

Lower Cost Lower Risk

Residential Energy Modelling

Matthew Cutler

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Architects, Designers, Engineers, and other advisors

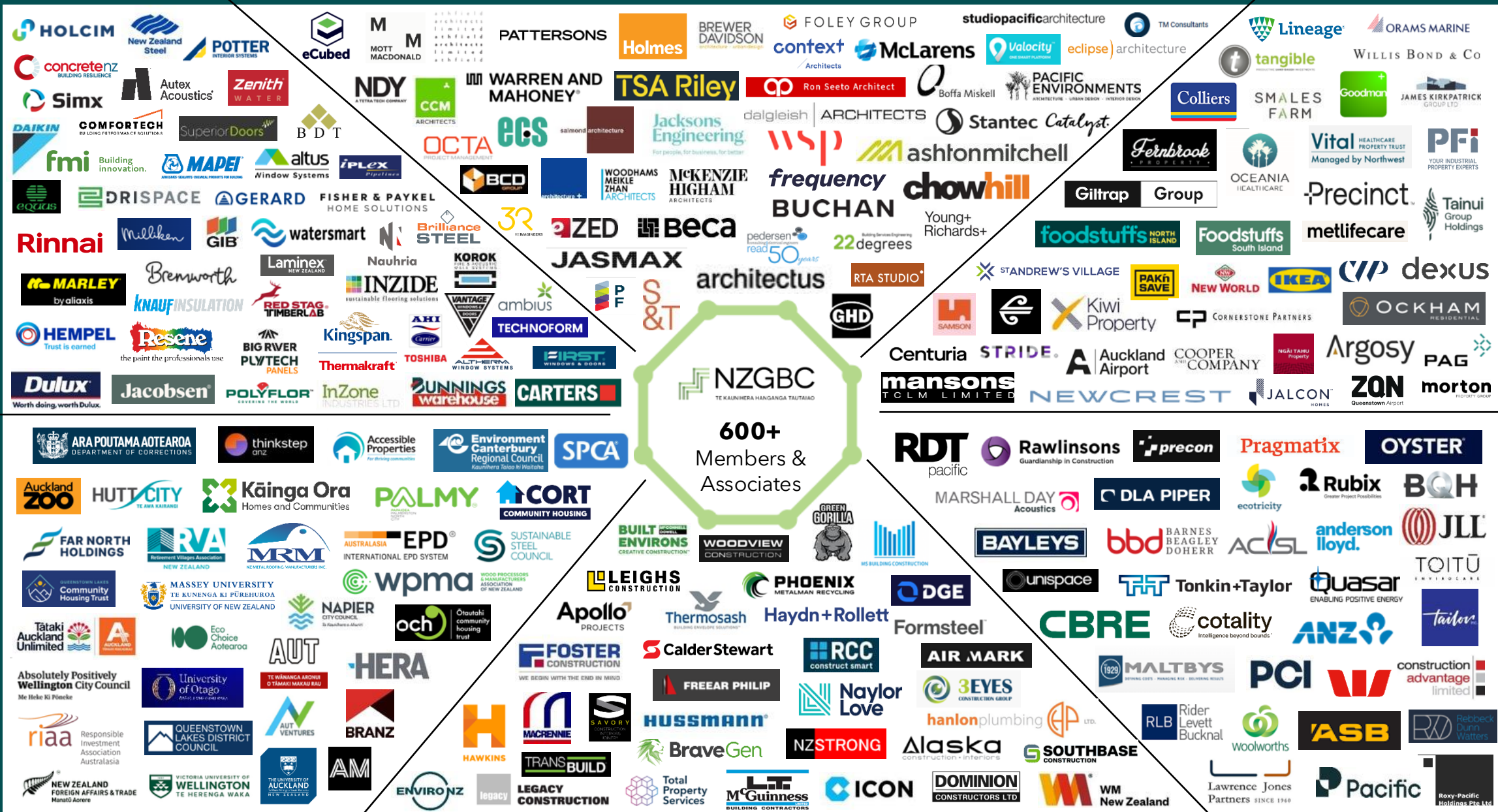
Property Developers, Owners, Occupiers and Investors

Property Professionals, Tenants and Related Property Interests

Contractors, Builders and other Construction Professionals

Product Manufacturers and Distributors

Local Authorities, Higher Education, Research Institutions



Inadequate

Absent

A General Provisions

A1 Classified Uses

A2 Interpretation

A3 Building Importance Levels

B Stability

B1 Structure

B2 Durability

C Protection from Fire

C1 Objectives of C2-C6

C2 Prevention from Fire Occurring

C3 Fire Affecting Areas Beyond the Source

C4 Movement to a Place of Safety

C5 Access and Safety for Firefighting Operations

C6 Structural Stability

D Access

D1 Access Routes

D2 Mechanical Installations for Access

E Moisture

E1 Surface Water

E2 External Moisture

E3 Internal Moisture

F Safety of Users

F1 Hazardous Agents on Site

F2 Hazardous Building Materials

F3 Hazardous Substances and Processes

F4 Safety from Falling

F5 Construction and Demolition Hazards

F6 Visibility in Escape Routes

F7 Warning Systems

F8 Signs

F9 Restricting Access to Residential Pools

G Services and Facilities

G1 Personal Hygiene

G2 Laundering

G3 Food Preparation

G4 Ventilation

G5 Interior Environment

G6 Airborne and Impact Sound

G7 Natural Light

G8 Artificial Light

G9 Electricity

G10 Piped Services

G11 Gas as an Energy Source

G12 Water Supplies

G13 Foul Water

G14 Industrial Liquid Waste

G15 Solid Waste

H Energy Efficiency

H1 Energy Efficiency







'A sauna without the fun': Calls grow for action on overheating townhouses

By Jacob Johnson, 1News Reporter | December 15, 2024



Calls to change building regulations to stop townhouses overheating

2:16

Air conditioning companies say they're seeing a surge in installations for townhouses. (Source: 1News)



Terraced houses in Auckland overheating due to poor design, demands for Building Code fix



By Raphael Franks

Multimedia Reporter • NZ Herald • 17 Jan, 2025 09:26 AM ⌚ 7 mins to read

19 Comments
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Large windows, poor ventilation, and lack of shade are primary causes of overheating homes, experts say, and we're locking it in. Photo / Michael Craig



Inadequate

Absent

A General Provisions

A1 Classified Uses

A2 Interpretation

A3 Building Importance Levels

EN6: Responsible Contracting

B Stability

B1 Structure

B2 Durability

LV5: Resilience and Adaptation

C Protection from Fire

C1 Objectives of C2-C6

C2 Prevention from Fire Occurring

C3 Fire Affecting Areas Beyond the Source

C4 Movement to a Place of Safety

C5 Access and Safety for Firefighting Operations

C6 Structural Stability

D Access

D1 Access Routes

D2 Mechanical Installations for Access

LV1: Inclusive Design

LV2: Occupant Amenities

LV3: Eco-Friendly Living

LV4: Sustainable Transport

E Moisture

E1 Surface Water

E2 External Moisture

E3 Internal Moisture

F Safety of Users

F1 Hazardous Agents on Site

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G11 Gas as an Energy Source

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G13 Foul Water

G14 Industrial Liquid Waste

G15 Solid Waste

HC2: Summer Comfort

EN5: Site Water and Ecology

H Energy Efficiency

H1 Energy Efficiency

EF1: Resource Efficiency

EF2: Urban Density

EF4: Water Use

EN1: Renewable Energy

EN2: Embodied Carbon

EN4: Construction Waste

What is energy
modelling?



