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**Warehome Limited**

The Oaks, 91 Ernest Dawes Avenue  
Priorslee, Telford  
TF2 9XA



# W21002 - 134 St James Lane

W21002-V4-Energy\_Statement

24<sup>th</sup> November 2022



Prepared by Joe Stuart of Warehome Limited  
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## 1. | EXECUTIVE SUMMARY

This Energy Statement report has been prepared to demonstrate compliance with Part L 2013 (with SAP 10 carbon Factors) for the proposed dwelling at **134 St James Lane/Land to the Rear of 33 Muswell Hill**. This development incorporates 1 no. new build home and, as such, falls under Part L1 of the building regulation 2013.

London Borough of Haringey have stated that;

*“Prior to the commencement of works on site, an Energy Statement shall be submitted to and approved in writing by the local Planning Authority. The statement **shall demonstrate how the development will work towards achieving zero-carbon requirement with high fabric efficiencies and a low-carbon heating strategy.***

*It shall set out the percentage reduction in CO2 emissions in comparison with total emissions from a building which complies with Building Regulations 2013 Part L (with SAP10 carbon factors). It shall include technical specification and seasonal efficiencies of the proposed low-carbon heating strategy, mechanical ventilation with heat recovery and solar photovoltaic panels.*

*The measures in the final agreed energy statement shall be installed prior to the first occupation of the development. The development shall be carried out strictly in accordance with the details so approved and shall be operated and maintained as such thereafter.*

**Reason:** *To ensure the development reduces its impact on climate change by reducing carbon emissions on site in compliance with the Energy Hierarchy, and in line with London Plan (2021) Policy SI2, and Local Plan Policy SP4 and DM22”*

**This building has been adopted from the previous design and adapted to ensure that the building strives to achieve the sustainability and energy levels suggested by the previous design team. The material selection has not only been considered for the ‘in use’ carbon footprint but also for the construction phase and end of life. The design has been stress tested with the Passivhaus design packages (PHPP and Design PH) to ensure that the home far exceeds the requirements of Part L and the SAP 10 carbon factors.**

A ‘fabric first’ approach has been taken to the building to reduce the demand for energy rather than focussing heavily on technology to offset the energy needs. This means that the building can improve with the introduction of developing technologies and yet still function in their absence.

This project comprises a single private dwelling, set over a ground floor and basement floor of approximately **100m<sup>2</sup>**. The building is a two bedroom home and has external amenity on both levels.

**This assessment also reviews the potential to minimise CO2 emissions through application of the London Mayor’s energy hierarchy:**

- **Be lean**
- **Be clean**
- **Be green**

## 2. | INTRODUCTION

This report has been compiled to provide an energy strategy which aims to provide figures and an understanding of how the design has worked towards zero-carbon with the consideration of the site, materials and technologies to achieve this.

**Note:** Due to the constraints of the site, Photovoltaic panels have been deemed the most appropriate with the option of an additional exhaust air heat pump linked to the MVHR and hot water system.

### Software

The thermal envelope, performance and energy consumption of the building has been calculated using the **Passivhaus Planning Package (PHPP)** and **DesignPH** softwares in line with the Passivhaus approach we take on all our projects.

### Local Planning Guidance

The design approach happens to align with Haringey's '**Towards Net Zero Carbon**' report with the following considerations being routed in the process from the start:

- The Passivhaus design and performance of the building answers **Objective 1: Reduce the energy use.**
- No gas being brought into the property answers **Objective 2: Low carbon heat**
- Incorporation of Solar PV (to the extent approved), MVHR with Exhaust air heat pump answers **Objective 3: Low carbon electricity**
- **Objective 4: Quality homes and affordable energy** is partly answered as the design, incorporating biophilic considerations, Low VOC materials and flexible amenity space ensures the home is high quality and low cost to run. Although the cost of energy is an external variable, the design ensures any fluctuation is minimised in comparison with a standard Part L compliant home.
- The result of this design approach ensures that the carbon emissions from the construction, use and end of life phases of this building are minimised, thus answering **Objective 5: Deliver co-benefits**

