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**CLIENT**

Mr & Mrs Knobloch

**PROJECT**

Energy Statement

2 Elsworthy Terrace
NW3 3DR

**Project No.:** 23/093
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**Revision:** 03

## Contents

# 1 Project Proposal

2 Elsworthy Terrace is an existing dwelling located in Primrose Hill, North West London. The proposal includes the refurbishment and extension of the existing dwelling for family accommodation. The refurbished dwelling will provide approximately 350 $m^2$ of family accommodation spanning across 4 floors.

# 2 Planning Policy

The refurbished dwelling is not classified as a major development as it is under the 1,000 $m^2$ threshold. As a result, the refurbishments at 2 Elsworthy Terrace do not have to comply with the London Plan.

However, the proposal does have to adhere to the minimum standards for refurbishment/extension in Building Regulations Part L1.

The proposed refurbishment/extension maintains or improves on the performance of the existing building services and fabric. Building fabric improvements may be considered if viable or practicable in the context of the existing building

## 2.1 Building Regulation Part L1

Part L1 provides guidance for extensions and refurbishments of existing dwellings on the following topics.

a) Limiting heat gains and loses
b) Building services
c) New elements in existing dwellings, including replacing a fabric element and constructing an extension.
d) Existing elements in existing dwellings, including renovating or retaining a thermal element, material change of use and change of energy status.

# 3 Limiting Heat Gains and Losses

## 3.1 Part L1 Guidance

### 3.1.1 Limiting Standards in Existing Dwellings

Section 4 of Part L1, 'limiting standards in existing dwellings', new fabric elements should meet the limiting standards in Table 4.2.

**Table 4.2 Limiting U-values for new fabric elements in existing dwellings**

| Element type | Maximum U-value[1] W/(m²·K) |
|---|---|
| Roof[2] | 0.15 |
| Wall[2][3] | 0.18 |
| Floor[4][5] | 0.18 |
| Swimming pool basin[6] | 0.25 |
| Window[7][8][9] | 1.4 or Window Energy Rating[10] Band B minimum |
| Rooflight[11][12] | 2.2 |
| Doors with >60% of internal face glazed[13] | 1.4 or Doorset Energy Rating[10] Band C minimum |
| Other doors[13][14] | 1.4 or Doorset Energy Rating[10] Band B minimum |

**NOTES:**

1. Area-weighted average values, except for windows, doors, roof windows and rooflights.
2. For dormer windows, 'roof' includes the roof parts of the windows and 'wall' includes the wall parts (cheeks).
3. If meeting such a standard would reduce the internal floor area of the room bounded by the wall by more than 5%, a lesser provision may be appropriate.
4. If meeting such a standard would create significant problems in relation to adjoining floor levels, a lesser provision may be appropriate.
5. The U-value of the floor of an extension may be calculated using the exposed perimeter and floor area of the whole enlarged dwelling.
6. The U-value of a swimming pool basin (walls and floor) calculated according to **BS EN ISO 13370**.
7. If other performance (e.g. wind load, safety, security or acoustic attenuation) requires thicker glass to be used, an equivalent window unit with standard thickness (6mm) glazing should be shown to meet the required standard.
8. Including roof windows and curtain walling.
9. For timber windows, a maximum U-value of 1.6 W/(m²·K) or Window Energy Rating Band C is permissible until 14 June 2023. This is to give manufacturers time to transition to the standard in this Table 4.2. From 15 June 2023 the full standard of 1.4 W/(m²·K) or Window Energy Rating Band B applies.
10. The methods for calculating Window Energy Rating and Doorset Energy Rating are set out in the Glass and Glazing Federation's Glazing Manual Data Sheet 2.3, Guide to the Calculation of Energy Ratings for Windows, Roof Windows and Doors.
11. U-values for rooflights or rooflight-and-kerb assemblies should be based on the outer developed surface area, which is often greater than the area of the roof opening. Further guidance on $U_d$-values is given in the Building Research Establishment's BR 443 and the National Association of Rooflight Manufacturers' Technical Document NTD02.
12. The limiting value for rooflights also applies to kerbs that are supplied as part of a single rooflight-and-kerb assembly sourced from the same supplier and for which the supplier can provide a combined $U_d$-value for the assembly. An upstand built on site should have a maximum U-value of 0.35W/(m²·K).
13. For timber doors, a maximum U-value of 1.8 W/(m²·K) or Doorset Energy Rating Band E is permissible until 14 June 2023. This is to give manufacturers time to transition to the standard in this Table 4.2. From 15 June 2023 the full standard of 1.4 W/(m²·K) applies.
14. For external fire doorsets, as defined in Appendix A of Approved Document B, Volume 1, a maximum U-value of 1.8W/(m²·K) is permissible.

**Figure 1: Table 4.2 Building Regulation Part L1**

3.1.2 Renovated and Retained Elements

Section 4, 'renovated and retained elements', states that the U-value of an existing thermal element that is being renovated should:

a. Be no worse than that of the element before it is renovated.
b. Meet the limiting standards in Table 4.3.