H1: Energy Efficiency



Schedule Method

- How holey can it be?

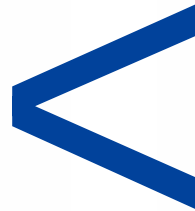


Calculation Method

- How relatively leaky is it?



Proposed bucket



Reference bucket

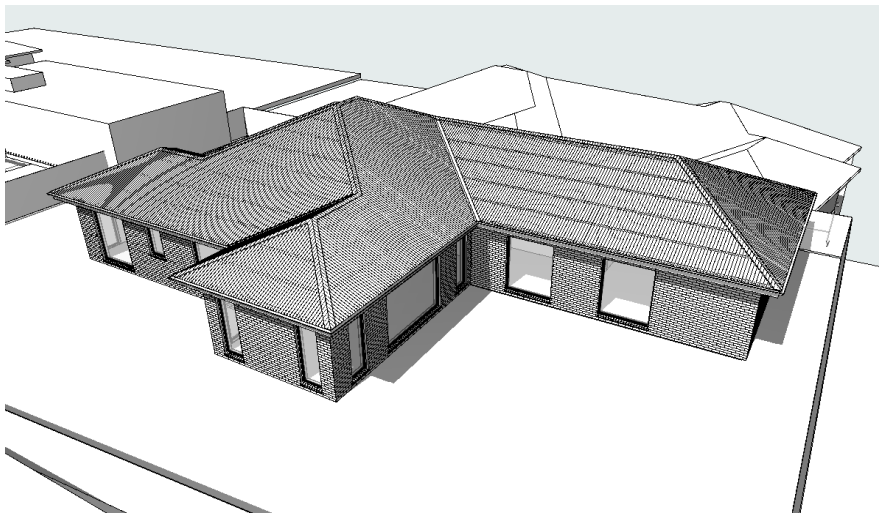
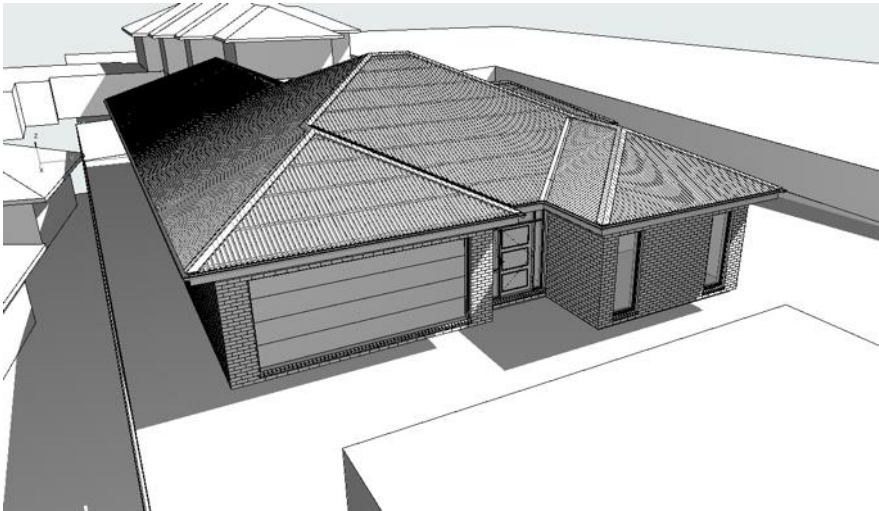


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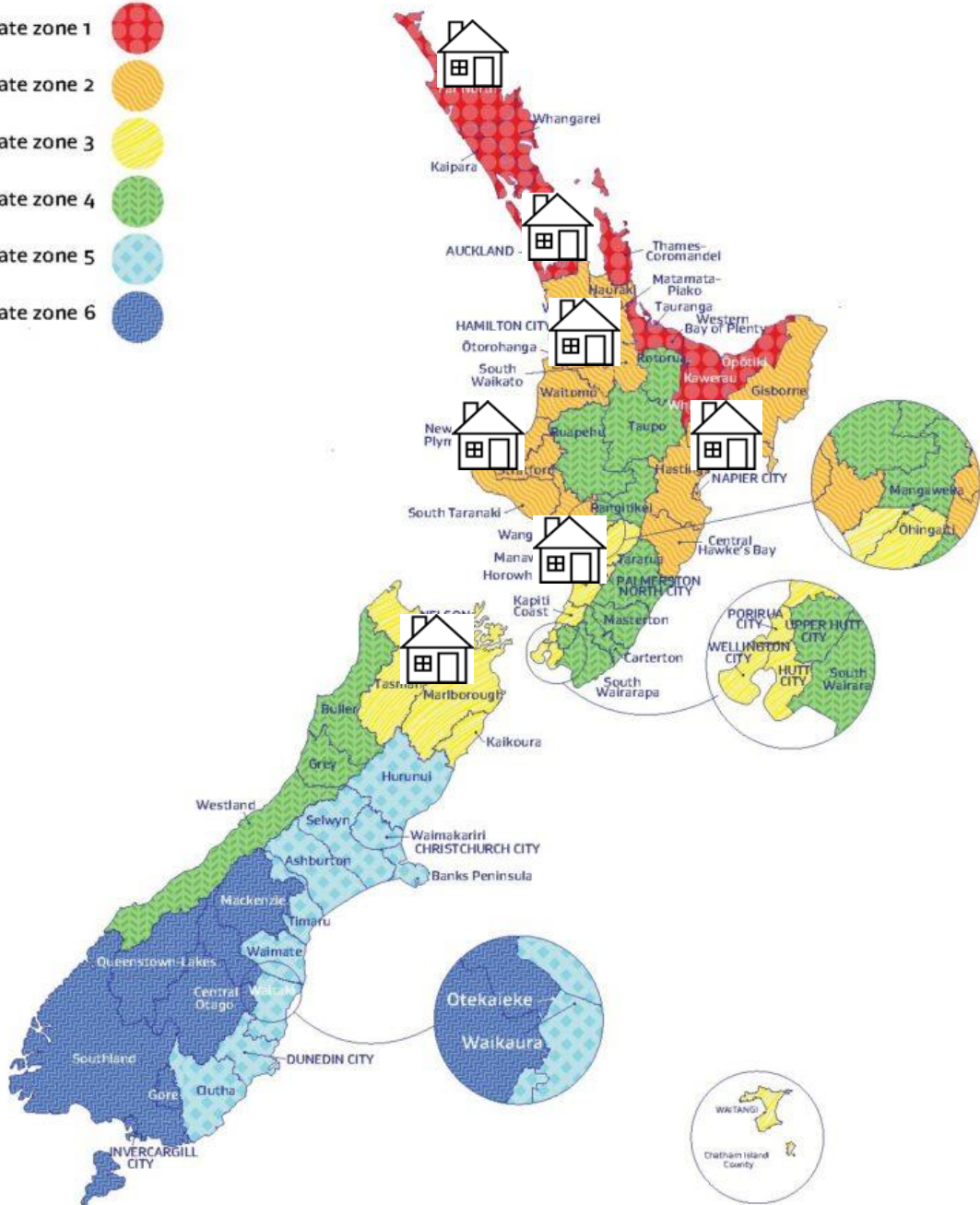
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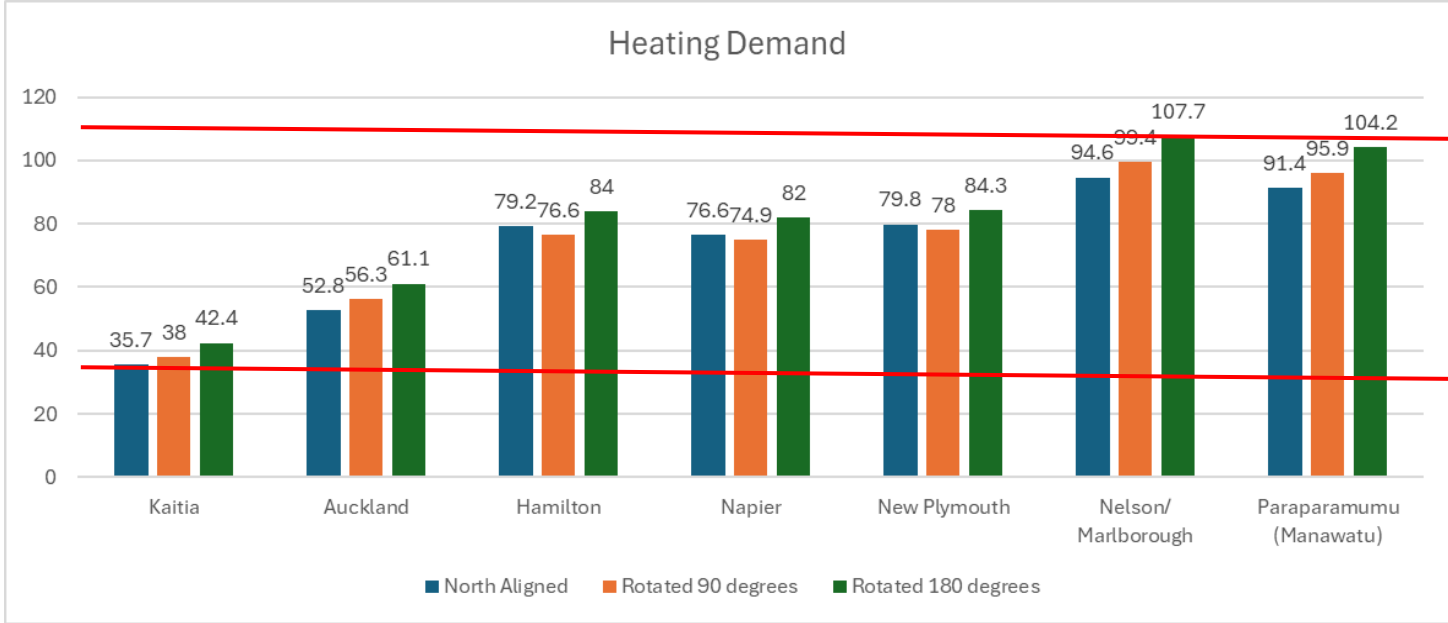
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Compliant house