### Methodology

This report details the following analysis:

- A. PHPP analysis of the design
- B. Comparison against Part L compliant building
- C. Future opportunities
- D. Summary of how the proposal demonstrates that it has worked towards **zero-carbon, high fabric efficiencies and a low-carbon heating strategy.**

### 3. | CURRENT STANDARDS

Ofgem states **146 kWh/m<sup>2</sup>/y** as the current benchmark for domestic homes. The RIBA 2030 Challenge aims to see this drop to the following figures:

- 2020 Targets **<105 kWh/m<sup>2</sup>/y**
- 2025 Targets **<70 kWh/m<sup>2</sup>/y**
- 2030 Targets **0 to 35kWh/m<sup>2</sup>/y**

With this in mind, the proposal needs to reflect the requirements of today's targets, whilst also striving to meet future targets and/or be designed to allow for future improvements in line with these targets.

The reduced (improved) U-Value requirements set out in June 2022 are as follows:

| Item                            | PART L Reference values | PART L Limiting values (Average) |
|---------------------------------|-------------------------|----------------------------------|
| Floors (W/m <sup>2</sup> K)     | 0.13                    | 0.18                             |
| Walls (W/m <sup>2</sup> K)      | 0.18                    | 0.26                             |
| Roof (W/m <sup>2</sup> K)       | 0.11                    | 0.16                             |
| Doors (W/m <sup>2</sup> K)      | 1                       | 1.6                              |
| Windows (W/m <sup>2</sup> K)    | 1.2                     | 1.6                              |
| Rooflights (W/m <sup>2</sup> K) | 1.7                     | 1.7                              |
| Air Permeability (AC/H)         | 5                       | 8                                |

The '**Towards Net Zero Carbon**' report sets out some KPIs and indicative design requirements that we have used to assess the proposal against.

## 4. | DEMAND REDUCTION (BE LEAN)

The proposal demonstrates that it aims to achieve the Part L 2013 compliance from energy efficiency (BE LEAN) measures alone.

The following energy performance measures incorporated within the design show compliance with Part L. The benefit of these is reflected in the ability of the building to demonstrate Part L 2013 compliance without reliance upon LZC technologies.

### FABRIC PERFORMANCE

| Item                       | PART L Reference values<br>(June 2022) | Proposed values | Improvement                    |
|----------------------------|----------------------------------------|-----------------|--------------------------------|
| Floors (W/m2K)             | 0.13                                   | 0.083           | <u>Yes - 1.57 times better</u> |
| Basement Walls (W/m2K)     | 0.18                                   | 0.081           | <u>Yes - 2.22 times better</u> |
| Above Ground Walls (W/m2K) | 0.18                                   | 0.095           | <u>Yes - 1.89 times better</u> |
| Roof (W/m2K)               | 0.11                                   | 0.064           | <u>Yes - 1.72 times better</u> |
| Doors (W/m2K)              | 1                                      | 0.7             | <u>Yes - 1.43 times better</u> |
| Windows (W/m2K)            | 1.2                                    | 0.6             | <u>Yes - 2 times better</u>    |
| Rooflights (W/m2K)         | 1.7                                    | 0.6             | <u>Yes - 2.83 times better</u> |
| Air Permeability (AC/H)    | 5                                      | 0.6             | <u>Yes - 8.33 times better</u> |

(Please note, the above results demonstrate a performance in-line or exceeding that of the 'Ultra-Low Energy' specification in Haringey's **'Towards Net Zero Carbon'** report. We have also used the reference/notional values, not the maximum allowable.)

