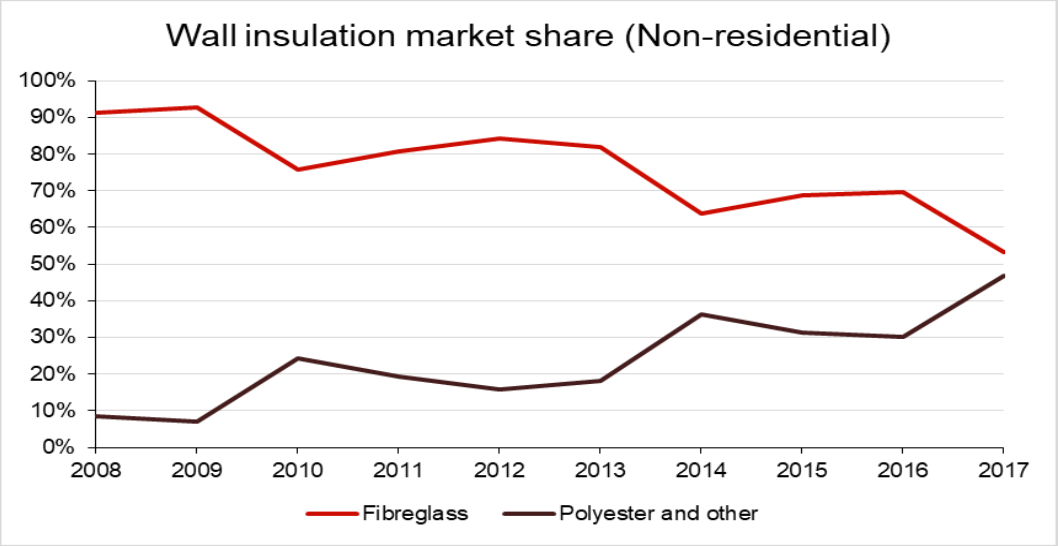

Figure 7. Wall insulation market share.

3.6.2 Ceiling insulation

Fibreglass has long been the dominant ceiling insulation material but this dominance is gradually being eroded (Figure 8). Relatively high use of polyester is reported in institutional and commercial buildings. Polystyrene, most likely as part of insulated panels, commands a strong market share of industrial buildings.

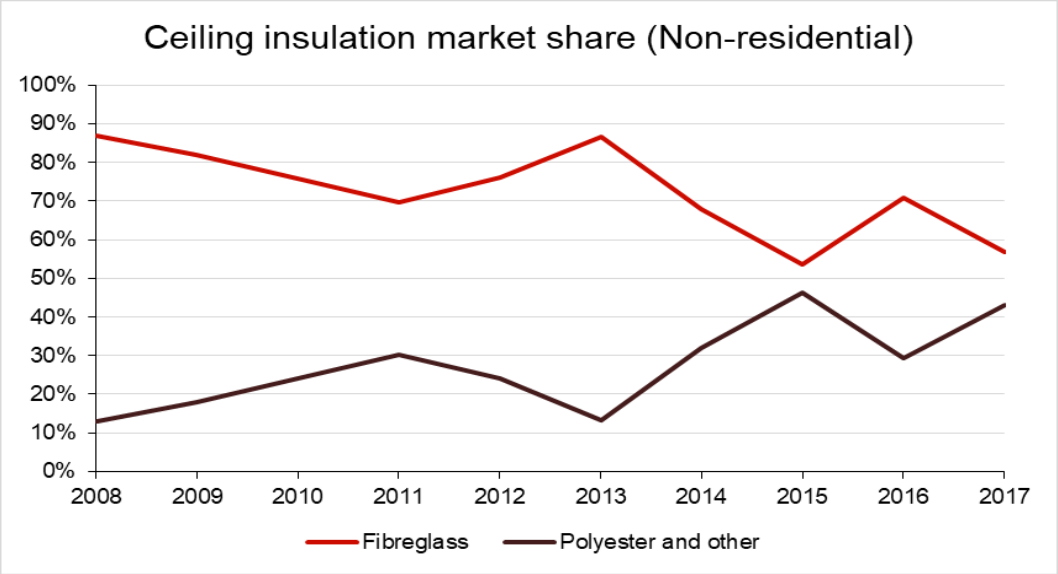

Figure 8. Ceiling insulation market share.

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 (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.