- Climate zone 1
- Climate zone 2
- Climate zone 3
- Climate zone 4
- Climate zone 5
- Climate zone 6

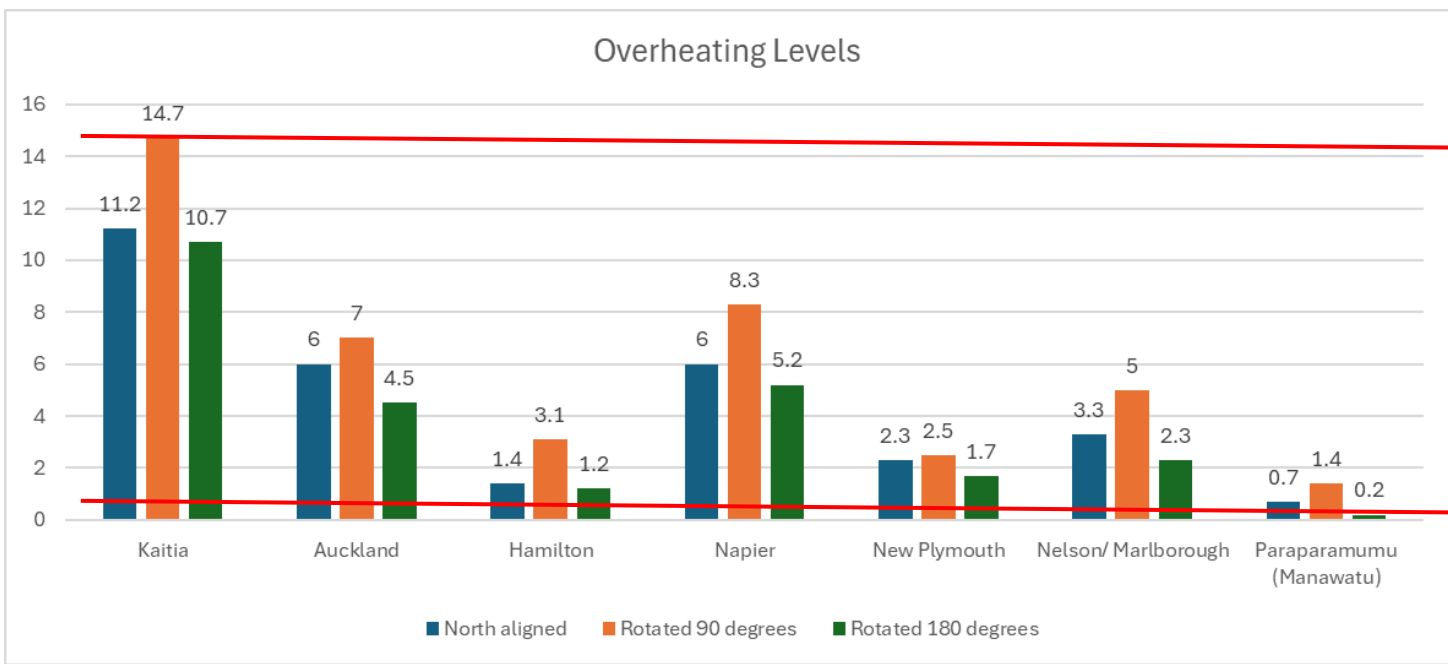




A totally code compliant house could have:

3x higher heating demand

Not great for a method that only calculates heat loss....



