



Planning Policy Response

This report demonstrates how the proposed design addresses and positively contributes towards the following areas of planning policy.

CC2: Sustainable Design and Construction. The report shows that the proposal is capable of meeting the Passivhaus standard, subject to PHPP modelling, detailed design and Certification. Should the Passivhaus standard be adopted it would result in a considerable improvement over and above the requirement for 19% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations.

The building design is based on a timber frame Passivhaus certified building system called PH15 which has very low embodied carbon when compared to alternative construction methods such as Steel frame or masonry construction.

CC3: Adaptation to Climate Change. The design has been carefully considered in relation to its form and solar orientation. Useful solar gains and passive heating are maximised by the south facing façade design whilst protecting against overheating and mitigating against the effects of climate change through careful shading design by means of deep reveals, overhangs and protruding shading elements to the south facing windows.

CC4: Decentralised Energy. In reducing energy demand to a minimum through Passivhaus design, relatively small intervention of renewable energy solutions can go a long way to meet a building's energy demand. We have proposed photovoltaic panels and air-source heat pumps to each dwelling as a simple and cost effective means of providing micro generation.

Please refrain from printing this report if possible.

40-50 Mount Pleasant Passivhaus Low Energy Design Report - Planning Application Stage.

1.0 Introduction

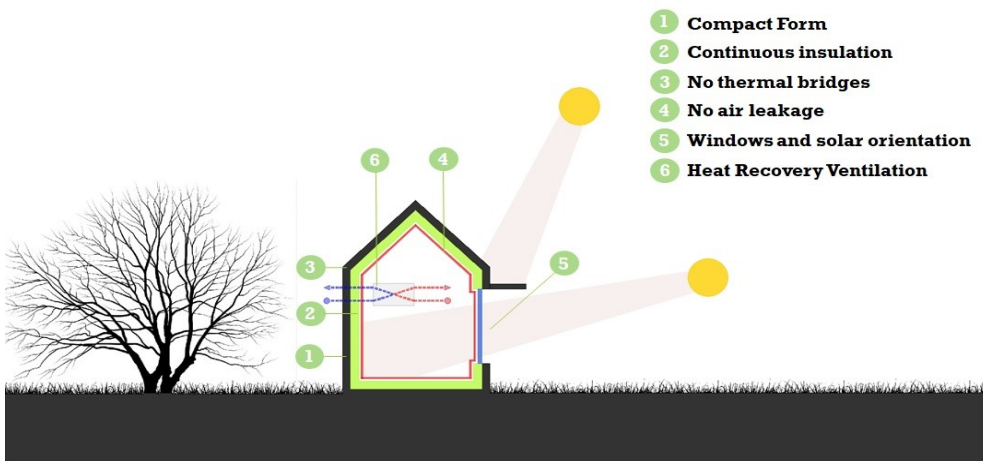
The purpose of this report is to outline the low energy design development and potential energy performance of the Mount Pleasant project.

1.1 The target of the project in energy terms has been to develop the design so it is capable of meeting the Passivhaus low energy design standard. At this stage the focus has been on achieving a potential energy balance for one of the mid terrace houses so that the energy required to heat the house is 15kWh/m²yr or less, as required by Passivhaus standard. The planning stage DesignPH model shows the proposed design is capable of meeting this target should the Passivhaus standard be a requirement. It should be noted that the PHPP modelling software will need to be used as the design develops in detail to formally assess the building's energy performance.

The heating energy target has been chosen for this stage as the form, fabric and fenestration design are mostly fixed by planning approval. We are also proposing microgeneration of energy via renewable sources with the use of solar panels and air source heat pumps.

1.2 The design has been developed on the basis of six principles of low energy passive design as follows:

Summary of **Passive** principles



1.3 The Passivhaus route has been chosen as it is a proven 'fabric first' standard, minimising energy demand and achieving significant energy savings over and above building regulation requirements. It has been the subject of wide ranging post-occupancy energy use studies. The actual energy use in Passivhaus buildings is shown to very closely match the use predicted by the design, closing the energy performance gap. In the UK, the performance gap between designed heat loss and in use heat loss has been shown to be between 10% and 125%. Further detail on this can be found in the Passivhaus Trust's report 'Passivhaus : the route to zero carbon?'

