

Recommended Insulation and Glazing Requirements QLDC Affordable Housing

The insulation standards for affordable housing in the Queenstown Lakes District are designed to achieve comfortable, efficient dwellings that are affordable to heat to an acceptable standard.

The payback periods for meeting these standards for 4 houses of different types have been calculated and are presented in this document.

The building code is under review and new insulation standards will be effective from 2009. The standards recommended here exceed the proposed building code standards as the council intends that affordable housing in the district will be of high quality, as well as being cheap to run. The additional cost to developers for meeting these standards (and the payback period for this additional cost) over the requirements of the proposed building code has been calculated.

The following assumptions have been made in the calculations:

- The ALF model calculates the amount of energy required to maintain a **whole-house internal air temperature of 18°C**
- Construction costs based on prices in the Rawlinsons Construction Handbook 2006 + 6% to approximate 2007 prices (Auckland prices have been used since construction costs in the region are closer to Auckland than Dunedin or Christchurch)
- The ALF climate model used for all the houses is Queenstown
- Energy costs based on data from MfE¹ and EECA²:

Energy cost: **18.5 c/kWh** (low estimate for gas or electricity).³

Payback periods do not take into account increases in energy costs: An increase in energy costs would reduce the payback period.

- Average soil conductivity (for concrete slabs) of 1.2 W/m K
- Window data from Metro Glasstech:

Cost of LowE coating: \$100 per m²
Cost of Argon gas: \$20 per m²

¹ <http://www.mfe.govt.nz/publications/energy/warm-homes-heating-options-phase1-nov05/html/page7.html>

² <http://www.eeca.govt.nz/eeca-library/residential/brochure/getting-warmer-by-degrees-brochure-05.pdf>

³ Can also model for 7.5 c/kWh, which is a low estimate for firewood or heat pumps. Alternatively an average (13 c/kWh) could be used

It should be noted that these calculations are estimates only, based on estimated construction costs and energy prices, and historical climate data. Payback periods will also vary between house designs.

Reference houses compared

Refer to appendix for break-down of prices

	Area	Type	Construction	code – proposed code		proposed code – best practice	
				Additional cost	Payback period	Additional cost	Payback period
1	137m ²	4 bed house	Timber frame, concrete slab, weatherboard cladding	0.7%	5.1 years	1.0%	7.5 years
2	65m ²	2 bed apartment	Tilt slab (strapped & lined), concrete slab	2.5%	11.9 years	0.04%	3.3 years
3	63m ²	2 bed house	Concrete block (insulated externally), suspended floor	1.3%	5.3 years	0.04%	3.6 years
4	65m ²	2 bed house	Timber frame, suspended floor, cementboard cladding	1.4%	6.6 years	1.3%	8.5 years

STANDARDS

CURRENT CODE

	Non - solid	Solid
Roof	2.5	3.0
Walls	1.9	1.0
Floor	1.3	1.3
Glazing	0.26 ¹	0.26 ¹

¹ double glazing with solid aluminium frames

PROPOSED CODE (to come into practice 2009)

	Non - solid	Solid	
Roof	3.1	3.5	3.5
Walls	2.1	1.4	1.1
Floor	1.9	1.9	1.9
Glazing	0.26 ¹	0.26 ¹	0.31 ²

² double glazing with lowE coating with solid aluminium frames

BEST PRACTICE (based on SNZ PAS 4244:2003 Solid construction type designed to have same heating benefit as a non-solid dwelling built to best practice standards)

	Non - solid	Solid
Roof	3.5	4.0
Walls	2.6	1.9
Floor	3.1	1.9
Glazing	0.48 ³	0.48 ³

³ double glazing with lowE coating and argon gas fill and timber/PVC frames

STANDARDS FOR AFFORDABLE HOUSING

	Non - solid	Solid	
Roof	3.5	3.9	4.0
Walls	2.5	1.9	1.4
Floor	3.1	1.9	1.9
Glazing	0.26 ¹	0.26 ⁴	0.33 ⁴

⁴ double glazing with lowE coating and argon gas fill and solid aluminium frames

UK BUILDING REGULATIONS 2006 – MINIMUM STANDARDS FOR ALL BUILDINGS (for comparison)

	Approximate R-value ⁴
Roof	4.0 / 6.25
Walls	2.8
Floor	4.0
Glazing	0.45 / 0.50

⁴ not allowing for surface conductance (would result in a higher R-value)

Appendix: Reference houses

Example 1: **137m² House**

Number of beds: 4

Construction: Timber frame, weatherboard wall cladding, metal roof cladding, concrete slab

Total construction cost: 137 x \$1828.50 = \$250,504.50

Insulation cost (\$):

Building element	Area (m ²)	CODE	PROPOSED CODE	BEST PRACTICE
Roof	98.8	1,148.78	1,570.92	1,486.65
Walls	156.2	1,862.67	2,111.04	2,111.04 + 2,069.65**
Floor	86	0	1,520.21*	2,073.89
Glazing	36	21,560.40	21,560.40	21,560.40
TOTAL		25,006.73	26,762.57	29,301.63
Additional cost over total cost of building		/	< 0.7%	< 1.0%
Payback period		/	< 5.1 years	< 7.5 years

* 1.6m perimeter insulation only (50mm XPS)

** change in cost between 100mm framing and 150mm framing

Example 2: **65m² Flat**

Number of beds: 2

Construction: Concrete tilt slab (strapped and lined), metal roof cladding, concrete slab

Total construction cost: 65 x \$2,199.50 = \$142,967.50

Insulation cost (\$):

Building element	Area (m ²)	CODE	PROPOSED CODE	BEST PRACTICE
Roof	65.6	1,147.34	1,773.17	1,773.17
Walls	67.2	1,015.06	1,104.10	1,371.22
Floor	65	80.30	1,365.15*	1,365.15
Glazing	15.3	9,163.17	10,784.97	11,109.33
TOTAL		11,405.86	15,027.39	15,618.87
Additional cost over total cost of building		/	< 2.5%	< 0.04%
Payback period		/	< 11.9 years	< 3.3 years

* 1.7m perimeter insulation only

Example 3: **63m² House**

Number of beds: 2

Construction: Concrete block (strapped and lined), metal roof cladding, suspended floor

Total construction cost: 63 x \$1,828.50 = \$115,195.50

Insulation cost (\$):

Building element	Area (m ²)	CODE	PROPOSED CODE	BEST PRACTICE
Roof	63	862.26	1,115.86	1,301.84
Walls	55.6	751.43	913.51	1,134.52
Floor	63	/	1,035.09	1,035.09
Glazing	23	13,774.70	13,774.70	13,774.70
TOTAL		15,386.96	16,839.16	17,246.15
Additional cost over total cost of building		/	< 1.3%	< 0.04%
Payback period		/	< 5.3 years	< 3.6 years

Example 4: **65m² House**

Number of beds: 2

Construction: Timber frame, metal roof cladding, weatherboard cladding, suspended floor

Total construction cost: 65.3 x \$1,828.50 = \$118,852.50

Insulation cost (\$):

Building element	Area (m ²)	CODE	PROPOSED CODE	BEST PRACTICE
Roof	65.3	882.52	1,038.27	1,142.10
Walls	55.6	933.88	933.88	933.88+915.57*
Floor	65.3	/	1,574.70	2,100.76
Glazing	23.5	14,074.15	14,074.15	14,074.15
TOTAL		15890.55	17,621.01	19,166.46
Additional cost over total cost of building		/	< 1.4%	< 1.3%
Payback period		/	< 6.6 years	< 8.5 years