73x higher overheating potential

Modelling Method



Modelling Method

- *How much is going out?*



Modelling Method

- *How much is going out?*
- *How much is coming in?*



Modelling Method

- *How much is going out?*
- *How much is coming in?*
- *What's the target level?*



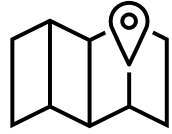
Modelling Method



- *How much is going out?*
- *How much is coming in?*
- *What's the target level?*
- *How does it vary?*



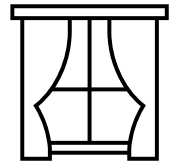
Map



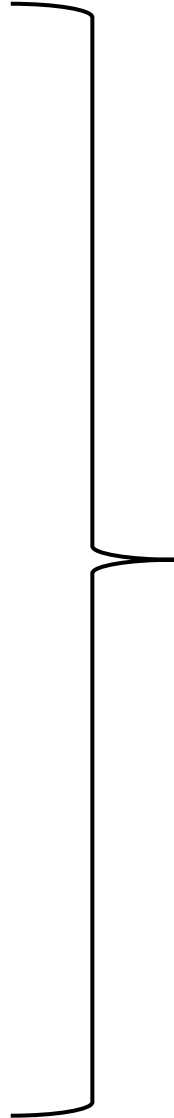
Wrap



Gaps



Apps



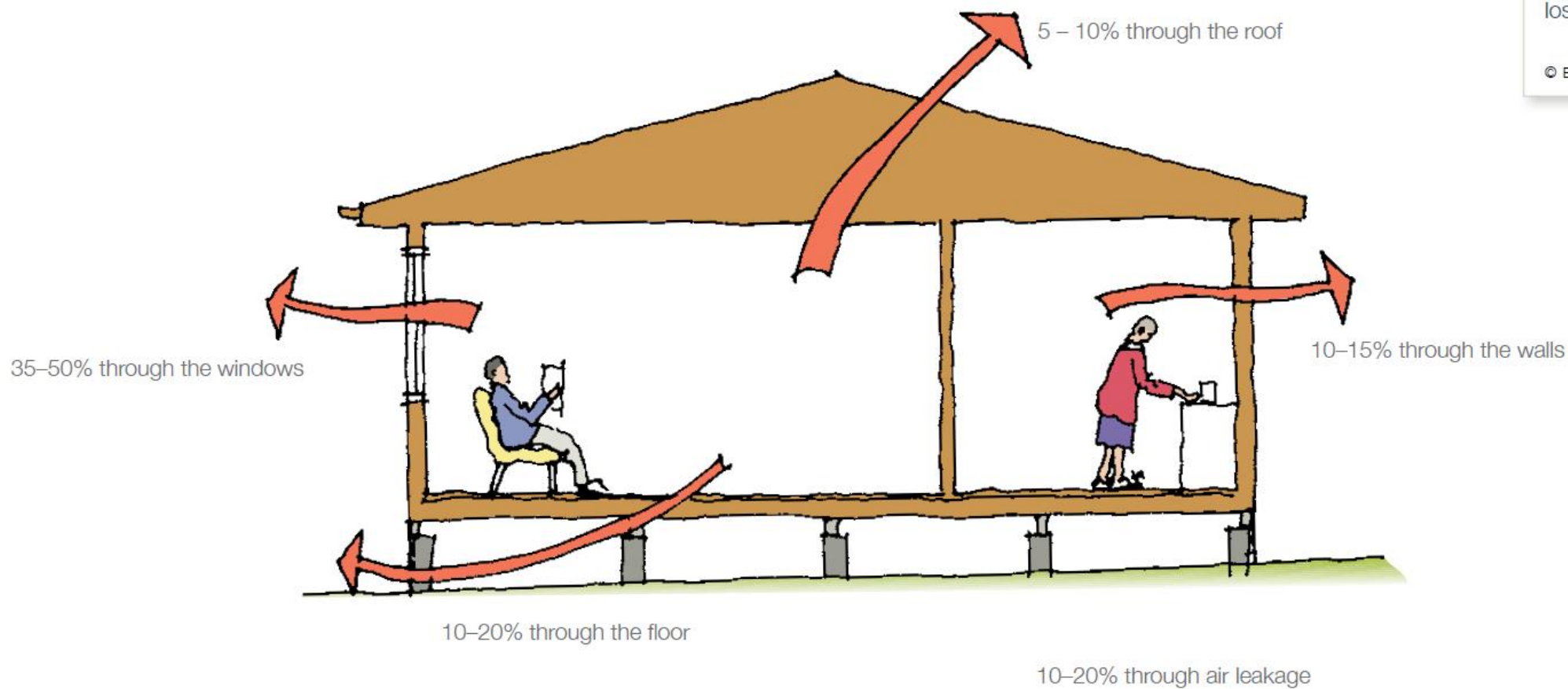
kWh/m²/yr

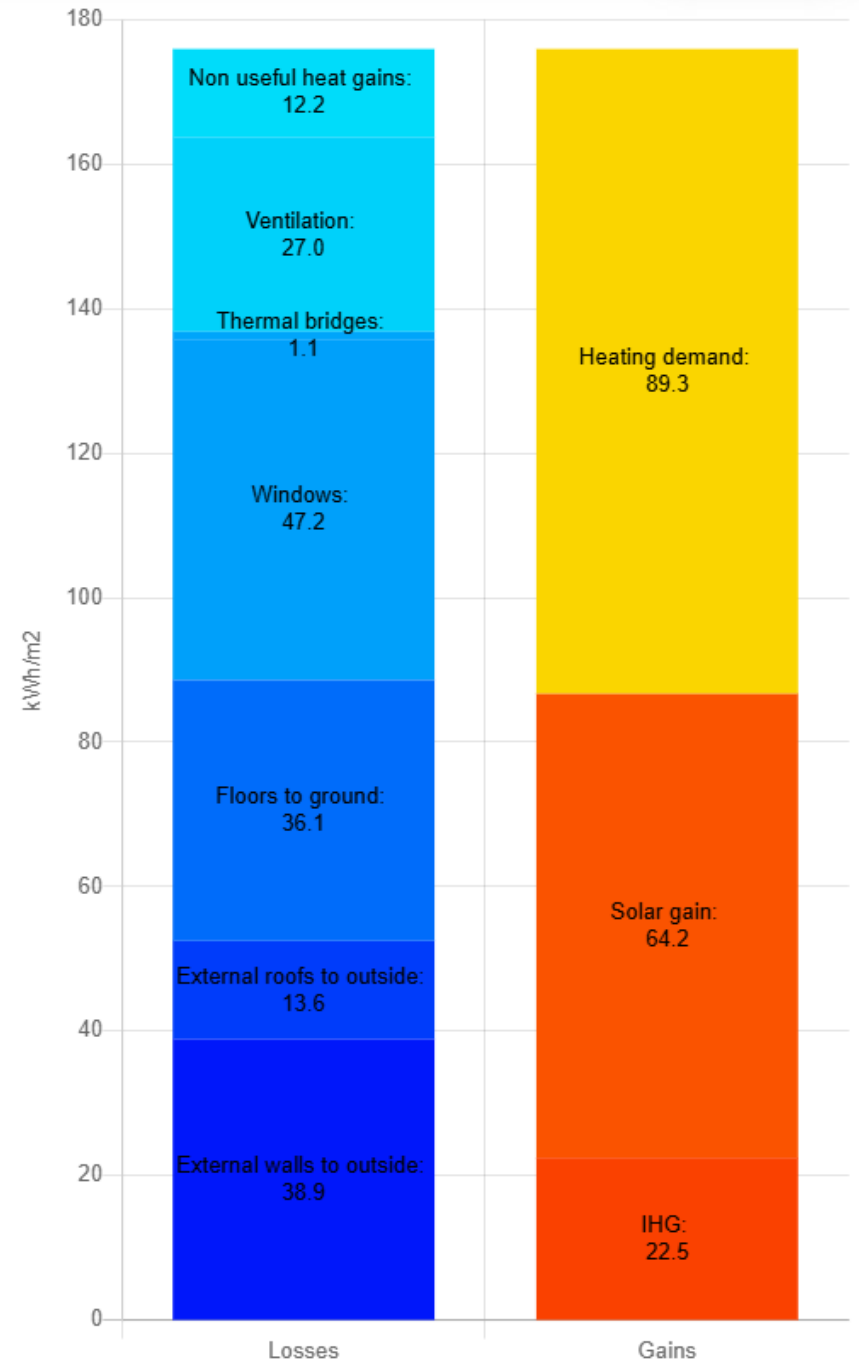
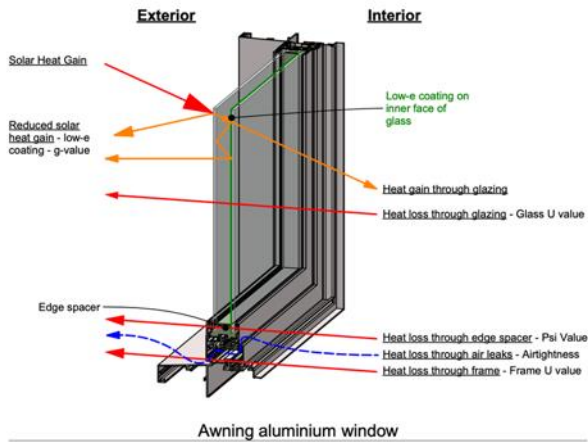
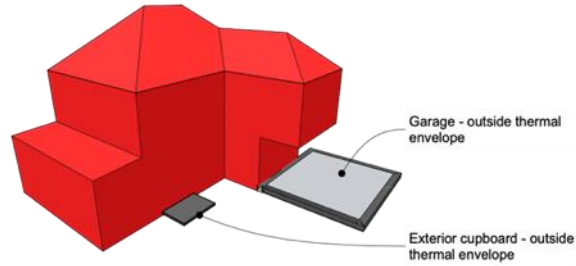
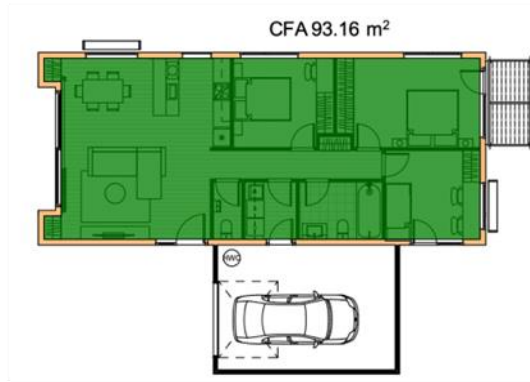