2.0 Design Development

2.1 A review of the original planning application design relating to energy use has been undertaken with the following observations.

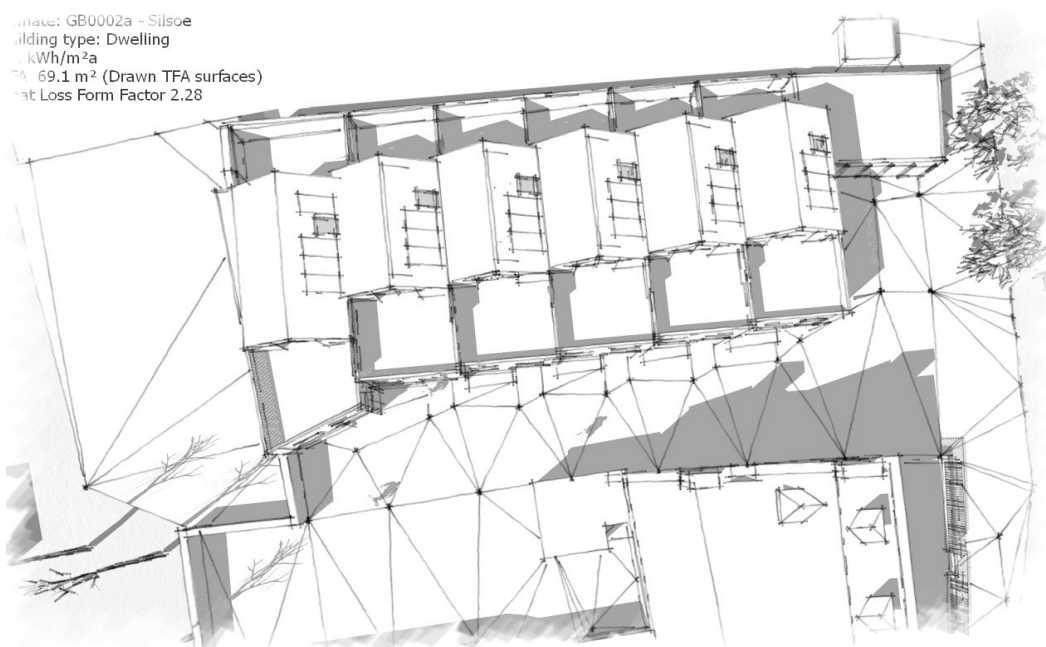


- The massing of the original planning application is quite simple and compact, this is beneficial to low energy design. Any amended design should consider using similar principles.
- The design's East/West orientation does not utilise the site's solar access well. As a result there will be considerable heat loss from the windows, even if high specification units are chosen.
- The design's East/West orientation has the potential to cause overheating in the summer months as it is very difficult to effectively shade windows on these elevations.
- Any amended design should look to develop a North/South facing orientation to optimise useful winter solar gains and reduce energy loss.

2.2 Site Analysis. The site has a mix of opportunities and constraints when considering low energy design. The orientation of the site is roughly 10 degrees from the north/south axis. This allows good solar access for any windows on the south facing elevation. The South side of the site is characterised by the North elevation of the adjacent listed building and its perimeter wall. The listed building is the most significant shading element on the site and reduces the site's winter solar access towards the road end of the site.

2.3 Several design options have been considered before settling on the submitted design. The proposal utilises several of the key concepts of passive low energy design as follows:

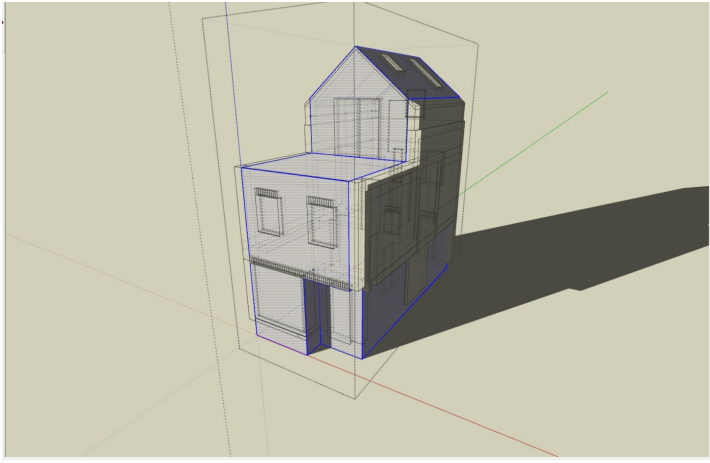
- The building has a relative simple and compact form. This helps give a low heat loss form factor, reducing the building's heat loss.
- The design is a series of South facing, three storey terraces, a very efficient form of house design.
- Each house has a South facing elevation, helping to maximise useful solar gains whilst allowing for a straightforward shading strategy to avoid overheating in the summer months.
- The adjacent listed building is a significant shading element on the site. To help maximise the solar access for the wellbeing of the building occupants, second floor sun terraces have been created.