### PASSIVHAUS STANDARD PERFORMANCE (STAGE 3 PHPP ASSESSMENT)

| Item                                | Building Regulation | Passivhaus Criteria | Proposal Standard | Passivhaus Fulfilled? |
|-------------------------------------|---------------------|---------------------|-------------------|-----------------------|
| Heating Demand (kWh/m2a)            | -                   | 15                  | 19                | Through Heating Load  |
| Heating Load (W/m2)                 | -                   | 10                  | 10                | Yes                   |
| Frequency of overheating (>25 deg.) | -                   | 10                  | 0                 | Yes                   |
| Freq. excess. high hum. (>12g/kg)   | -                   | 20                  | 0                 | Yes                   |
| Airtightness                        | 5                   | 0.6                 | 0.6               | Yes                   |
| PE Demand (kWh/(m2a))               | -                   | 120                 | 116               | Yes                   |
| PER Demand (kWh/(m2a))              | -                   | -                   | 54                | N/A                   |
| Generation                          | -                   | -                   | 19                | N/A                   |

(Please note, with the Heating demand or Heating Load meeting the criteria, the proposal passes the PHPP.)

## PASSIVE DESIGN CONSIDERATIONS

| Item                       | Detail                                                                                                                                                                                             | Comment                                                                                                                                                                                                                                               |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Orientation</b>         | Orientation to consider winter gains and summer shading whilst balancing daylight.                                                                                                                 | Orientation fixed previously but used to inform the glazing specification and shading.                                                                                                                                                                |
| <b>Daylight</b>            | Considering where daylight enters the building and through what kind and what size of aperture.                                                                                                    | Windows and doors are glazed to provide balanced daylighting throughout the day.                                                                                                                                                                      |
| <b>Solar Gains</b>         | Consideration of reveal depths, glazing positions and specification for retaining heat and considering beneficial solar gains.                                                                     | Automatic shading has been provided to the large rear glazing with glazing specification to take advantage of the winter sun. Window positions are set within the makeup of the wall to avoid overheating but benefit from a recessed final position. |
| <b>Insulation</b>          | Consideration of insulation type and thickness so as to ensure the building is kept warm but overheating is minimised, airtightness is maintained, and all service runs are appropriately wrapped. | This has been considered in depth. Material specification used for decrement delay as well as U-Values.                                                                                                                                               |
| <b>Cold Bridging</b>       | To prevent the loss of heat and to prevent the development of cold spots which can lead to mould.                                                                                                  | External insulation wrap to ensure structure is kept on the warm side of the fabric, thus reducing the cold bridging significantly.                                                                                                                   |
| <b>Thermal Mass</b>        | Consideration of appropriately placed thermal mass to ensure supporting the heat management of the building.                                                                                       | CLT (Mass timber) construction above ground and concrete below ground have been positioned inside of the insulation layer to help steady the internal temperature of the building throughout the year.                                                |
| <b>Natural Ventilation</b> | Consideration of secure window openings and types to allow cross ventilation, across both levels throughout the warmer months to avoid overheating.                                                | This has been considered across both floors with the ability to use the 'stack effect' due to the newly positioned central staircase.                                                                                                                 |