**Table 4.3 Limiting U-values for existing elements in existing dwellings**

| Element | U-value[1] W/(m²·K) | |
|---|---|---|
| | (a) Threshold | (b) Improved |
| Roof[2][3][4] | 0.35 | 0.16 |
| Wall – cavity insulation[2][5] | 0.70 | 0.55 |
| Wall – internal or external insulation[2][6] | 0.70 | 0.30 |
| Floor[7][8] | 0.70 | 0.25 |

**NOTES:**

1. Area-weighted average values.
2. For dormer windows, 'roof' includes the roof parts of the windows and 'wall' includes the wall parts (cheeks).
3. If meeting such a standard would limit head room, a lesser standard may be appropriate. In such cases, both of the following should be achieved.
   a. The depth of the insulation plus any required air gap should be at least to the depth of the rafters.
   b. The insulant should be chosen to achieve the lowest practicable U-value.
4. If there are problems with the load-bearing capacity of the frame or height of the upstand, for a flat roof or roof with integral insulation, a lesser standard may be appropriate.
5. This applies only to a wall that is suitable for cavity insulation. Where this is not the case, it should be treated as 'wall – internal or external insulation'.
6. If meeting such a standard would reduce the internal floor area of the room bounded by the wall by more than 5%, a lesser standard may be appropriate.
7. The U-value of the floor of an extension may be calculated using the exposed perimeter and floor area of the whole enlarged dwelling.
8. If meeting such a standard would create significant problems in relation to adjoining floor levels, a lesser standard may be appropriate.

**Figure 2: Table 4.3 Building Regulations Part L1**

3.2 Demonstrating Compliance

Elements of the building fabric for the refurbishment and extension will have the following U-values.

| **Element** | **U-value (W/$m^2K$)** |
|---|---|
| External Wall | 0.17 |
| Roof | 0.14 |
| Floor | 0.14 |
| External Windows | 1.4 |
| French Doors / Entrance Door | 1.4 |
| Extension Bi-fold Doors | 1.5 |
| Velux Rooflights | 1.1 |
| Walk-on Rooflight | 1.5 |

- The U-value of the walls improves on the reference value in Building Regulations Part L1 Table 4.2 by 0.01 W/$m^2K$.
- The U-value of the roof improves on the reference value in Building Regulations Part L1 Table 4.2 by 0.01 W/$m^2K$.
- The U-value of the floor improves on the reference value in Building Regulations Part L1 Table 4.2 by 0.04 W/$m^2K$.
- The U-value of the Velux rooflights improves on the reference value in Building Regulations Part L1 Table 4.2 by 0.7 W/$m^2K$.
- The walk-on rooflight improves on the reference value in Building Regulations Part L1 Table 4.2 by 1.1 W/$m^2K$.

# 4 Building Services

## 4.1 Part L1 Guidance

### 4.1.1 Replacement Building Services in Existing Buildings

A replacement fixed building service should be at least as efficient as the value set out in Table 6.2 and should comply with either of the following:

a) Use the same fuel as the service being replaced and have an efficiency that is not worse than that of the service being replaced.

b) Use a different fuel than the service being replaced. The system should both:

I. not produce more CO2 emissions per kWh of heat than the appliance being replaced

II. not have a higher primary energy demand per kWh of heat than the appliance being replaced.

**Table 6.2 Minimum efficiencies for gas-fired heating systems in existing dwellings**

| System type | Minimum efficiency | Notes |
|---|---|---|
| Wet heating (e.g. radiators or underfloor heating) | 92% (as defined in ErP[1]) | Or, in exceptional circumstances in existing dwellings[2], SEDBUK 2009 efficiencies as follows:<br>• 78% for natural gas<br>• 80% for LPG<br>Follow paragraph 6.2 |
| Range cooker with integral central heating boiler | 75% (as defined in SEDBUK 2009) | Follow paragraph 6.3 |
| Warm air heating | **BS EN 17082** | If a gas-fired circulator is incorporated for domestic hot water, its full and part load efficiency should meet **BS EN 15502-2**<br>Follow paragraph 6.4 |
| Independent space heating appliance for primary and secondary space heating | 63% gross<br>70% net | Gross efficiency using the following standards as appropriate:<br>• **BS EN 1266**<br>• **BS 7977-1**<br>• **BS EN 613**<br>• **BS EN 13278**<br>Follow paragraph 6.5 |
| Inset live fuel-effect combined fire/back boiler | 45% for natural gas<br>46% for LPG | Gross efficiency using **BS 7977-2**<br>Follow paragraph 6.6 |
| All types except inset live fuel-effect combined fire/back boiler | 63% for natural gas<br>64% for LPG | Gross efficiency using **BS 7977-2** as appropriate |

**NOTES:**

1. Energy-Related Products Directive. For Standard Assessment Procedure modelling, SEDBUK values should be used.
2. Exceptional circumstances are defined in the ODPM's *Guide to the Condensing Boiler Installation Assessment Procedure for Dwellings.*

**Figure 3: Building Regulations Part L1 Table 6.2**

4.2 Demonstrating Compliance

The existing building is currently heated by a gas boiler that is approaching end of life and is due for replacement. It is estimated the efficiency of the boiler is between 70-80% due to degradation over time.