\$

Heat loss from a house insulated to H1/AS1 4th edition minimum requirements.
The windows account for the largest single proportion of heat loss.

© BRANZ 2021





If you're not modelling, your clients are basically crash test dummies on every new house!



Who is doing it

Project: Milton Street

Type: Social Housing

By: Kāinga Maha

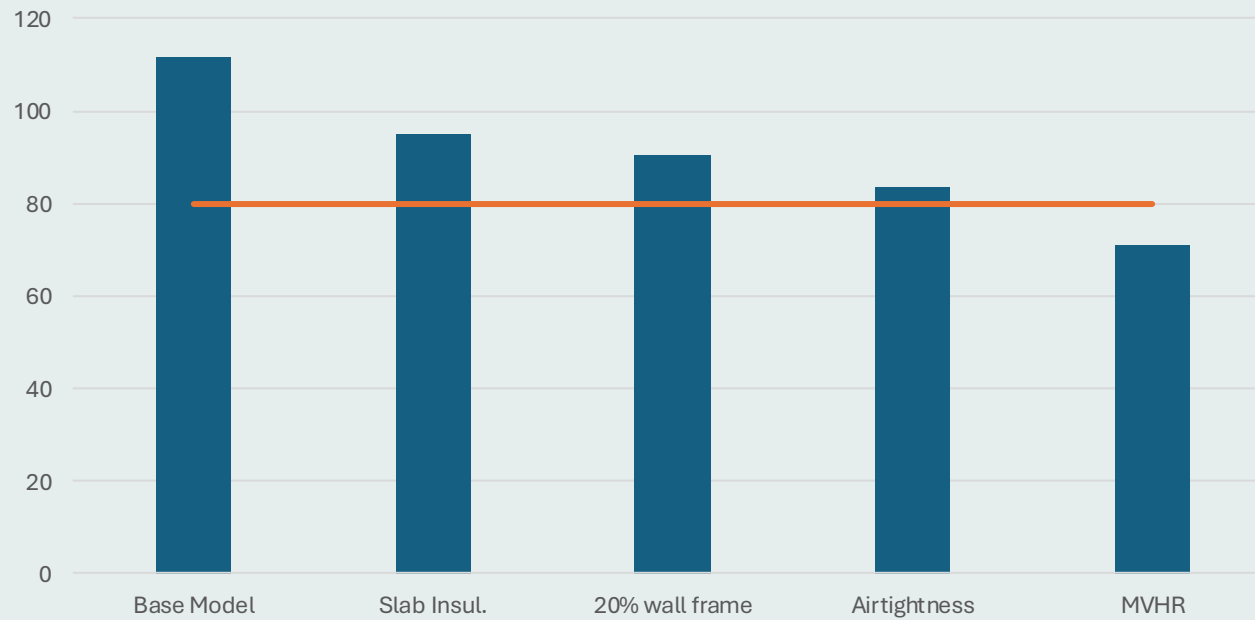
Location: Nelson

Rating: Aiming for 6&7  homestar



The Process

1. Homestar Designer involved from concept stage
2. Modelled options – SIPs, framing, timber floor, concrete floor, etc
3. Refined design including window sizing, shading, etc
4. Assessed the 'weak' points for thermal performance and overheating



SIPs Option									
Type	Terrace mid	Terrace End	Apartment top	Apartment bottom	Average	Homestar 6	Homestar 7	Homestar 8	Spec
Units									115 SIP+45
Heating demand	20	25.4	21.9	21.4	22.175	60	42	34	240 Suspended timber
Overheating	22.2	18	22.8	22.8	20.175	7	7	5	215 SIP
Cooling demand	6.4	6.1	18.3	11.5	10.075	-	-	-	200mm double glazing
Total heating & cooling demand	26.4	31.5	38.2	32.9	32.25	-	-	-	Glazing R value
Electrical use	34.7	36.8	41.3	44.1	39.225	65	47	35	Glazing g value
Homestar rating	0	0	0	0		6	7	8	Ventilation
									Balanced MVHR - steel
									Airtightness
									5
									Timber thermal bridge
									0.01
									Summer vent
									No
									Temporary shading to windows
									No
									Heating & cooling
									100% HP
									Hot water
									100% HP