2.4 We have used shadow studies to help develop a design that maximises the use of the winter sun to passively heat the houses.

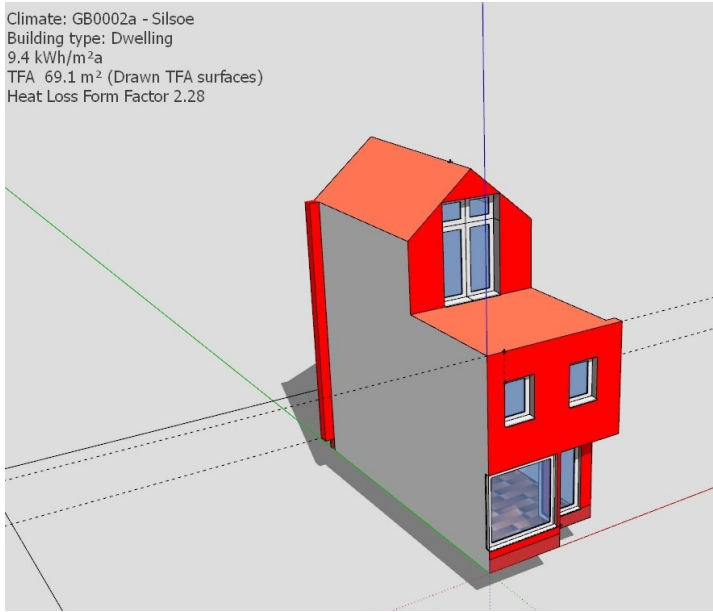


2.5 DesignPH model extracts showing the thermally modelled unit.



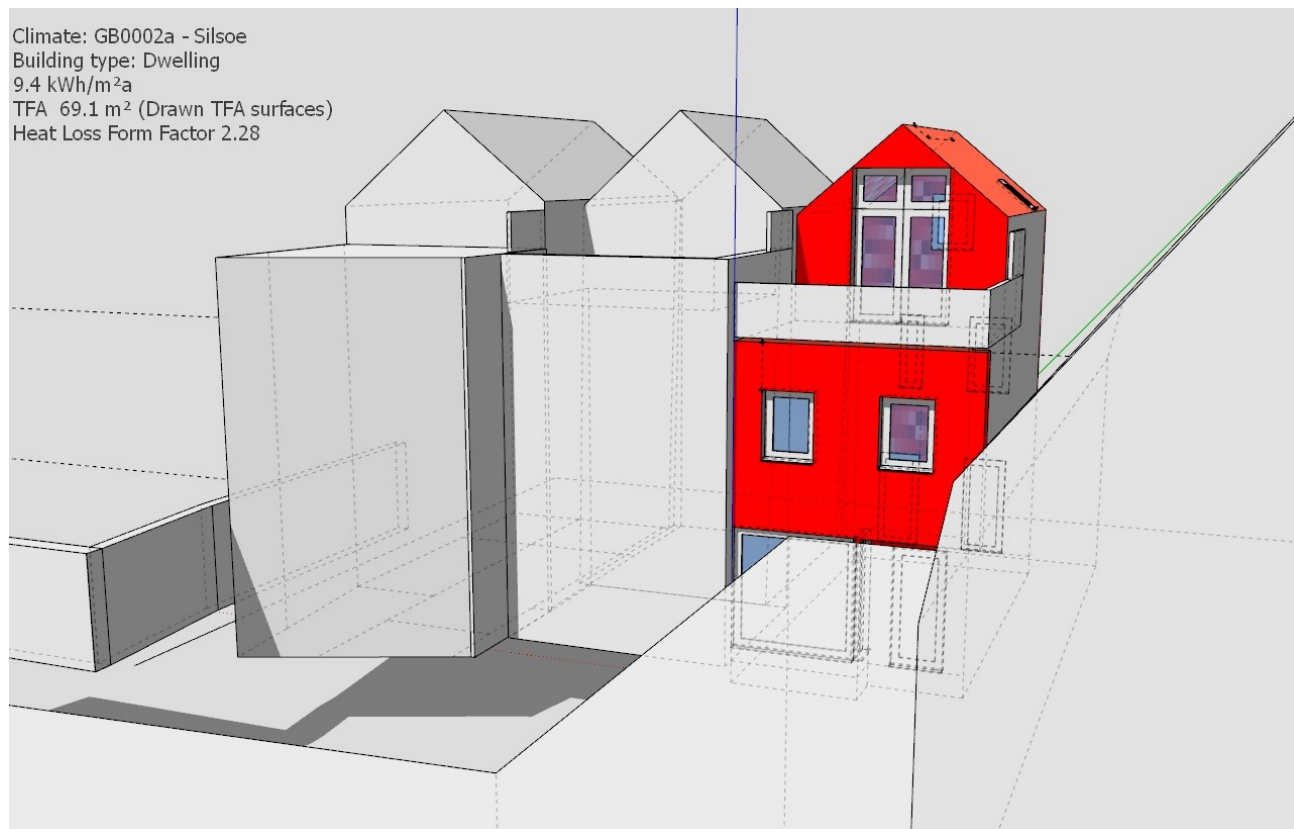
Initial geometric modelling of thermal envelope.

