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PRELIMINARY PASSIVE HOUSE REPORT

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33 Myoora Road,
Terrey Hills NSW 2084

Client: Kristian Wolf
Project: 2021-KM-02

NOVEMBER 3, 2021

Preliminary Report

Project Address: 33 Myoora Rd, Terrey Hills NSW 2084

Based on

☑ Design Development drawing set
Date on plans: 18/08/21

☑ Typical U-values for wall build ups

Contents

1. Scope of works undertaken

1.1. Stage 1: Preliminary

- Preliminary designPH model
  - Full building
  - Upper level
  - Lower level
- Preliminary PHPP analysis
  - Full building
  - Upper level
  - Lower level
- Preliminary optimisation of PHPP

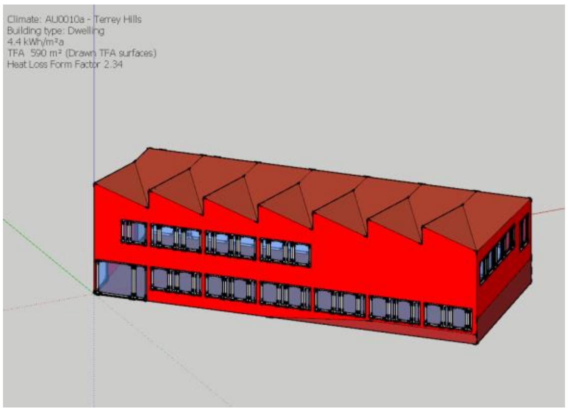

Figure 1 Project as modelled in DesignPH

The preliminary energy modelling was carried out with the Passive House Planning Package (PHPP). The analysis was optimised in line with the main required results for Passive House certification, as outlined below:

The Passive House Standard:

I. Heating demand: $q_H \leq 15$ kWh/(m²a)
(or) Heating load: $p_H \leq 10$ W/m²

II. Cooling demand: $q_C \leq 15$ kWh/(m²a)
(or) Cooling load: $p_C \leq 10$ W/m²
(or) No cooling system: 10 % of time over 25°C

III. Primary Energy Demand: **(Electricity)**
PE ≤ 120 kWh/(m²a)
(or) Primary Energy Renewable Demand:
PER ≤ 60 kWh/(m²a)

IV. **Airtightness** n_{50}: ≤ 0.6 h^{-1} (@ 50Pa)

Passive House requirements

- ✓ Comfort Zone 20 -25°C
- ✓ ΔT ≤ 4.2 K between air temp. and surface temp.
- ✓ ΔT ≤ 2 K between 0.1m and 1.1m off ground and 0.5m away from the window.
- ✓ Relative Humidity (RH) 30% -60%
- ✓ absolute humidity (AH) ≤ 12 g/kg @ 25°C
- ✓ Min. temperature 12.6°C at any point
- ✓ min supply air: 30m³ per person and hour
- ✓ Heat Recovery Ventilation (HRV) η ≥ 75 % heat recovery efficiency

Passive House classes:

Passive House classes	Classic	Plus	Premium	Units
Primary Energy Demand (PER)	≤60	≤45	≤30	$\frac{kWh_{PER}}{m^2_{TFA}a}$
Renewable Energy Generation	n/a	≥60	≥120	$\frac{kWh_{PER}}{m^2_{ground}a}$

The preliminary PHPP analysis is based only on the **building envelope and shading**. Standard values for other parameters were applied to get a better result. Thermal bridging is not accounted for in the calculation, it is expected to be built thermal bridge free.

All the findings and advice in this report are preliminary only and are not a guarantee for certification or sizing of equipment.

2. Project Information

Building Type	School
Location	33 Myoora Rd, Terrey Hills NSW 2084
Climate Data Set	AU0010a-Terrey Hills (NSW, Australia)
TFA	Total 590m2 approx.