SIPs Option									
Type	Terrace mid	Terrace End	Apartment top	Apartment bottom	Average	Homestar 6	Homestar 7	Homestar 8	Spec
Units									115 SIP+45
Heating demand	24.0	30.4	27.9	20.7	27.4	60	42	34	240 Suspended timber
Overheating	4.9	3.5	12	12.8	9.55	7	7	5	215 SIP
Cooling demand	3	2.9	8.9	6.7	5.375	-	-	-	200mm double glazing
Total heating & cooling demand	27.6	33.3	36.8	27.4	32.725	-	-	-	Glazing R value
Electrical use	36.5	38.8	43.7	46.2	41.3	65	47	35	Glazing g value
Homestar rating	7	7	0	0		6	7	8	Ventilation
									Balanced MVHR - steel
									Airtightness
									5
									Timber thermal bridge
									0.01
									Summer vent
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Type	Terrace mid	Terrace End	Apartment top	Apartment bottom	Average	Homestar 6	Homestar 7	Homestar 8	Spec
Units									115 SIP+45
Heating demand	20.5	27.2	24.2	21.1	24	60	42	34	240 Suspended timber
Overheating	4.8	3.1	18.1	14.4	10.2	7	7	5	215 SIP
Cooling demand	2.7	2.7	8.4	6.5	5.075	-	-	-	200mm double glazing
Total heating & cooling demand	24.2	29.9	32.6	27.6	29.075	-	-	-	Glazing R value
Electrical use	35.3	37.6	42.2	44.7	39.95	65	47	35	Glazing g value
Homestar rating	7	7	0	0		6	7	8	Ventilation
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SIPs Option									
Type	Terrace mid	Terrace End	Apartment top	Apartment bottom	Average	Homestar 6	Homestar 7	Homestar 8	Spec
Units									115 SIP+45
Heating demand	15.9	21.3	18.7	17.4	18.325	60	42	34	240 Suspended timber
Overheating	2.5	1.7	20.8	15.1	14.975	7	7	5	215 SIP
Cooling demand	3.2	3	9.5	7.5	5.8	-	-	-	200mm double glazing
Total heating & cooling demand	19.1	24.3	28.2	24.9	24.125	-	-	-	Glazing R value
Electrical use	33	35.2	40	42.5	37.675	65	47	35	Glazing g value
Homestar rating	0	7	0	0		6	7	8	Ventilation
									Balanced MVHR - steel
									Airtightness
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Units									115 SIP+45
Heating demand	15.9	21.3	18.7	17.4	18.325	60	42	34	240 Suspended timber
Overheating	0.5	0.1	2	1.7	2.575	7	7	5	215 SIP
Cooling demand	1.6	1.6	5.2	3.8	3.05	-	-	-	200mm double glazing
Total heating & cooling demand	17.5	21.9	23.9	21.2	21.975	-	-	-	Glazing R value
Electrical use	33	35.2	40	42.5	37.675	65	47	35	Glazing g value
Homestar rating	8	7	0	7		6	7	8	Ventilation
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Cooling demand	1.6	1.6	5.2	3.8	3.05	-	-	-	200mm double glazing
Total heating & cooling demand	17.5	21.9	23.9	21.2	21.975	-	-	-	Glazing R value
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The Result

- On budget
- Achieving Homestar
- Much needed social and community housing
- Better core performance = fewer additional points
- Occupant benefits:
 - Lower bills
 - higher comfort
 - better health
 - less maintenance
 - less risk...

Homestar Results

Project: 20260204_Toi Toi Street

Dwelling: Apartment - Top

Climate file: Nelson

☒ Homestar results
☐ Custom results

PDF Data & Results

PDF Embodied
Carbon

Headline dwelling energy & carbon data

Assuming NO cooling and heating to 20.0°C

Annual space heating demand (kWh/m ² /year)	Annual electricity demand (excluding appliances) (kWh/m ² /year)	Annual on-site fossil-fuel carbon emissions (kg.CO ₂ -e/m ² /year)	Annual TOTAL carbon emissions (kg.CO ₂ -e/m ² /year)	Upfront carbon emissions (kg.CO ₂ -e/m ²)
31.6	50.1	1.5	9.8	17.16

Additional heating parameters

Assumed occupancy (#)	Total effective air change (ach)	Internal heat gain (W/m ²)
1.5	0.39	3.05

Cooling and overheating data

Assuming cooling setpoint of 25.0°C

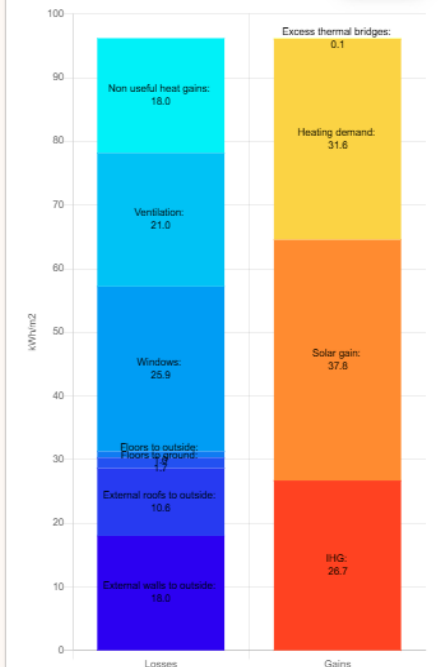
Summer window vent rate (ach/hour)	Percentage time above setpoint (no mechanical cooling)	Annual cooling demand (with mechanical cooling) kWh/m ² /year
0.0	5.1 %	4.4

Additional cooling parameters

Assumed occupancy (#)	Total effective air change (ach)	Internal heat gain (W/m ²)
1.8	0.85	3.87

Heat balance chart

Data to csv file





Project: Westmorland House

Type: Private home

Location: Christchurch

Rating: 9 

Features for enhanced quality:

-  Constructed with high-performing thermally efficient composite panels
-  Airtight envelope
-  Mechanical Heat Recovery Ventilation

Benefits:

-  Dry and warm in winter with low energy input
-  Comfortable in summer with minimal cooling
-  Access to low interest green loan



Scan to view the
full case study

A modern, two-story house with a dark, corrugated metal exterior and large glass windows. The house is situated on a grassy hillside with a wooden deck and stairs leading up to it. A large, semi-transparent text box with a black border is overlaid on the image, containing the text:

**NO HUMANS WERE
HARMED IN THE
TESTING OF THIS
PRODUCT**

- Unlock lower-interest development finance,
- Reduce post-build risk
- Deliver superior comfort and air quality
- Save your customers \$60–\$100k
- Stand out in a competitive market

Ngā wāhi pai ke atu, tūturu
Better places, proven





- Achieve Homestar by modelling early and often.
- Optimising comfort, health and cost with:
 - ✓ Size and shape
 - ✓ Insulation
 - ✓ Sunlight
 - ✓ Shading
 - ✓ Ventilation
 - ✓ Heating

Supplement the building code with a few basics:

1. An energy model
2. Winter and summer comfort
3. Continuous mechanical ventilation



- Embodied carbon
- Double-glazed Windows
- Ventilation: Continuous
- Winter Comfort: Good
- Moisture Control
- Water Use: WELS Rating
- Summer Comfort: Good
- Energy Usage: Basic
- Waste



Download
the free
Design Guide



Project: Wharenui Student Village

Type: Student Accommodation

By: White Hoban Properties

Location: Christchurch

Rating: 6 

Build cost increase to achieve Homestar:

 \$2.5 m build cost + 2%:	\$50,000
 Consultants and fees:	\$10,000
 Additional cost:	\$60,000

Interest Savings:

