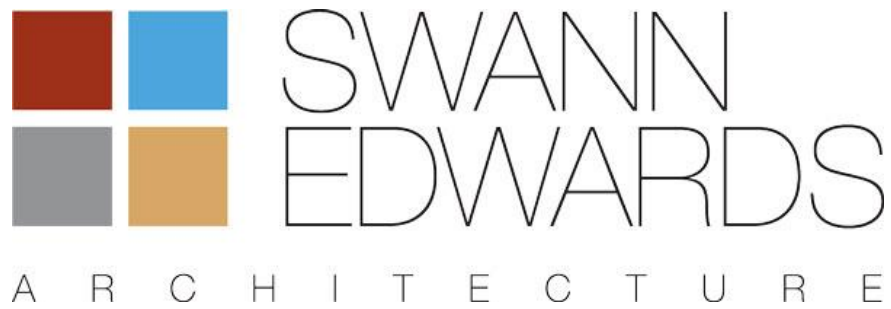




PASSIVHAUS PLANNING PACKAGE REPORT

PROPOSED SHIPPING CONTAINER PASSIVHAUS

AT

LAND SOUTH WEST OF
LIFT & SHIFT
BROADGATE
SUTTON ST JAMES

FOR

MR & MRS REED

Job No. SE-564

August 2017

1.0 Introduction

This report has been prepared during the Planning Application Stage of the project (RIBA Stage D) to review the design against the targets required to meet the Passivhaus standard.

In preparing this report the Passivhaus Planning Package (PHPP) software has been used to inform the analysis and generate outputs with regards to heating demand (kWh/m²/a) heating load, W/m², overheating (%) and primary energy demand (kWh/m²/a).

This information has been prepared using the following information:

- SE-564-10 to 13 (Planning Application drawings)
- Building Regulation Notes

Where this information is silent or not sufficiently developed (due to the level of design, i.e. not construction information or consultants have not been appointed to undertake designs) the Certified Passivhaus Designer has made assumptions in arriving at the PHPP outputs.

This report will:

- Provide an estimate of the performance of the building assuming a high level of workmanship in construction
- Detail assumptions made in arriving at the calculations
- Highlight potential problem areas
- Suggest alternatives to improve the estimated project performance where appropriate.

The report is set out to follow the relevant PHPP worksheet tabs and includes summaries of under each heading.

It is imperative that if any changes to the specification or assumptions are made (whether through client choice or design development) the Passivhaus Designer must be notified to assess the impact of this within the PHPP software. It should be noted that the design and PHPP calculation are only part of the process, which will also require good workmanship and construction techniques to adhere to the specifications and meet the Passivhaus Certification criteria. Key to this is full briefing of the contractors and constant monitoring throughout the construction process. Evidence will be required by the certifiers that the project has been constructed to the correct information using the correct products prior to issuing the Passivhaus certificate.

The PHPP and this report will be subject to interrogation and change following review by the Passivhaus Certifiers.

1.1 Verification

Figure 1 below details the PHPP outputs based on the information provided and the assumptions made as detailed throughout this document.

Although a large dwelling in terms of area only three bedrooms are provided and the dwelling is to be occupied by Mr and Mrs Reed only on a permanent basis. However, a figure of 5 occupants has been included within the calculation.

The key outputs are indicating that the proposal will meet the Passivhaus criteria and achieve the following:

- Heating Demand – 14.494 kWh/m²/a
- Heating Load – 11.037 kWh/m²/a
- Overheating – 5.8%
- Primary Energy – 105 kWh/m²/a
- Airtightness – 0.6 1/h

These results indicate that the proposal based on current design assumptions meet the passivhaus standard. There are areas that require further investigation and improvement, including further thermal bridging and foundation connection details as the detailed design is development. In addition, areas of concern are the overheating, which is over 5% and relies on occupant control and the Primary Energy Demand due to the inclusion of renewable technologies and potential specification changes.

Suggestions have been made within the relevant sections to improve these results, such as reducing the form factor by omitting cantilevers, installing insulation with better thermal conductivity, address thermal bridges, install additional insulation, and using 15mm diameter plumbing (subject to M&E) design. It is also important that the Passivhaus designer is notified of any changes, including omissions of renewable technology, to assess their implications.