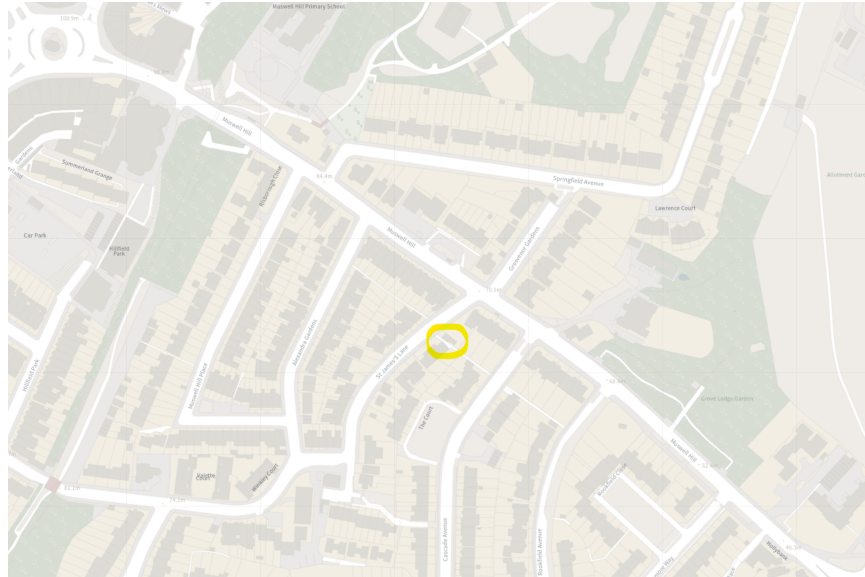
## ACTIVE DESIGN CONSIDERATIONS

| Item                       | Detail                                                                                                            | Comment                                                                                                                                               |
|----------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Heating System</b>      | Low energy, high impact energy system for balanced and efficient control of the internal environment.             | Use of a high efficiency infrared heating system to heat the thermal mass of the building rather than the air, thus reducing the demand.              |
| <b>Heat Recovery</b>       | Recovery of waste energy from heating or process energy to reduce energy consumption.                             | MVHR with EAHP used to avoid excess energy being lost out of the building. This works in conjunction with the highly insulated building envelope.     |
| <b>Cooling Systems</b>     | What additional cooling systems are to be considered                                                              | The external automatic shading has removed the overheating risk, even with a 1.5 degree stress test. Opening windows should manage all cooling needs. |
| <b>Ventilation System</b>  | Centralised or decentralised options to managing the quality of the air with the levels of airtightness required. | MVHR with EAHP manages this                                                                                                                           |
| <b>Mechanical Services</b> | Low energy considerations for all Mechanical Services                                                             | EAHP to help with reducing the energy demand of the heating and hot water.                                                                            |
| <b>Lighting</b>            | Ensuring that the lighting choices do not negatively increase the energy demand                                   | 100% low energy LED luminaires to be used throughout. Smart home management to ensure appropriate use.                                                |

## 5. HEATING & COOLING INFRASTRUCTURE INC. CHP (BE CLEAN)

### DISTRICT HEATING OPPORTUNITIES

As shown in the map below, there are no opportunities for connecting to an existing district heating system and so this is not a viable option to explore.



### COMBINED HEAT AND POWER

As this is a single dwelling, with a small floor area it is not feasible to suggest a CHP system.

### VENTILATION SYSTEM

Mechanical ventilation with heat recovery (MVHR) manages the quality of air and reduces heat losses by recovering heat that would otherwise be lost via windows and trickle vents. The additional exhaust air heat pump (EAHP) has been specified to help further reduce the energy consumption and redirect the heat losses into the heating and hot water system.

### HEATING PROVISION

The nominal heating load and demand for the building is to be provided from electric power generated from the grid, through a 100% renewable energy provider, and supplemented by the renewable energy technologies specified.

## 6. | LZC TECHNOLOGY (BE GREEN)

A high level assessment of the potential renewable technologies that can be incorporated into the scheme can be summarised as follows:

### VIABLE TECHNOLOGIES

As the site is constrained both physically and in line with being in a conservation area, there are physical and external factors limiting the renewable energy technologies suitable for the proposal. In addition, as the proposal is single family dwelling with high fabric efficiency (**BE LEAN**), there needs to be consideration for the CO2 saving, the upfront capital cost, the serviceability/maintenance requirement, and the payback period.

| LZC TECHNOLOGY                 | COMMENT ON VIABILITY                                                                       | VIABLE (Y/N) |
|--------------------------------|--------------------------------------------------------------------------------------------|--------------|
| Solar Hot Water Heating        | Low demand for hot water, and less in summer months when it would be producing most energy | N            |
| Photovoltaics                  | Space already confirmed. Grid payback in summer when generating most energy                | Y            |
| Hydro                          | No fast flowing water                                                                      | N            |
| Wind Turbine                   | Not suitable in urban environment with conservation area constraints                       | N            |
| Biomass Heating                | Insufficient storage space and delivery access                                             | N            |
| CHP - Natural Gas              | Too complex for DHW demand                                                                 | N            |
| Community Heating              | No District Heating nearby                                                                 | N            |
| Air Source Heat Pump (Elec)    | Concerns of noise as in a residential area. Real-life efficiency is limited. Space limited | N            |
| Air Source Heat Pump (Gas)     | Lower efficiency to electricity. Cooling demand is low. Space is a concern                 | N            |
| Ground Source Heat Pump (Elec) | Insufficient space for bore hole or ground loop                                            | N            |
| Water Source Heat Pump (Elec)  | Insufficient Water source on site                                                          | N            |
| Geothermal Heat Pump (Elec)    | No geothermal activity nearby                                                              | N            |
| Fuel Cells                     | Insufficient space and low heating demand                                                  | N            |