Climate: GB0002a - Silsoe
Building type: Dwelling
9.4 kWh/m²a
TFA 69.1 m² (Drawn TFA surfaces)
Heat Loss Form Factor 2.28



Thermal model calculation.

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9.4 kWh/m²a
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Model showing shading objects.

3.0 Building Specification and Energy Performance

The design has been tested using DesignPH software, the building is thermally modelled based on the following specification.

3.1 External Walls. The materials list is shown from internal surface at the top to external surface at the bottom. The brick-slip cladding is not shown as it is outside the thermal envelope but it is accounted for in the Rse calculation as a ventilated space.

Assembly no.	05ud					1D PH15 WALL, 300 I-JOIST (Rainscreen e.g. timber or brick slip)		Interior insulation?	-
Orientation of building element	2-Wall		Heat transmission resistance		interior R _{si}		0.13		
Adjacent to	1-Outdoor air		exterior R _{se}		0.04				
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]			
Interior plaster	0.250					15			
Service void	0.270					25			
Airtightness Board	0.130					12			
Blown Insulation	0.039	Flange	0.130	Flange	0.130	45			
Blown Insulation	0.039	Blown Insulation	0.039	Web	0.180	210			
Blown Insulation	0.039	Flange	0.130	Flange	0.130	45			
External Wood Board (Steico Special Dry)	0.041					60			
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total			
82%		15.0%		3.0%		41.2 cm			
U-value supplement		-		W/(m²K)		U-value: 0.116 W/(m²K)			

3.2 Floor Slab. The materials list is shown from internal surface at the top to external surface at the bottom.

Assembly no.	01ud					PH15 CONCRETE FLOOR SLAB		Interior insulation?	-
Orientation of building element	3-Floor		Heat transmission resistance		interior R _{si}		0.17		
Adjacent to	2-Ground		exterior R _{se}		0.00				
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]			
Concrete Slab	2.100					150			
Cellotex or similar	0.022	Perinsul	0.058			200			
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total			
99%		1.0%		-		35.0 cm			
U-value supplement		-		W/(m²K)		U-value: 0.109 W/(m²K)			

3.3 Pitched Roof. The materials list is shown from internal surface at the top to external surface at the bottom. The roof cladding is not shown as it is outside the thermal envelope.