 \$2,560,000 at 1.63% saving:	\$41,728
 Saving over 5yrs:	\$208,640



Property Developers

	Typical Eligible Project Size	Funding Available / Scope	Typical Green Discount	Sustainability Criteria Used by Bank
	\$500k → \$100m+	• Up to \$3m at published Green Loan rate • Larger projects via bespoke sustainable finance	~10–30 bps (up to ~1.5% vs standard floating for ≤\$3m)	Residential: Homestar ≥6 (NZGBC accredited) Commercial / Mixed-use: Green Star ≥4 Operational / refinance: NABERSNZ ≥4 Certification is a hard eligibility requirement
	\$10m → \$1bn+	• No formal cap • Portfolio & corporate-scale lending Institutional SLLs common	~10–25 bps, KPI-linked	Homestar, Green Star, Green Star Performance, and NABERSNZ used as pricing KPIs Certification often embedded in Sustainability-Linked Loan targets, not just eligibility
	\$5m → \$500m+	• >\$440m already deployed • \$1bn committed to social & affordable housing	~20 bps margin discount	Residential: Homestar ≥6 Commercial: Green Star ≥4 Precincts: Green Star Communities NABERSNZ increasingly used for refinancing existing assets
	\$25k → \$10m+	• Standard product up to \$2m • Larger deals by negotiation	~10–25 bps	Residential: Homestar ≥6, Passive House Commercial: Green Star ≥4, Green Star Performance ≥4 Operational: NABERSNZ ≥4 Pragmatic evidence-based assessment
	SME → mid-market	• No fixed cap • ~\$100m+ per year currently • Long-term ~\$2bn target	~50–100 bps, impact-based	Residential: Homestar ≥6 Commercial: Green Star ≥5, NABERSNZ ≥4 Social / transitional housing explicitly included Criteria assessed alongside emissions and social outcomes

- <https://nzgbc.org.nz/sustainable-finance>
- <https://sustainablefinance.nz/wp-content/uploads/2025/04/Green-Finance-Guidance-for-Green-Buildings-FINAL-AUGUST.pdf>

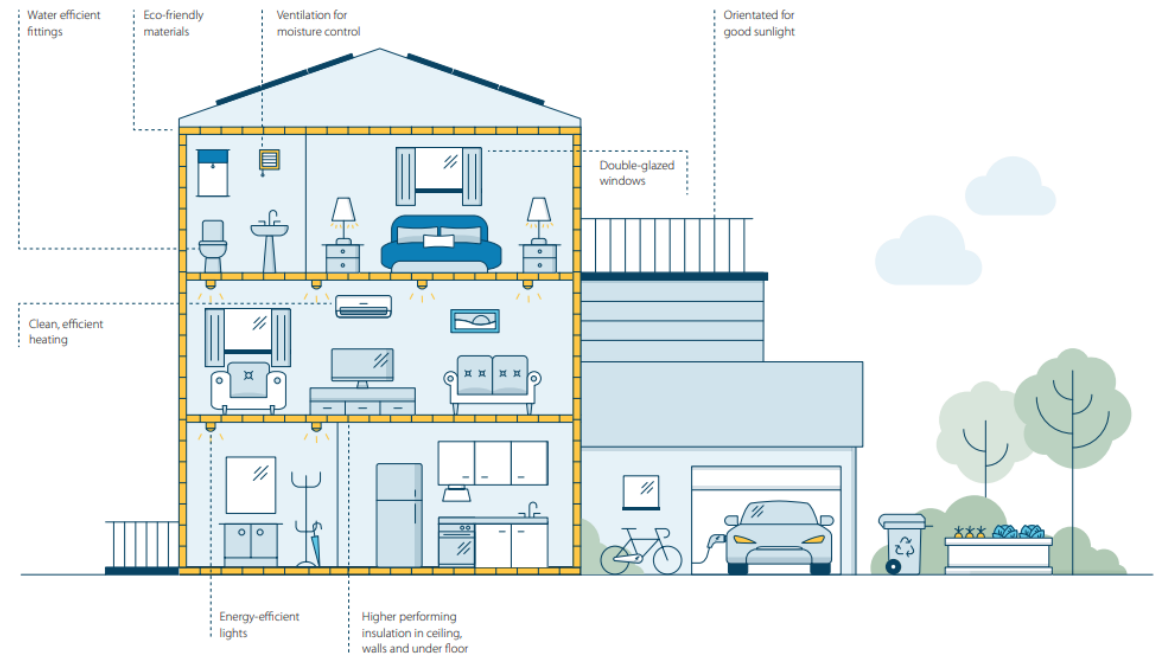


HEALTHY
HOMES

MAKE YOUR HOME A
PLACE TO THRIVE



FEATURES OF A 6 HOMESTAR RATED HOME



ANZ Home Loans

Save with interest rate discounts

- Fixed rate: **0.70% p.a. discount** (applied to new fixed-rate periods only)
- Floating rate: **1.00% p.a. discount**
- Flexible rate: **1.00% p.a. discount**

Low interest green mortgages could save Kiwi homeowners tens of thousands

- Enjoy a more comfortable, healthy home from day 1
- 6 Homestar can save over \$62,000
- Modest upfront cost increase of just 0.5% to 1.5%
- Be better off in three years or less

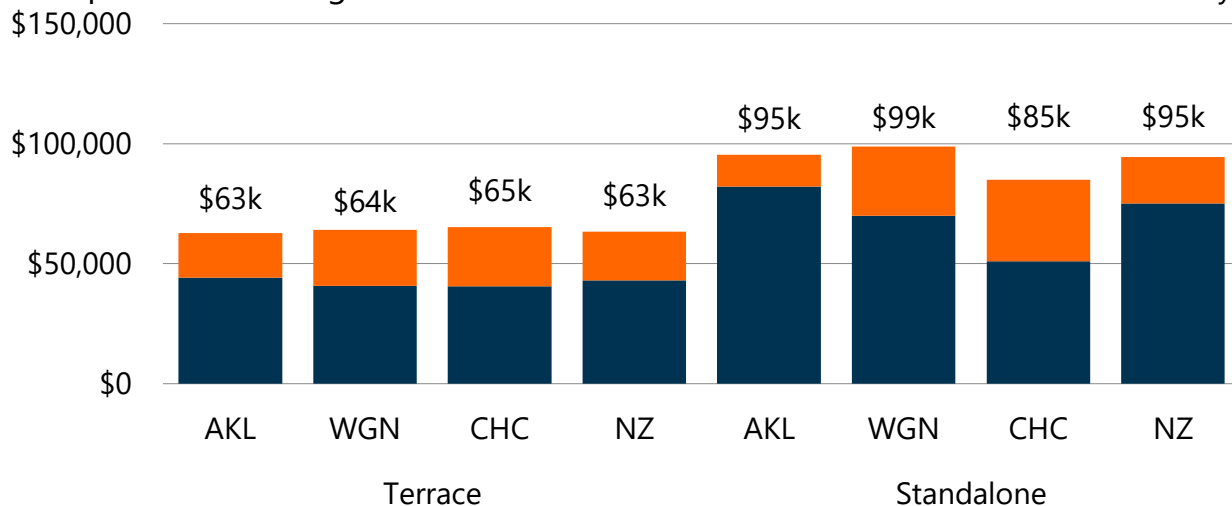
“Our analysis shows that Homestar homes are not only better for the environment — they’re better for your wallet,” says Brad Olsen, Chief Executive and Principal Economist at Infometrics.