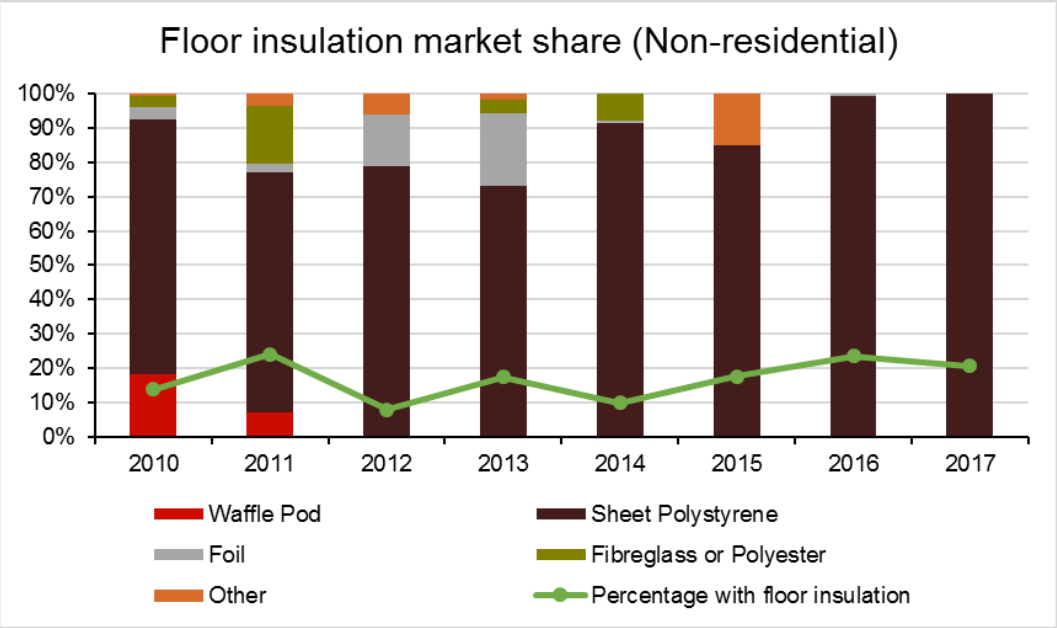

Figure 9. Floor insulation.

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 2008-2017	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Sheet metal	81%	83%	81%	70%	83%	86%	0%	0%	61%	73%
Tiles (metal and concrete)	7%	1%	3%	6%	0%	2%	0%	0%	0%	1%
Other (plastic, insulated panels, memb	12%	16%	17%	24%	17%	11%	0%	0%	39%	26%
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 2008-2017	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Steel, Aluminium and other Metals	42%	49%	40%	49%	46%	59%	0%	0%	51%	60%
Concrete (tilt-slab)	41%	25%	35%	24%	28%	28%	0%	0%	34%	19%
Timber (weatherboard and sheet)	1%	6%	3%	5%	5%	2%	0%	0%	4%	3%
Other	17%	20%	22%	22%	20%	11%	0%	0%	10%	19%
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 2008-2017	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Concrete Frame	48%	32%	20%	16%	25%	18%	11%	25%	12%	5%
Steel Frame	39%	44%	54%	61%	59%	68%	73%	58%	67%	71%
Other	1%	2%	8%	9%	2%	8%	4%	2%	4%	8%
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 2008-2017	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Timber	52%	51%	56%	43%	54%	61%	51%	49%	63%	61%
Concrete (tilt-slab + block)	10%	16%	18%	12%	12%	9%	11%	18%	9%	3%
Steel	24%	29%	20%	38%	31%	25%	27%	22%	25%	25%
Other	14%	5%	6%	7%	3%	5%	11%	11%	4%	11%
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 2008-2017	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Steel	25%	29%	31%	33%	41%	40%	30%	24%	15%	41%
Timber	50%	58%	58%	48%	48%	47%	59%	58%	77%	57%
Other	25%	13%	11%	19%	11%	13%	10%	18%	8%	1%
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 2008-2017										
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Fibreglass	91%	93%	76%	81%	84%	82%	64%	69%	70%	53%
Polyester and other	9%	7%	24%	19%	16%	18%	36%	31%	30%	47%
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 2008-2017										
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Fibreglass	87%	82%	76%	70%	76%	87%	68%	54%	71%	57%
Polyester and other	13%	18%	24%	30%	24%	13%	32%	46%	29%	43%
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 2010-2017								
	2010	2011	2012	2013	2014	2015	2016	2017
Waffle Pod	18%	7%	0%	0%	0%	0%	0%	0%
Sheet Polystyrene	74%	70%	79%	73%	91%	85%	99%	100%
Foil	4%	2%	15%	21%	1%	0%	1%	0%
Fibreglass or Polyester	3%	17%	0%	4%	8%	0%	0%	0%
Other	1%	4%	6%	2%	0%	15%	0%	0%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%
	92%							
Percentage with floor insulation	14%	24%	8%	18%	10%	18%	24%	21%
Note: Percentages weighted to allow for different building types								