### SOLAR PV

4 no. Solar PV panels are to be installed on the roof. The current specification gives a nominal performance of 450Wp per panel. This would generate a **Primary Energy Renewable (PER) of 19kWh(m2a)**. Additional panels, if allowed, or the future replacement of these panels with better performing products will only increase this position in future.

**Worth noting is that the PER is the same value as the Heating Demand.**

The use of an exhaust air heat pump is to aid with the efficiency of the energy generation, although the final supplier calculations are to be confirmed.

## 7. | CONCLUSION

The proposal is exceeding the requirements of Building Regulations Part L (with SAP10 carbon factors) and results in a very high quality and energy efficient dwelling.

**With the constrained site, it has been concluded that the previously permitted solar PV array with Passivhaus thermal envelope performance is the most appropriate approach for this scheme.**

There is the future potential to generate more renewable energy with the introduction of more efficient and/or additional solar PV panels on the roof should this be required.

The current design works with a fabric first and passive approach to control the indoor climate without the need for excessive heating or cooling. This solid platform allows for the future advancement in building technologies to be bolted on. Worth noting is that the continuous basement ceiling void allows for future installations to be more accessible and less disruptive.

### **Zero Carbon Operational**

The PHPP assessment, accompanying this energy statement - *Appendix A & B*) confirms that **the design can achieve the full zero carbon/Passivhaus Plus\*** operational position. Having said this, the number of solar panels obtained from the planning permission limits the amount of energy that can be generated currently. **Should additional panels be permitted by the local planning authority and grid, coupled with the advancement in PV technology in the coming years, the building can successfully achieve zero carbon operational efficiency.**

*\*Passivhaus Plus - A building certified to Passivhaus Plus not only drastically reduces energy use, but it also produces as much energy as occupants consume, turning them into Passivhaus Powerhouses. The energy generated must come from renewable sources and provide enough energy to operate the building throughout the whole year.*

*(Source: <https://www.passivhaustrust.org.uk/>)*

**Please note:** *The PHPP Assessment of the St James Lane has been completed by Passivhaus certified Architect Richard Hands of Architeco Ltd.*

## 8. | APPENDIX A

Passivhaus verification for initial build:

| Passive House Verification                                                                                                                                                                                  |                                                |       |  |                                                                                                                                                                                                                                                                                                                |     |          |   |                      |     |                         |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----------|---|----------------------|-----|-------------------------|--|
| Photo or Drawing                                                                                                                                                                                            |                                                |       |  | <b>Building:</b> 134<br><b>Street:</b> St James Lane<br><b>Postcode/City:</b> London<br><b>Province/Country:</b> GB-United Kingdom/ Britain<br><b>Building type:</b> Dwelling<br><b>Climate data set:</b> GB0001a-London (Central)<br><b>Climate zone:</b> 4: Warm-temperate <b>Altitude of location:</b> 26 m |     |          |   |                      |     |                         |  |
|                                                                                                                                                                                                             |                                                |       |  | <b>Home owner / Client:</b><br><b>Street:</b><br><b>Postcode/City:</b><br><b>Province/Country:</b>                                                                                                                                                                                                             |     |          |   |                      |     |                         |  |
| <b>Architecture:</b> ARCHITECO<br><b>Street:</b> 43 Argyll street<br><b>Postcode/City:</b> PA237HG Dunoon<br><b>Province/Country:</b> Scotland                                                              |                                                |       |  | <b>Mechanical system:</b><br><b>Street:</b><br><b>Postcode/City:</b><br><b>Province/Country:</b>                                                                                                                                                                                                               |     |          |   |                      |     |                         |  |
| <b>Energy consultancy:</b><br><b>Street:</b><br><b>Postcode/City:</b><br><b>Province/Country:</b>                                                                                                           |                                                |       |  | <b>Certification:</b> Passivhaus+<br><b>Street:</b><br><b>Postcode/City:</b><br><b>Province/Country:</b>                                                                                                                                                                                                       |     |          |   |                      |     |                         |  |
| <b>Year of construction:</b> 2022<br><b>No. of dwelling units:</b> 1<br><b>No. of occupants:</b> 2.4                                                                                                        |                                                |       |  | <b>Interior temperature winter [°C]:</b> 20.0<br><b>Interior temp. summer [°C]:</b> 25.0<br><b>Internal heat gains (IHG) heating case [W/m²]:</b> 2.6<br><b>IHG cooling case [W/m²]:</b> 2.6<br><b>Specific capacity [Wh/K per m² TFA]:</b> 60<br><b>Mechanical cooling:</b>                                   |     |          |   |                      |     |                         |  |
| <b>Specific building characteristics with reference to the treated floor area</b>                                                                                                                           |                                                |       |  |                                                                                                                                                                                                                                                                                                                |     |          |   |                      |     |                         |  |
| <b>The PHPP has not been filled completely; it is not valid as verification</b>                                                                                                                             |                                                |       |  |                                                                                                                                                                                                                                                                                                                |     |          |   |                      |     |                         |  |
| Treated floor area m²                                                                                                                                                                                       |                                                | 102.7 |  |                                                                                                                                                                                                                                                                                                                |     | Criteria |   | Alternative criteria |     | Fulfilled? <sup>2</sup> |  |
| Space heating                                                                                                                                                                                               | Heating demand kWh/(m²a)                       | 12    |  | ≤                                                                                                                                                                                                                                                                                                              | 15  | -        |   | -                    |     | yes                     |  |
|                                                                                                                                                                                                             | Heating load W/m²                              | 9     |  | ≤                                                                                                                                                                                                                                                                                                              | -   | 10       |   | -                    |     | -                       |  |
| Space cooling                                                                                                                                                                                               | Cooling & dehum. demand kWh/(m²a)              | -     |  | ≤                                                                                                                                                                                                                                                                                                              | -   | -        |   | -                    |     | -                       |  |
|                                                                                                                                                                                                             | Cooling load W/m²                              | -     |  | ≤                                                                                                                                                                                                                                                                                                              | -   | -        |   | -                    |     | -                       |  |
| Frequency of overheating (> 25 °C) %                                                                                                                                                                        |                                                | 2     |  | ≤                                                                                                                                                                                                                                                                                                              | 10  |          |   |                      | yes |                         |  |
| Frequency excessively high humidity (> 12 g/kg) %                                                                                                                                                           |                                                | 0     |  | ≤                                                                                                                                                                                                                                                                                                              | 20  |          |   |                      | yes |                         |  |
| Airtightness                                                                                                                                                                                                | Pressurization test result n <sub>50</sub> 1/h | 0.6   |  | ≤                                                                                                                                                                                                                                                                                                              | 0.6 |          |   |                      | yes |                         |  |
| Non-renewable Primary Energy (PE)                                                                                                                                                                           | PE demand kWh/(m²a)                            | 109   |  | ≤                                                                                                                                                                                                                                                                                                              | 120 |          |   |                      | yes |                         |  |
| Primary Energy                                                                                                                                                                                              | PER demand kWh/(m²a)                           | 50    |  | ≤                                                                                                                                                                                                                                                                                                              | -   |          | - |                      | -   |                         |  |
| Renewable (PER)                                                                                                                                                                                             | Generation of renewable energy kWh/(m²a)       | 14    |  | ≥                                                                                                                                                                                                                                                                                                              | -   |          | - |                      | -   |                         |  |
| <sup>2</sup> Empty field; Data missing; "-": No requirement                                                                                                                                                 |                                                |       |  |                                                                                                                                                                                                                                                                                                                |     |          |   |                      |     |                         |  |
| I 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 verification. |                                                |       |  |                                                                                                                                                                                                                                                                                                                |     |          |   |                      |     |                         |  |
| <b>Task:</b> 1-Designer<br><b>First name:</b> Richard<br><b>Surname:</b> Hands<br><b>City:</b> Architeco<br><b>Issued on:</b> 2nd December 20                                                               |                                                |       |  | <b>Passive House Classic?</b> yes<br><b>Signature:</b>                                                                                                                                                                                                                                                         |     |          |   |                      |     |                         |  |
| Project data imported from designPH 2.0.09                                                                                                                                                                  |                                                |       |  |                                                                                                                                                                                                                                                                                                                |     |          |   |                      |     |                         |  |
| PHPP9 display.code:                                                                                                                                                                                         |                                                |       |  |                                                                                                                                                                                                                                                                                                                |     |          |   |                      |     |                         |  |