Download the
report

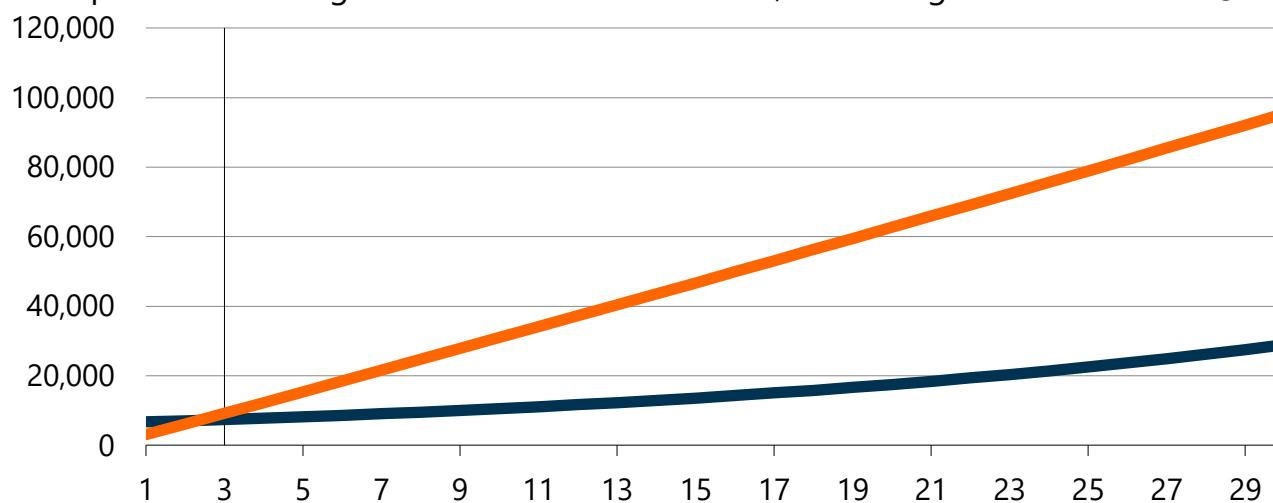
Total savings over 30y with 6 Homestar

Compared to Building Code minimum



Cumulative costs and savings with 6 Homestar

Compared to Building Code minimum. Standalone, NZ average



Market Opportunity



- Housing is expensive and uncertain
- Expensive items are often missing



- New homes overheat
- New homes still have condensation



- Carbon awareness
- Extreme weather
- 'Greenwashing'



Small Investment

- Design time upfront
- 0% - 1.5% above code

Significant Benefits

- ✓ **\$300 - \$1,800** savings per year
- ✓ **\$100,000s** savings for developers
- ✓ Over **\$60,000** off mortgage

- ✓ Warm in winter
- ✓ Cool in summer
- ✓ Fresh air
- ✓ Dry

- ✓ Get ahead on carbon
- ✓ Resilience
- ✓ Third party verification



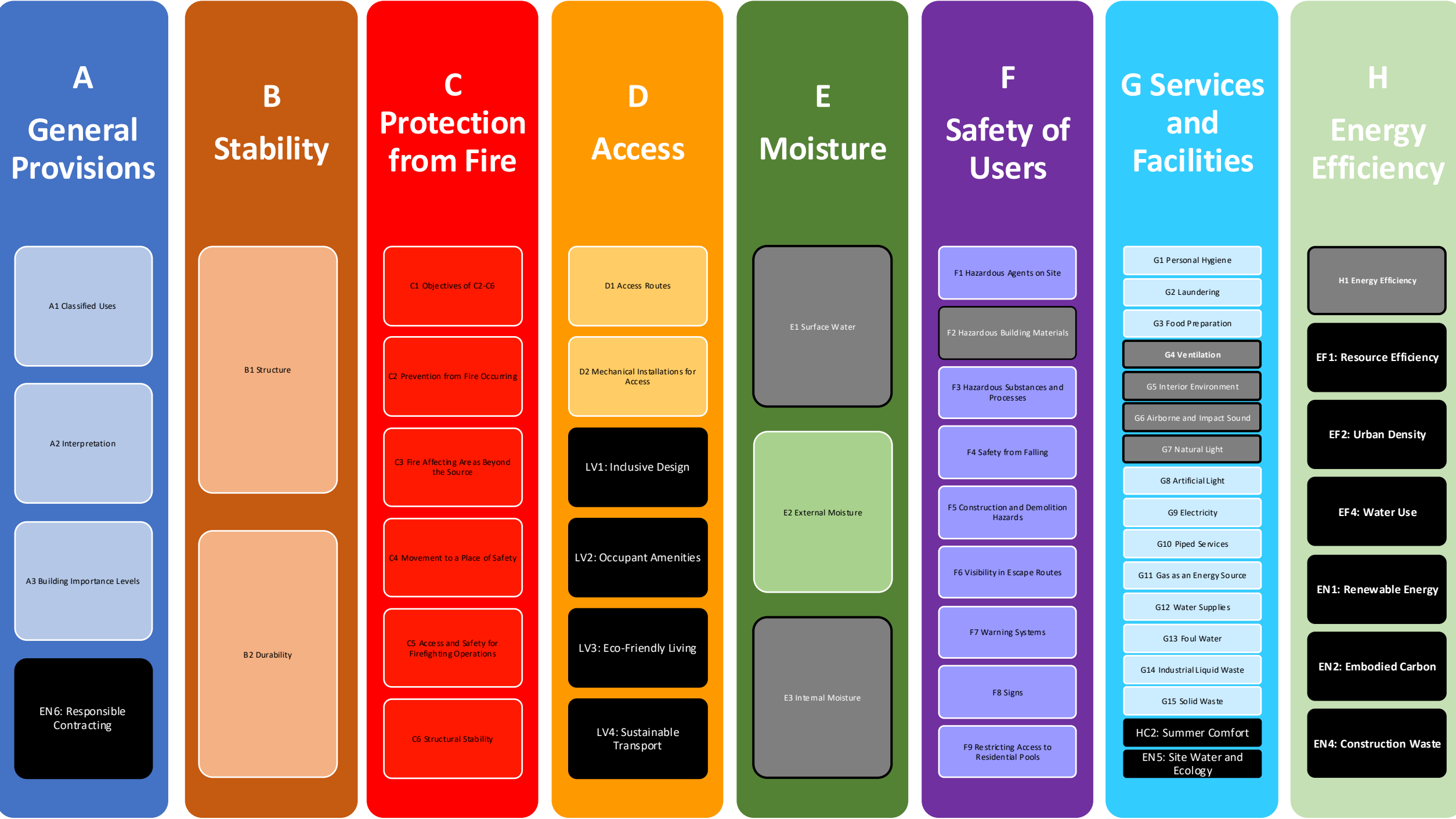












Key Takeaways

- Minimum compliance is high risk
- Model to reduce risk
- Prototype virtually
- Save money and your reputation

What next?

- Get a FREE model
- Better by Design – 4 hour workshop
- Residential Energy Modelling – 2 day course
- Bespoke in-house training

Build Better. Build to Homestar.

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