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

	tick	Floor area	
New		..... sqm	Number of storeys .....
Addition		..... sqm	Average storey height ……m
Alteration		.....	(describe alterations)

Main Structure

	tick one or more		tick		tick		tick
Concrete frame		Timber frame		Conc block		Laminated wood	
Steel frame		Tilt slab		Other……(state)			

Floor base material

Concrete ……sqm Particle Board ……sqm Plywood ……sqm Other (state) ..... sqm

Partition Wall Framing tick one or more

Timber Steel Other .....(state)

Amount of Timber Framing (only applicable if framing work is done)

	Cub metres		Wall/floor area		Sizes/spacing
Walls		**or**		with	
Walls		**or**		with	
Floors		**or**		with	
Roof		**or**		with	
Roof		**or**		with	
	cum		sqm		

Example Walls 550sqm with 150x50mm @600 ctrs.
and 2000sqn with 100x50mm @450 ctrs.
Roof 300 sqm with 100x50mm truss @900 ctrs.

Secondary Wall Framing tick one or more

Radiata Steel Douglas fir Concrete block Other (state) ……

Timber treatment (for framing) Please tick one or more

	Untreated kiln dry	Untreated Wet	H1.2	T1.2 (orange)	H3.1
State where used (eg outer walls, subfloor, etc) ……	……	……	……	……	……

Building wraps (tick one or more)

	Flamestop®	Thermakraft	Bitumac®	Greencap	Pauloid	Black Paper	Other (state)
Roof							

(tick one or more)

	Flamestop®	Tyvek®	Thermakraft coverup	FrameGard II	Greenwrap	Fastwrap	Black Paper	Other (state)
Wall								

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 BGC CSR PRIMA Other

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	Seratone	Villaboard	Hardiglaze	GIB	Aqualine	Other	(state)
m2	m2	m2	m2	m2	m2	m2	……

Roof cladding (only applicable if there is new roof cladding)

Type ..... Roof area ……sq 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

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

	tick	floor area	
New	☐	..... sqm	Number of storeys: .....
Addition	☐	..... sqm	Average storey height: ..... m
Alteration	☐	.....	(describe alteration)

Are you claiming "green" building features? Yes / No **If Yes, what type?** .....

Main Structure

Concrete Frame ☐ Timber Frame ☐ Concrete block ☐ LVL ☐ Glulam ☐
Steel Frame ☐ Tilt Slab ☐ 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 ☐ Steel ☐ Concrete ☐ Other (state) .....

Wall Infill Framing (between main frame) (tick one or more)

Radiata ☐ Steel ☐ Douglas Fir ☐ Concrete block ☐ 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)	None	Pink Batts	Bradford Gold	Premier Fibreglass	Brown FG Rocwool	Greenstuf (polyester)	Other Polyester	Wool	Polystyrene	Other (state)
Wall insulation	☐	☐	☐	☐	☐	☐	☐	☐	☐	.....
Ceiling insulation	☐	☐	☐	☐	☐	☐	☐	☐	☐	.....

	None	Warmfeet	Expol Polystyrene (not Polythene) Under Slab	Snug Floor	Sisalation Foil	Ribraft Floor	Cupolex	Other (state)
Floor insulation	☐	☐	☐	☐	☐	☐	☐	.....

	Builder	Other (please specify)
Insulation Installer (name)	☐	☐ .....

Building Wraps (tick one or more)

	Flamestop	Thermacraft	Bitumac	CoverTek	Pauloid	Black Paper	Other (state)	Diflex 130	Tekton
Roof wrap	☐	☐	☐	☐	☐	☐	☐	☐	☐

(tick one or more)	Flamestop	Tyvek	Thermacraft	Frameguard	Home RAB	Fastwrap	Black Paper	Other (state)	Diflex 130	Tekton	Ecoply Barrier
Wall wrap	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Wall Cladding State type and approximate % wall coverage

e.g. Fibre cement, 75%
Clay Brick, 15%
Cedar WB, 10%

Other examples include: tilt slab, concrete block, steel zincalum, glazing, alumunium, radiata WB, linea WB etc.

Type ..... % area .....
Type ..... % area .....
Type ..... % area .....

If Fibre Cement cladding is used, who is the manufacturer? Hardies ☐ BGC ☐ CSR ☐ PRIMA ☐ Other ☐ Eterpan ☐

Fibre Cement product used as Applied texture finish sheet, Flat sheet, FC plank (7.5mm), Linea (16mm)

If solid plaster, what backing was used? Fibre cement, plywood, paper, Triple S, block/brick, metal lathe

Wet Area Linings (bathroom, kitchen, laundry etc)

Please state the approximate square metres used

Formica Aquapanel	Seratone	Villaboard	Hardiglaze	GIB	Aqualine	Other	(state)
m²	m²	m²	m²	m²	m²	m²	.....