As a result of the poor form factor and the thermal bridge allowance for 41 pile connections enhanced U-value and window and doors are required to achieve compliance. This should be reviewed further and improved at the technical design stage if possible. Consideration should also be given to make the form factor more compact, a way of achieving this would be to remove the cantilevers from the scheme, however, this does not fit with the architectural aspirations of the project.

Passive House verification



Building:	Proposed Shipping Container Dwelling, Adjacent Lift and Shift		
Street:	Broadgate, Sutton St James		
Postcode / City:	PE12 0HD		
Country:	UK		
Building type:	Detached Dwelling		
Climate:	[UK] - East Anglia (Hemsby)	Altitude of building site (in [m] above sea level):	2
Home owner / Client:	Mr and Mrs Reed		
Street:	As above		
Postcode/City:	As above		
Architecture:	James Burton - Swann Edwards Architecture Ltd		
Street:	Fen Road, Guyhirn		
Postcode / City:	PE13 4AA		
Mechanical system:	TBC		
Street:			
Postcode / City:			
Year of construction:	2018	Interior temperature winter:	20.0 °C
No. of dwelling units:	1	Interior temperature summer:	25.0 °C
No. of occupants:	5.0	Internal heat sources winter:	2.1 W/m²
Spec. capacity:	60 Wh/K per m² TFA	Ditto summer:	3.2 W/m²
		Enclosed volume V _e m³:	595.0
		Mechanical cooling:	

Specific building demands with reference to the treated floor area				
	Treated floor area	258.6 m²	Requirements	Fulfilled?*
Space heating	Heating demand	14.494 kWh/(m²a)	15 kWh/(m²a)	yes
	Heating load	11.037 W/m²	10 W/m²	-
Space cooling	Overall specif. space cooling demand	kWh/(m²a)	-	-
	Cooling load	W/m²	-	-
	Frequency of overheating (> 25 °C)	5.8 %	-	-
Primary energy	Heating, cooling, dehumidification, DHW, auxiliary electricity, lighting, electrical appliances	105 kWh/(m²a)	120 kWh/(m²a)	yes
	DHW, space heating and auxiliary electricity	73 kWh/(m²a)	-	-
	Specific primary energy reduction through solar electricity	kWh/(m²a)	-	-
Airtightness	Pressurization test result n ₅₀	0.6 1/h	0.6 1/h	yes

* empty field: data missing; '-': no requirement

Passive House?	yes
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We confirm that the values given herein have been determined following the PHPP methodology and based on the characteristic values of the building. The PHPP calculations are attached to this application.	Name:	PHPP Version 8.4
	Surname:	Registration number PHPP:
	Company:	Issued on:
		Signature:

Figure 1 – PHPP Verification Sheet

1.2 Climate

The climate data has been entered as Western Europe, (UK) East Anglian (Hemsby) with an altitude above sea level of 2m. This has been based on topographical information and available climate datasets within the software.

1.3 U-Values

The following U-values have been calculated within the PHPP software using the manufactures lamda values from available datasheets:

- External wall – 0.094W/m²K using Walltite insulation with 0.028W/mK
- Cantilever Overhang – 0.094W/m²K using Walltite insulation with 0.028W/mK
- Roof – 0.073W/m²K using Walltite insulation with 0.028W/mK
- Ground floor – 0.074W/m²K using celotex insulation with 0.022W/mK

These U-values meet the limiting U-values of the Passivhaus requirements.

As part of these U-value calculations 12% & 8% bridging fractions have been used. Further detailed information is required to allow accurate inputs. It should be noted that improved bridging fractions will improve the heating demand, heating load and primary energy; however, it will increase the frequency of overheating.

At other junctions within the building envelope have been assumed as thermal bridge free – this will be subject to thermal bridging calculations.

1.4 Areas

These have been calculated using the .dwg file and the overmark drawings that are within the appendix detail the area calculations including the treated floor area.

1.5 Windows & Doors

The PHPP calculation has been undertaken using Slavona Progression Windows and Doors with SwisspacerV and Slavona Standard Glass. This is a Passivhaus certified system.

The glass has a g-value of 0.54 and a Ug-value of 0.53W/m²K. The frame has a U-value of 0.83W/m²K.