Assembly no.		07ud				2B PH15 PITCHED ROOF 300 I-JOIST				Interior insulation?		-	
Orientation of building element		1-Roof		Heat transmission resistance [m²K/W]		interior R _{si}		0.10					
Adjacent to		1-Outdoor air		exterior R _{se}		0.04							

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Interior plaster	0.250					15
Service void	0.270					25
Airtightness board	0.130					12
Blown Insulation	0.039	Flange	0.130	Flange	0.130	45
Blown Insulation	0.039	Blown Insulation	0.039	Web	0.180	210
Blown Insulation	0.039	Flange	0.130	Flange	0.130	45
Steico Special Dry	0.041					60

Percentage of sec. 1	82%	Percentage of sec. 2	15.0%	Percentage of sec. 3	3.0%	Total	41.2 cm
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U-value supplement	-	W/(m²K)	U-value:	0.116	W/(m²K)
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3.4 Windows(fixed and opening). The window system specified is the Design model from Katzbeck.

Frame u-value -1.16 W/(m²K)

Glazing u-value (smaller panes) -0.50 W/(m²K)

Glazing u-value (larger panes) -0.64 W/(m²K)

Glazing g-value (smaller panes) -0.53

Glazing g-value (larger panes) -0.51 (g-value could be lowered if required to limit summer overheating).

Installation thermal bridge W/(mK) Yinstallation left -0.033, Yinstallation right -0.033, Yinstallation top -0.026, Yinstallation bottom -0.083.

3.5 Rooflights (all opening). The rooflight system specified is the FTT U6 model from Fakro.

Frame u-value -1.20 W/(m²K)

Glazing u-value -0.54 W/(m²K)

Glazing g-value -0.44

Installation thermal bridge W/(mK) Yinstallation left -0.050, Yinstallation right -0.050, Yinstallation top -0.044, Yinstallation bottom -0.040.

3.6 External Glazed Doors. The glazed door system specified is the Design model from Katzbeck.

Frame u-value $W/(m^2K)$ -Left 1.00, Right 1.00, Top 1.30, Bottom 1.70.

Glazing u-value $-0.64 W/(m^2K)$

Glazing g-value -0.51 (g-value could be lowered if required to limit summer overheating).

Installation thermal bridge $W/(mK)$ Yinstallation left -0.040 , Yinstallation right -0.040 , Yinstallation top -0.040 , Yinstallation bottom -0.040 .

3.7 Shading. The window reveals, ground floor overhangs and protruding metal elements to first floor windows act as shading elements. Increased reveal depth to the south elevation reduces summer overheating. Any changes to the form of these shading elements will impact the energy performance and summer overheating results.

3.8 Air-tightness requirement. 0.6ach at 50Pa (air-changes per hour n50 not q50).

3.9 Thermal Bridges. Thermal bridge free construction.

3.10 Ventilation. Passivhaus Certified MVHR system to each dwelling with minimum efficiency of 75%. Recommended efficiency 90%.

3.11 Summer Overheating. Frequency of overheating –percentage of the time over $25^{\circ}C$. The Passivhaus maximum is 10%, however 2% or below will help futureproofing for increasing temperatures due to climate change. This must be tested using PHPP software at detailed design stage if the Passivhaus standard is a requirement.

3.12 Primary Energy Demand. To be developed at detailed design stage. Maximum value $120kWh/m^2yr$.

3.13 Heating/Hot Water/Electrical. To be developed at detailed design stage.

3.14 Adherence to the performance specification. If the Passivhaus standard is to be met then any future amendment to the design, specification or performance should be equal to or better, in energy terms, than those described, unless it can be proved that the Passivhaus standard is still met using the PHPP energy modelling software. The thermal model is based on the PH15 building system which is designed to be thermal bridge free. If a different building system is chosen, it will also be required to be thermal bridge free to maintain the energy results. The PH15 system also has the benefit of utilising responsibly sourced, natural and low embodied-carbon materials, offering significantly lower production and construction related carbon emissions than steel framed or masonry alternatives.

4.0 Conclusion.

The DesignPH model shows in basic terms, that the proposed building design is capable of reaching the Passivhaus standard. In order for Passivhaus Certification to be achieved the design will need to be developed in detail in the correct way using the PHPP modelling software and Certified via the required methodology by a qualified Passivhaus Certifier. As the design is developed in more detail it is possible that the annual heating demand may increase. If this is the case and further measures are required to meet the Passivhaus standard, the following changes would help to improve the building's energy performance.

- Increased depth of floor slab insulation.
- Increased thickness of wall/roof insulation.
- Reduction in glazing area on the north elevation.
- Increased window sizes to areas on the South elevation where windows provide a positive energy balance.