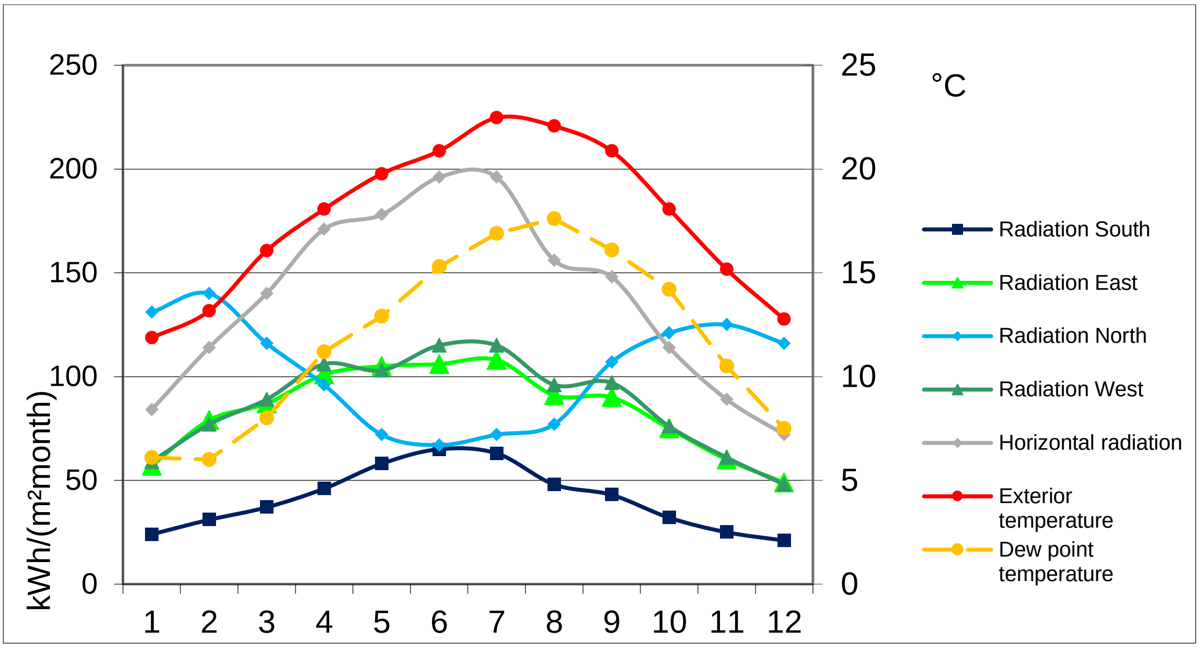

Figure 2 Climate date set for Terrey Hills, NSW, Australia, adjusted for building site elevation. Derived from Australian climate statistics, NaTHERS & Meteonorm data

2.1. Given Parameters

The following parameters have been used to complete the preliminary PHPP model. Please advise if these need to be changed.

- Preliminary U values:

Component	U-value ($\frac{W}{m^2K}$)
Roof	0.15
Slab	0.49
Wall	0.22

- Windows component:

Window Frame U_f	1.4 $\frac{W}{m^2K}$
Window Glazing U_g	0.60$\frac{W}{m^2K}$
g-Value	0.25

- Building usage times: 9AM to 3:15PM, Mo to Fr.
- Experimentation times:
    - Biology class 5%
    - Chemistry and physics between 10-30%.
- Generally, the classrooms/lab spaces will be used seated with standing lab benches on the perimeter.

2.2. Assumptions

The following assumptions have been used to complete the preliminary PHPP model. Please advise if these need to be changed.

- Occupancy = 100 persons
- Specific capacity, mixed building (CLT) = 132Wh/(Km^2)
- Lighting for classroom = 300 lux
- Building site elevation = 188m AHD
- Building site classification: Suburban

3. Findings

3.1. Specific building characteristics with reference to the treated floor area

					Criteria	Alternative criteria	Fulfilled?
	Treated floor area	m²	590				
Space heating	Heating demand	kWh/(m²a)	3	≤	15	-	yes
	Heating load	W/m²	7	≤	-	10	
Space cooling	Cooling & dehum. demand	kWh/(m²a)	3	≤	17	17	yes
	Cooling load	W/m²	11	≤	-	10	
	Frequency of overheating (> 25 °C)	%	-	≤	-		-
	Frequency of excessively high humidity (> 12 g/kg)	%	0	≤	10		yes

Table 1 Summary of heating and cooling characteristics for the project.