The following installation psi values have been used:

- Head = +0.02W/mK
- Cill = +0.02W/mK
- Jamb = +0.02W/mK

These are enhanced installation psi values and have been used based on experience. Given knowledge of a similar detail on Swann Edwards' Studio and the thermal bridge calculations there is scope to improve these further through calculations to give additional flexibility with the design. However, we prefer to leave standard installation values of $+0.04\text{W/mK}$ to give maximum flexibility. These figures have been used to reach the passivhaus figures and thermal bridge analysis will need to be undertaken at later stage to ensure this is achievable.

If alternative windows and doors are to be used full details are to be provided for assessment prior to order to ensure compliance with the Passivhaus standard. In addition the system must be Passivhaus certified.

1.6 Shading

Shading has been entered into the calculation as detailed on the overmark drawing within the appendix. This is based on our site visit and knowledge of the area. In addition shading overhangs and reveals have been included as detailed on the overmarks within the appendix.

We have entered the hedge as a solid object due to its height, size and density. In addition, shading reduction factors have been entered using conservative values. The proposed landscaping scheme may result in some additional shading, however, this has not been considered as part of this PHPP review.

Existing and future trees are identified as a risk item as they impact on the solar energy received which can impact on the heating load and demand as well as the overheating assessment of the building.

To ensure overheating is limited we recommend that consideration is given to the installation of controllable shading to the East, West and South Elevations. Ideally the shading should be external and can be concealed within the external reveals of the windows and doors when not in use.

1.7 Ventilation

A Paul Novus 450 MVHR system has been used within the PHPP calculation. Detailed design and duct sizes are required to assess if this proposal is achievable.

The MVHR unit is to be positioned within the conditioned environment and duct lengths to external air have been conservatively set at 1.5m pending detailed MVHR design.

If an alternative system is preferred details are to be provided to the Passivhaus Designer to enable this to be checked with in the PHPP.

1.8 SummVent (Summer Ventilation)

As part of the design strategy to avoid overheating a combination of MVHR (without heat recovery) and opening windows have been used to reduce overheating during the summer months.

During the day the following windows and doors have been assumed to be opened for at least 4 hours per day; D3, D4, D7 & D8, W7, W8, W32 & W33.

In addition to this certain secure first floor windows have been entered in to the calculation to provide night time purge ventilation during summer months to further reduce overheating. These windows are W15, 16, 20, 21, 29 & 30.

The building occupiers will ultimately be responsible for controlling the opening and closing of windows at certain times of day during the summer months to limit overheating. The end user must give serious consideration as to whether this is achievable and reasonable and discuss any concerns with the Passivhaus Designer.

1.9 DHW + Distribution (Domestic Hot Water)

Further details are required from a Mechanical and Electrical Designer to allow input in to the calculation. As such assumptions have been made with regards to the pipe runs and locations and their diameter. The assumed pipe diameter has been limited to 15mm to limit overheating.

The heating system is to be provided by an air source heat pump which in this rural area makes a positive contribution to the Primary Energy demand of the proposal.

In addition this is based on the heating system using underfloor heating as emitters, again this will change depending on the input from the M&E engineer and this input is vital in assessing the overheating of the property.

1.10 Solar DHW (Domestic Hot Water)

No solar hot water has been included within the calculation as this is counterproductive when using an air source heat pump.

1.11 PV

Further details are required from a Mechanical and Electrical Designer to allow accurate input in to the calculation.

1.12 Electricity

Based on previous occupiers experience tumble dryers are not required as a result of the internal air conditions the clothes dry extremely quickly without a tumble dryer. As such this has been removed from the calculation. In addition 100% of the light fittings have been entered to be energy efficient light fittings.

1.13 Aux Electricity

Further details are required from a Mechanical and Electrical Designer to allow accurate input in to the calculation.

1.14 PE Value (Primary Energy)

Further details are required from a Mechanical and Electrical Designer to allow accurate input in to the calculation.

At this stage assumptions have been made as to the contribution of the heat pump.

1.15 HP (Heat Pump)

Further details are required from a Mechanical and Electrical Designer to allow accurate input in to the calculation.

At this stage generic values have been entered and underfloor heating has been selected as the heat emitters.