**Please note:** The PHPP Assessment of the St James Lane has been completed by Passivhaus certified Architect Richard Hands of Architeco Ltd.

## 9. | APPENDIX B

Passivhaus verification for future improvement:

| Passive House Verification                                                                                                                                                                                  |                                                |                 |  |                                                                                                                                                                                                                                                                                                                |     |            |     |                                |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-----------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------------|-----|--------------------------------|--|
| Photo or Drawing                                                                                                                                                                                            |                                                |                 |  | <b>Building:</b> 134<br><b>Street:</b> St James Lane<br><b>Postcode/City:</b> London<br><b>Province/Country:</b> GB-United Kingdom/ Britain<br><b>Building type:</b> Dwelling<br><b>Climate data set:</b> GB0001a-London (Central)<br><b>Climate zone:</b> 4: Warm-temperate <b>Altitude of location:</b> 26 m |     |            |     |                                |  |
|                                                                                                                                                                                                             |                                                |                 |  | <b>Home owner / Client:</b><br><b>Street:</b><br><b>Postcode/City:</b><br><b>Province/Country:</b>                                                                                                                                                                                                             |     |            |     |                                |  |
| <b>Architecture:</b> ARCHITECO<br><b>Street:</b> 43 Argyll street<br><b>Postcode/City:</b> PA237HG Dunoon<br><b>Province/Country:</b> Scotland                                                              |                                                |                 |  | <b>Mechanical system:</b><br><b>Street:</b><br><b>Postcode/City:</b><br><b>Province/Country:</b>                                                                                                                                                                                                               |     |            |     |                                |  |
| <b>Energy consultancy:</b><br><b>Street:</b><br><b>Postcode/City:</b><br><b>Province/Country:</b>                                                                                                           |                                                |                 |  | <b>Certification:</b> Passivhaus+<br><b>Street:</b><br><b>Postcode/City:</b><br><b>Province/Country:</b>                                                                                                                                                                                                       |     |            |     |                                |  |
| <b>Year of construction:</b> 2022<br><b>No. of dwelling units:</b> 1<br><b>No. of occupants:</b> 2.4                                                                                                        |                                                |                 |  | <b>Interior temperature winter [°C]:</b> 20.0<br><b>Internal heat gains (IHG) heating case [W/m²]:</b> 2.6<br><b>Specific capacity [Wh/K per m² TFA]:</b> 60                                                                                                                                                   |     |            |     |                                |  |
|                                                                                                                                                                                                             |                                                |                 |  | <b>Interior temp. summer [°C]:</b> 25.0<br><b>IHG cooling case [W/m²]:</b> 2.6<br><b>Mechanical cooling:</b>                                                                                                                                                                                                   |     |            |     |                                |  |
| <b>Specific building characteristics with reference to the treated floor area</b>                                                                                                                           |                                                |                 |  |                                                                                                                                                                                                                                                                                                                |     |            |     |                                |  |
| <b>The PHPP has not been filled completely; it is not valid as verification</b>                                                                                                                             |                                                |                 |  |                                                                                                                                                                                                                                                                                                                |     |            |     |                                |  |
| Treated floor area m²                                                                                                                                                                                       |                                                | 102.7           |  |                                                                                                                                                                                                                                                                                                                |     | Criteria   |     | Alternative criteria           |  |
| Space heating                                                                                                                                                                                               | Heating demand kWh/(m²a)                       | 12              |  | ≤                                                                                                                                                                                                                                                                                                              | 15  | -          |     | Fulfilled? <sup>2</sup>        |  |
|                                                                                                                                                                                                             | Heating load W/m²                              | 9               |  | ≤                                                                                                                                                                                                                                                                                                              | -   | 10         |     | yes                            |  |
| Space cooling                                                                                                                                                                                               | Cooling & dehum. demand kWh/(m²a)              | -               |  | ≤                                                                                                                                                                                                                                                                                                              | -   | -          |     | -                              |  |
|                                                                                                                                                                                                             | Cooling load W/m²                              | -               |  | ≤                                                                                                                                                                                                                                                                                                              | -   | -          |     | -                              |  |