3.2. Energy Balance Heating (monthly method)

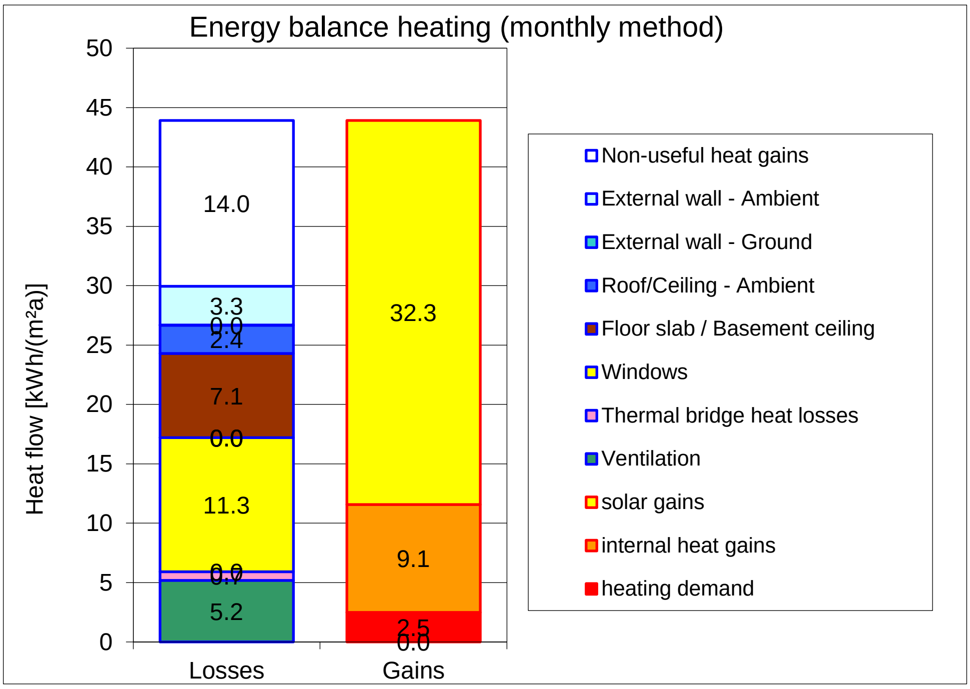

Figure 3 Total building energy losses and gains

3.3. Opaque building envelope

Roof/ceiling	• Pending green roof data
Wall	• Recommended U-value is suitable
Slab	• The ground temperatures are acting in favour of the thermal comfort of the interior environment. As such, we found that the performance is negatively affected with the insulation on the slab as currently designed.
Use factor	• The use factor is the ratio between the treated floor area and building envelope area. This factor is a good indicator of the compactness of the building. The smaller the use factor, the better the energy efficiency of the building. • This building has a use factor of 2.34, which is deemed good.

3.4. Windows & Doors

Frame	• U_f=1.4 (as provided) or lower
Glazing	• Ug=0.6 (as provided) or lower • g-value is very critical and needs to be below 0.4 with shading devices, or below 0.3 without shading devices. A g-value of 0.25 was used (as provided).