The proposed gas boiler, Vaillant ecoTEC plus 64, has an ErP efficiency of 94%. The new gas boiler will be used in conjunction with radiators and underfloor heating. The efficiency of the new gas boiler exceeds the minimum efficiency listed in Table 6.2.


**Figure 4: Vaillant ecoTEC plus 64**

The footprint of the ecoTEC plus 64 kW is 720 x 440 x 473 mm. Accounting for clearance around the unit, the total volume of space required is between 0.5 – 1.0 $m^3$. The footprint of the gas boiler is at least 9 times smaller than that required by an ASHP.

| Technical data | Unit of measure | ecoTEC plus 48 | ecoTEC plus 64 |
|---|---|---|---|
| **General** | | | |
| Article number | | 0010021520 | 0010021521 |
| Boiler dimensions (HxWxD) | mm | 720 x 440 x 405 | 720 x 440 x 473 |
| **Heating** | | | |
| Nominal heat output range at 50/30°C (Condensing mode) | kW | 8.7 - 48.0 | 12.2 - 63.5 |
| Nominal heat output range at 80/60°C (Non condensing mode) | kW | 7.8 - 44.1 | 11.0 - 58.7 |
| Maximum flow temperature | °C | 80 | |
| Flow temperature range | °C | 30 - 80 | |
| Flow temperature factory setting | °C | 75 | |
| Approximate condensate volume at 50/30°C | litres/hr | 5.0 | 6.9 |
| **Mechanical** | | | |
| Boiler lift weight (Dry boiler - includes pump) | kg | 38 | 48 |
| Maximum horizontal flue length 80/125 | m | 18 | 15 |
| **Performance** | | | |
| NOx (En 15502-2-1) | mg/kWh | 30.8 | 29.1 |
| ErP efficiency (Heating / DHW) | A, A/A, A+ | A+ | |
| ErP efficiency | % | 94 | |
| ErP decibel rating (sound power) | dBa | 43 | |

**Figure 5: Technical Datasheet Vaillant ecoTEC plus 64**

## 4.3 Other Options

A number of other heating options were considered. However, they were deemed unfeasible due to the following reasons.

### 4.3.1 Air Source Heat Pumps (ASHP)

ASHPs are not recommended for the property. To meet the space heating and DHW needs, the required ASHP will have a large footprint and need a significant acoustic enclosure. This acoustic enclosure will sit above the neighbour's fence line possibly creating an unsightly visual to the neighbouring property.

**Figure 6: Typical ASHP configuration.**

The footprint of the required ASHP is 1710 x 1750 x 740 mm. With the addition of clearance around the unit, the total volume of space require by the ASHP will be 8.0 - 9.0 $m^3$.


**Figure 7: Required enclosure for the ASHP.**

Furthermore, it has been showed that the efficiency of air source heat pumps will drop during high heating loads and low outside air temperatures. It is expected that the running costs will be higher or equivalent to that of a gas boiler.

4.3.2 Ground Source Heat Pumps (GSHP)

GSHPs are not recommended for the property. A detailed geological survey is required to determine the viability of horizontal or vertical collectors. Depending on the geological conditions, horizontal collectors may require a significant amount of surface area. If vertical collectors are more suited, upfront costs will be significant as the collector will need to be driven to a substantial depth.

4.3.3 Domestic Combined Heat Power (CHP)

A CHP will not be feasible for the property due to economies of scale. Heating loads will not be consistently large enough to benefit from on-site electricity generation.

4.3.4 Biomass Boilers

A biomass boiler is not recommended for the property. The modulating energy demand of the property may not suit the longer start-up times of the biomass boilers. Furthermore, an additional structure will be required for on-site fuel storage.

## 5 Onsite Renewables

On-site renewables were considered for the property. Specifically, solar PV and solar thermal technology were considered.

5.1 Photovoltaic Panels

The only available roof space is between rooflights on the south westerly side of the property. Due to the limited roof space and the possible visual disturbance to neighbouring properties. Solar PV is not recommended.

5.2 Solar Thermal Panels

The only available roof space is between rooflights on the south westerly side of the property. If the limited roof space was to be used for renewables, it is recommended that solar PV be prioritised. Solar thermal is not recommended.

## 6 Summary

2 Elsworthy Terrace is a refurbishment/extension project. As its floor area is less than 1,000 $m^2$ it does not have to comply with the London Plan. Furthermore, the building fabric and services improves on the existing building. Hence, the proposal will be compliant with Building Regulations Part L1.