Roof Cladding (only applicaple if there is new roof cladding)

What roof cladding was used? (circle one or state below)
metal tiles, prepainted corrugated, trough zincalum, other steel profiles, concrete tiles, butyl, asphalt shingles, other (state) .....

Approx. Roof Area: ..... sqm

Type of roof structure Timber ☐ Steel ☐ Concrete Slab ☐

Thank you. Please fold this form, and freepost it in the return envelope Nov-11

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	☐	..... sqm	Number of storeys:	.....
Addition	☐	..... sqm	Average storey height:	..... m
Alteration	☐	(describe alterations)		

Are you claiming "green" building features? Yes / No **If Yes, what type?** .....

Main Structure

Concrete Frame ☐ Timber Frame ☐ Concrete Block ☐ LVL ☐ Glulam ☐
Steel Frame ☐ Tilt Slab ☐ Insulated Panel ☐ 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 ☐ Steel ☐ Concrete ☐ Other (state) .....

Wall Infill Framing (between main frame) (tick one or more)

Radiata ☐ Steel ☐ Douglas Fir ☐ Concrete block ☐ 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)	None	Pink Batts	Bradford Gold	Premier	Knauf Earthwool	Autex Greenstuf	Other Polyester	Wool	Polystyrene	Other (state)
Wall insulation	☐	☐	☐	☐	☐	☐	☐	☐	☐	.....
Ceiling insulation	☐	☐	☐	☐	☐	☐	☐	☐	☐	.....

Concrete slab insulation **Timber sub-floor insulation**

	Underslab full/partial	Perimeter edge	Under footing	Polystyrene	Polyester	Glasswool	Foil
Floor insulation	☐	☐	☐	☐	☐	☐	☐

Insulation Installer (name) ..... Builder ☐ **Other (please specify)** ☐

Building Wraps

	Flamestop	Bitumac	Tyvek Supro	CoverTek	Thermakraft	Fastwrap	Pauloid	Other (state)
Roof Wrap	☐	☐	☐	☐	☐	☐	☐	☐ .....

(tick one or more)	Bitumac	Tyvek Homewra	Watergate	Covertek	Thermakraft	Tekton	Fastwrap	Pauloid	Ecoply Barrier	Other (state)
Wall Wrap	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Wall Cladding State type and approximate % wall coverage

e.g. Concrete block, 75% Clay Brick, 15% Cedar WB, 10%

Other examples include: tilt slab, concrete block, steel zincalum, glazing, alumunium, radiata WB, linea WB etc.

Type ..... % area .....
Type ..... % area .....
Type ..... % area .....

If Fibre Cement product, what is it used as? (circle one) Applied texture finish sheet, Flat sheet, FC plank (7.5mm), Linea (16mm)

Wet Area Linings (bathroom, kitchen, laundry etc)

Please state the approximate square metres used

Formica Aquapanel	Seratone	Villaboard	Hardiglaze	GIB	Aqualine	Other	(state)
m²	m²	m²	m²	m²	m²	m²	.....

Spouting

What profile is the SPOUTING?

¼ round/quad ☐ ½ round ☐ Old gothic ☐ Box ☐ Other (state) .....

What material is the SPOUTING?

PVC (White) ☐ PVC (Colour) ☐ Steel ☐ Aluminium ☐ Copper ☐ Other (state) .....

Who installed the SPOUTING?

Roofer ☐ Spouting installer ☐ Builder ☐ Plumber ☐ Other (state) .....

Downpipes

What profile are the DOWNPIPES?

65mm round ☐ 80mm round ☐ 100mm round ☐ 65x50mm rectangular ☐ 100x50mm rectangular ☐
Other (state) .....

What material are the DOWNPIPES?

PVC (White) ☐ PVC (Colour) ☐ Steel ☐ Aluminium ☐ Copper ☐ Other (state) .....

Who installed the DOWNPIPES?

Roofer ☐ Spouting installer ☐ Builder ☐ Plumber ☐ Other (state) .....

Roof Cladding (only applicaple if there is new roof cladding)

What roof cladding was used? (circle one or state below)

metal tiles, prepainted corrugated, trough zincalum, other steel profiles, concrete tiles, butyl, asphalt shingles, other (state) ..... **Approx. Roof Area:** ..... sqm

Type of roof structure Timber ☐ Steel ☐ Concrete Slab ☐

Thank you. Please fold this form, and freepost it in the return envelope Oct-15