	• Note: please use a g-value above 0.25 to maintain the visual light spectrum, except in the case of smart glass or self-tinting
Shading	• We have allowed for the adjacent buildings in the shading analysis and louvres to the north-side upper storey windows. • Note, the Passive House standard may be achieved without additional external shading louvres. This is subject to more detailed information in general. • For now, we have not allowed for greenery like trees in our modelling

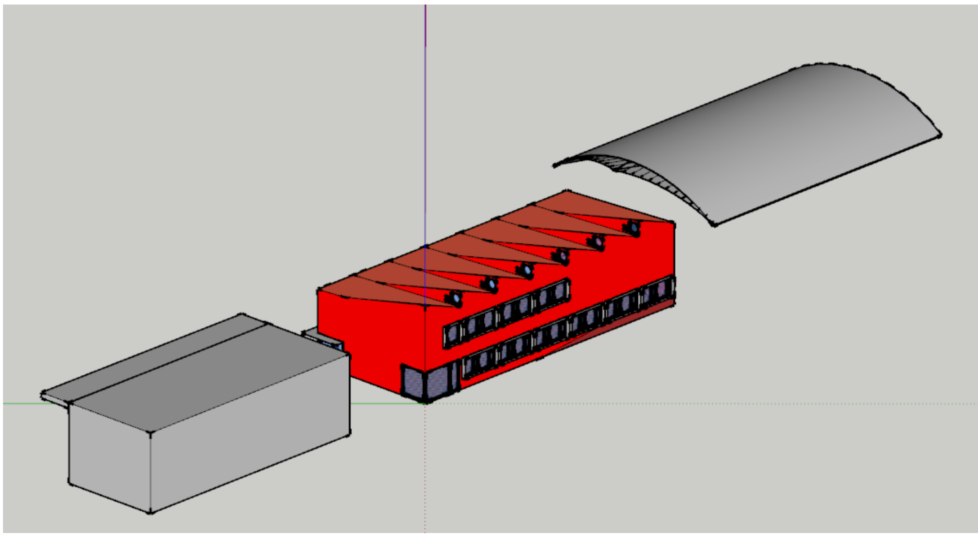

Figure 4 Contextual shading elements allowed for in analysis

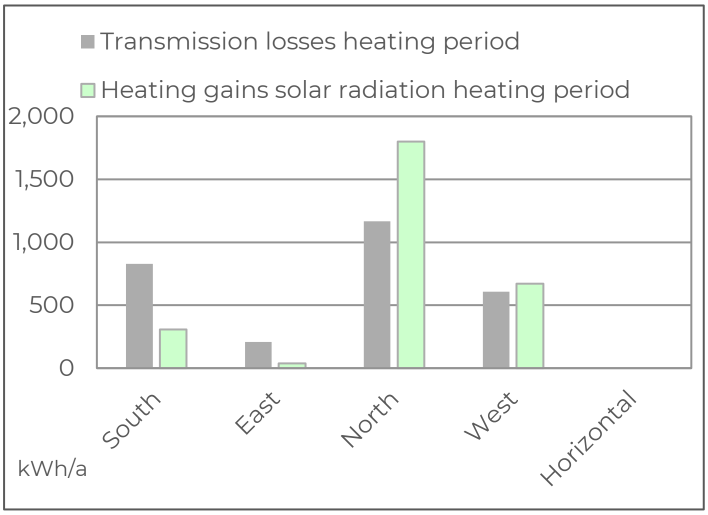

Figure 5 Heat losses and gains for window components by orientation

3.5. Airtightness

n50	• We have allowed 0.5 air exchanges per hour as recommended (see advice section)

3.6. Thermal Bridging

Thermal Bridge	• Window install values and glazing edge values have been allowed for. Any other potential thermal bridges have not been considered at this stage. • Most likely, no further thermal bridge entries are required for thermal analysis. Condensation risk and mould risk thermal bridge analyses may be advised.

3.7. Ventilation

Ventilation system	• An ERV or HRV system is suitable, as long as the energy efficiency recovery is above 80%. • For now, we have modelled one ventilation system, not with multiple ventilation systems.