| Frequency of overheating (> 25 °C) %                                                                                                                                                                        |                                                | 2               |  | ≤                                                                                                                                                                                                                                                                                                              | 10  |            | yes |                                |  |
| Frequency excessively high humidity (> 12 g/kg) %                                                                                                                                                           |                                                | 0               |  | ≤                                                                                                                                                                                                                                                                                                              | 20  |            | yes |                                |  |
| Airtightness                                                                                                                                                                                                | Pressurization test result n <sub>50</sub> 1/h | 0.6             |  | ≤                                                                                                                                                                                                                                                                                                              | 0.6 |            | yes |                                |  |
| Non-renewable Primary Energy (PE)                                                                                                                                                                           | PE demand kWh/(m²a)                            | 109             |  | ≤                                                                                                                                                                                                                                                                                                              | -   |            | -   |                                |  |
| Primary Energy                                                                                                                                                                                              | PER demand kWh/(m²a)                           | 50              |  | ≤                                                                                                                                                                                                                                                                                                              | 45  | 50         |     | yes                            |  |
| Renewable (PER)                                                                                                                                                                                             | Generation of renewable energy kWh/(m²a)       | 68              |  | ≥                                                                                                                                                                                                                                                                                                              | 60  | 67         |     |                                |  |
| <sup>2</sup> Empty field: Data missing; '-': No requirement                                                                                                                                                 |                                                |                 |  |                                                                                                                                                                                                                                                                                                                |     |            |     |                                |  |
| I 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 verification. |                                                |                 |  |                                                                                                                                                                                                                                                                                                                |     |            |     | <b>Passive House Plus?</b> yes |  |
| Task:                                                                                                                                                                                                       |                                                | First name:     |  | Surname:                                                                                                                                                                                                                                                                                                       |     | Signature: |     |                                |  |
| 1-Designer                                                                                                                                                                                                  |                                                | Richard         |  | Hands                                                                                                                                                                                                                                                                                                          |     |            |     |                                |  |
| Architeco                                                                                                                                                                                                   |                                                | Issued on:      |  | City:                                                                                                                                                                                                                                                                                                          |     |            |     |                                |  |
|                                                                                                                                                                                                             |                                                | 2nd December 20 |  |                                                                                                                                                                                                                                                                                                                |     |            |     |                                |  |
| Project data imported from designPH 2.0.09                                                                                                                                                                  |                                                |                 |  |                                                                                                                                                                                                                                                                                                                |     |            |     |                                |  |
| PHPP9 display.code:                                                                                                                                                                                         |                                                |                 |  |                                                                                                                                                                                                                                                                                                                |     |            |     |                                |  |

**Please note:** The PHPP Assessment of the St James Lane has been completed by Passivhaus certified Architect Richard Hands of Architeco Ltd.