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Flexi House, Mount Pisa – Preliminary Energy Modelling Report

Project details	J116 Flexi
Address	Mount Pisa, Cromwell 9383
Client	Flexi house Ltd
Architect/Designer	Flexi House/ Makers of Architecture
Date	31 October 2022
Report Status:	Issued
Version	v01

Caveat on the modelling:
We have termed this work "preliminary energy modelling" as we haven't gone into the modelling in as much detail as we would do, for example, for Passive House certification modelling. There are some areas where we have used sensible and pragmatic assumptions in the modelling as it would take considerably more data, time, and effort to model in more detail. The figures produced from the modelling represent the assumptions and data used for modelling and therefore are not intended to be an accurate reflection of the energy used by occupants living in the Flexi House.

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1. Results

To establish the thermal performance of the house, the design was modelled and compared against the Building Code schedule method minimum requirements (H1/AS1 5th Edition) and the PHI Low Energy Building Standard. Some elements are simplified or approximated out of necessity.

The Passive House Planning Package (PHPP v10) software modelling was used to establish the energy performance of the design. It gives an accurate picture of how the design will perform in terms of comfort, heating requirements and the frequency of any overheating or cooling requirements.

PHPP-Energy balance calculation

10.3 EN

Building:	Flexi House Show Home		
Street:			
Postcode/City:		Mount Pisa	
Province/Country:	Otago	NZ-New Zealand	
Building type:	1-Freestanding single family house		
Climate data set:	NZ1006b-Queenstown, Altitude corrected		
Climate zone:	4: Warm-temperate	Altitude of location:	230 m
Home owner / Client:	Flexi House		
Street:	4 Jackson Street, Petone		
Postcode/City:	5012	Lower Hutt	
Province/Country:		NZ-New Zealand	
Architecture:	Flexi House/ Makers of Architecture		
Street:			
Postcode/City:	6011	Wellington	
Province/Country:		NZ-New Zealand	
Mechanical engineer:			
Street:			
Postcode/City:			
Province/Country:			
Energy consultancy:	VIA architecture Ltd		
Street:	PO Box 1707		
Postcode/City:	5252	Paraparaumu Beach	
Province/Country:	Wellington	NZ-New Zealand	
Certification:	Sustainable Engineering		
Street:	6A Buckingham Street		
Postcode/City:	6023	Wellington	
Province/Country:	Wellington	NZ-New Zealand	

Year of construction:	2022	Interior temperature winter [°C]:	20.0	Interior temp. summer [°C]:	25.0
No. of dwelling units:	1	Internal heat gains (IHG) winter [W/m²]:	3.0	IHG summer [W/m²]:	3.0
No. of occupants:	1.5	Specific heat capacity [Wh/K per m² TFA]:	60	Mechanical cooling:	

Specific building characteristics with reference to the treated floor area

					Criteria	Alternative criteria	Fullfilled?²
	Treated floor area	m²	53.3				
Space heating	Heating demand	kWh/(m²a)	**80**	≤	-	-	-
	Heating load	W/m²	**37**	≤	-	-	
Space cooling	Cooling & dehum. demand	kWh/(m²a)	**-**	≤	-		-
	Frequency of overheating (> 25 °C)	%	**19**	≤	-		-
	Frequency of excessively high humidity (> 12 g/kg)	%	**0**	≤	-		-
Airtightness	Pressurisation test result n_{50}	1/h	**1.5**	≤	-		-
Moisture protection							
	Smallest temperature factor $f_{Rsi=0.25\ m²K/W}$	-	**-**	≥	-	-	-
Thermal comfort	All requirements fulfilled?	-					-
	U-value	W/(m²K)		≤	-		
	U-value	W/(m²K)		≤	-		
	U-value	W/(m²K)		≤	-		
	U-value	W/(m²K)		≤	-		
Non-renewable Primary Energy (PE)	PE demand	kWh/(m²a)	**152**	≤	-		-
Primary Energy Renewable (PER)	PER demand	kWh/(m²a)	**70**	≤	-	-	-
	Generation of renewable energy (in relation to projected building	kWh/(m²a)	**0**	≥	-	-	

Note:

- Active cooling requirements have not been modelled; hence no figures showing.
- Total energy use (PE/PER) has not been modelled; those figures can be ignored.