Preliminary ventilation requirements

Average air flow rate	Average air change rate	Extract air excess (extract air system)	Effective heat recovery efficiency unit	Humidity recovery efficiency	Specific power input
m^3/h	1/h	1/h	[-]	[-]	Wh/m^3
1538	**1.04**	**0.00**	**79.9%**	**80.0%**	**0.35**

Table 2 Preliminary total ventilation requirements

3.8. Conditioning

Heating	• By our findings, it is possible to neglect heating, with an expected lowest temperature of 18°C. This a preliminary finding only.
Cooling	• By our findings, it is possible to neglect cooling, with a maximum expected temperature of 26°C. This is a preliminary finding only.
Dehumidification	• The building has a high dehumidification load from the occupants. However, with a summer ventilation of $25m^3$/person, dehumidification requirements may not be needed. This is a preliminary finding only. • Conditioning via windows has not been considered. This does <u>not</u> mean you cannot open the windows.

3.9. Water services

DHW	Not part of the preliminary report.
Cold water	Not part of the preliminary report.
Sewer system	Not part of the preliminary report.

4. Advice

4.1. Opaque building envelope	
Roof/ceiling	• Provided build ups are sufficient.
Wall	• Provided build ups are sufficient.
Slab	• Provided build up is over designed. Thermal insulation below the slab can be eliminated. This is a preliminary finding only.
4.2. Windows & Doors	
Frame	• The provided U_f of 1.4 seems high compared to the glazing values. A better frame may be advised for a balanced economical solution.
Glazing	• The provided glazing values seem very good and might be over designed. A more economical option might be possible.
Shading	• We note that external louvres may be beneficial to reduce instances of glare (applies only to glazing in direct sunlight).
4.3. Airtightness	
n50	• Due to huge building volume, we would recommend a q50 of 0.6 $\frac{m^3}{m^2h}$. The q50 is representing the risk of damage in the thermal envelope build-up, i.e. air permeability of the structure. No additional work is required, the PHPP provides us with the q50 if we enter the n50 value. The recommended n50 would be 0.5 air exchanges per hour.
4.4. Thermal Bridging (TB)	
Roof	• Roof beam as shown not expected
Wall/roof	• Check TB of wall roof junction at high point
Windows/doors	• Check TB of windowsills and side of frames • Check TB of door sills • Check TB glazing edge
Separating floor level	• Not expected
Wall/ground	• TBC – details needed.
Slab perimeter	• Check TB of slab perimeter – detail needed.
4.5. Ventilation	
HRV	• 4-7 individual units without conditioning (must be only sensible heat recovery) • 7th unit in chemical storage room

4.6. Conditioning

Heating	• Heating may not be required (as modelled 4kW to maintain a min temperature of 20°C)
Cooling (sensible)	• Cooling may not be required (as modelled 7.1kW to maintain a max temperature of 25°C)
Dehumidification	• Dehumidification may not be required (as modelled 2.4kW to maintain a max indoor absolute humidity of 12g/kg)

4.7. Water Services

DHW	Not part of this report.
Cold water	Not part of this report.
Sewer system	Not part of this report.

4.8. Project Unique Advice

Ventilated chemistry storage room	• As the ventilated chemistry storage room needs to be ventilated 24/7, it makes sense to have a heat recovery ventilation unit for that room, with a slight negative pressure to avoid fume leakage. • Side note: In the case a chemistry cupboard is used, an air supply and extract unit are required, and the cupboard needs to be airtight. It needs to be considered that this cupboard now has outdoor conditions, inside the cupboard. What could cause condensation inside the cupboard and will cause energy losses to the rest of the building. We would recommend to thermally insulate that cupboard and double check with the client if the stored items are temperature sensitive.
Fume cupboard	• As the fume cupboard needs to extract a huge volume of air out of the room, it needs a supply vent close by in the thermal envelope. This vent needs to be airtight when not used and it would make sense to have the operation of the vent coupled with the on/off switch of the fume cupboard.

5. Information required

5.1.	Green roof U-value	
5.2.	Details of TB's above	
5.3.	Fume cupboard details	
5.4.	Chemical storage room details ▪ Is this conditioned space for the chemicals?	
5.5.	Geotechnical/soil composition report	
5.6.	IFC context file for shading	✓
5.7.	Hot/cold water requirements	
5.8.	Sanitary requirements (regulation)	