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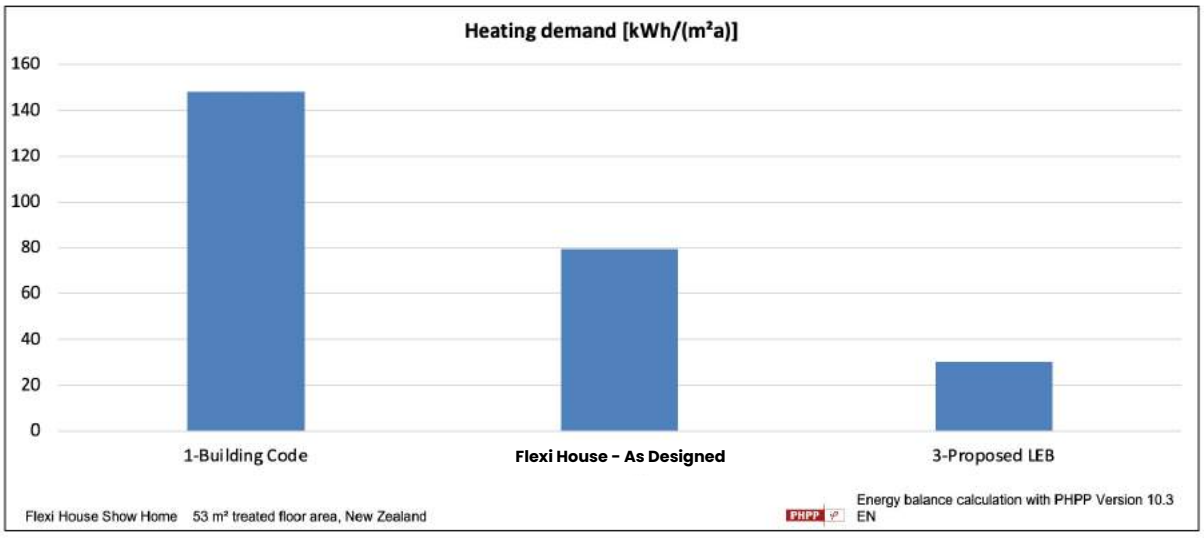
1.1 Summary performance comparison

The summary results in the table show the reduction in heating (46 %) from the building code to the Flexi House and to the PHI Low Energy Building standard. The "Treated Floor Area" (essentially useable floor area) is used as the reference area for modelling.

Metric	Building Code	Flexi House	LEB
Treated Floor Area (TFA)	53.3 m^2	53.3 m^2	53.3 m^2
Annual Heating Demand	148 kWh/(m^2a)	80 kWh/(m^2a)	30 kWh/(m^2a)
Total Annual Heating Demand	7.9 MWh/year	4.3 MWh/year	1.6 MWh/year
Peak Heat Load	69 W/m^2	37 W/m^2	19 W/m^2
Overheating Frequency	13 %	19 %	16 %



Please note that these results are based on design assumptions set out in the report and are not a guarantee that the stated performance will or will not be achieved.

3.2 Heating Load

The Specific Heating Load provides the basis to size the heating system. The table below sets out the heating system requirements (total heat load) for the Flexi House and for the LEB option at some different temperatures. To actually size a heating system, we recommend adding a sensible margin (even doubling) to these figures to allow for warming the house up quickly after it hasn't been occupied for a period in winter.

Metric	Flexi House	PHI Low Energy Building
Treated Floor Area (TFA)	53.3 m^2	53.3 m^2
Heating to 20°C (standard modelling assumption)		
Heat Load	37 W/m^2	19 W/m^2
Total Heat Load	1.9 kW	1.0 kW
Only heating to 18°C		
Heat Load	33 W/m^2	17 W/m^2
Total Heat Load	1.8 kW	0.9 kW
Heating to 22°C		
Heat Load	42 W/m^2	22 W/m^2
Total Heat Load	2.2 kW	1.2 kW

Note that this amount of heating is the peak. The amount of heating required varies from none in the summer month to the maximum in July and August. If you refer to the graph in the overheating section, the grey bars show how much heating is needed per square meter per month.

The heating load could be served with a small air source heat pump (air conditioning), and it could provide cooling in summer also. Occupants may also benefit from a small panel heater in the bedroom and a heated towel rail in the bathroom to provide some localised comfort heating.