

Energy Strategy

Frederick Morfill House

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Executive Summary

This energy strategy has been prepared in order to assess the improvement in energy performance as a result of the proposed development at Frederick Morfill House. The site of the development is located within the London Borough of Haringey.

The development comprises the erection of two three-bedroom homes.

An energy assessment has been carried out based on design information to identify the most appropriate way to reduce CO₂ emissions and energy demand and to address the London Borough of Haringey's Energy and Carbon ER's.

Following the thermal and M&E equipment upgrades described, the energy strategy for the proposed building has been demonstrated to be capable of achieving an improvement of 71% CO₂ emissions.

1 Introduction

This energy strategy has been prepared for the development at Frederick Morfill House. The development comprises two three-bedroom houses.

This statement summarises the sustainable design and construction measures that have been incorporated into the project in order to meet the sustainability requirements of the London Borough of Haringey, the energy and carbon ER's of Haringey and the London Plan.

1.1 Assessment approach

This report summarises the work undertaken to support the development of an energy strategy for the new development, following the energy hierarchy 'Be Lean, Be Clean, Be Green, Be Seen'.

Standard Assessment Procedure for the Energy Rating of Dwellings (SAP) calculations have been carried out for the residential unit. These are used to assess the impact on energy demand and CO₂ emissions of improvements through the hierarchy and demonstrate the most appropriate solution for the development to meet the relevant planning requirements.

2 Policy

This development consists of two dwelling units and does not surpass the requirement for a major development, therefore the London plan and London Borough of Haringey referring to major developments are not relevant.

2.1 London Borough of Haringey's Local Plan

Policy SP4 Working towards a low carbon Haringey

Over the life time of the Local Plan, reducing energy use in buildings and working towards a low carbon borough will be one of the key challenges facing Haringey. The Council will promote the measures outlined below to reduce carbon emissions from new and existing buildings.

1. In line with London Plan policy, the Council will promote and require all new developments to take measures to reduce energy use and carbon emissions during design, construction and occupation, by incorporating the following measures:
 - a. From 2011 onwards, all new residential development will achieve a minimum 25% reduction in total (regulated) CO₂ emissions in line with Code for Sustainable Homes Level 4 energy standards, and should aim to achieve Level 6. All new residential development shall be zero carbon from 2016 onwards; and
 - b. From 2011 onwards all new non-residential development shall be built to at least BREEAM "very good" standard and should aim to achieve BREEAM "excellent" or the current nationally agreed standard. All new non-residential development shall be zero carbon from 2019.
2. The Council will promote low- and zero-carbon energy generation through the following measures:

- a. Requiring all developments to assess, identify and implement, where viable, site-wide and area-wide decentralised energy facilities including the potential to link into a wider network;
- b. Establishing local networks of decentralised heat and energy facilities by requiring developers to prioritise connection to existing or planned networks where feasible;
- c. Working with neighbouring boroughs and other partners to explore ways of implementing sub-regional decentralised energy networks including the potential in the Upper Lee Valley Opportunity Area; and
- d. All new developments are required, where viable, to achieve a reduction in predicted carbon dioxide emissions of 20% from onsite renewable energy regeneration, which can include connections to local sources of decentralised renewable energy.

2.2 London Borough of Haringey's Energy and Carbon ER's

Part A

Net Zero Carbon Homes in Operation

Net Zero carbon buildings are supported by four core principles: energy efficiency, low carbon heat. Renewable energy, and low embodied carbon.

Energy Efficiency

Buildings use energy for heating, hot water, ventilation, lighting, cooking and appliances. The efficient use of energy reduces running costs and carbon emissions. It also reduces a building's impact on the wider energy supply network, which is an important consideration.

Low Carbon Heating

Low carbon sources of heat are an essential feature of Net Zero carbon buildings. All new buildings should be built with a low carbon heating system and must not connect to the gas network.

Renewable Energy Generation

In new buildings, renewable energy generation should ideally be at least equal the energy use of the building on an annual basis for it to qualify as Net Zero carbon in operation on-site. This should be achieved through the use of solar photovoltaic (PV) panels. If it is not technically feasible (e.g. high density development), the shortfall in renewable energy generation should be identified and addressed by Homes for Haringey, ideally on another site with more roof space available (e.g. lower density development).

Low Embodied Carbon

Net Zero carbon buildings should minimise embodied carbon in materials and product selection. This should be as well as reducing operational carbon. Comparisons between the two are rarely valid or fair comparisons on a building by building basis.

7 – The role of Passivhaus

Passivhaus is the world's leading comfort and energy standard for buildings. It sets targets for space heating demand and total energy that a building can use and provides a process to ensure that target is achieved.

Passivhaus is simple. It focuses on these core principles:

- Reducing heating energy.
- Best practice construction fabric performance.
- Robust energy calculations using PHPP (Passivhaus Planning Package).
- Quality assurance during design and construction.

The London Borough of Haringey require all buildings to be designed to the Passivhaus 'Classic' standard. The London Borough of Haringey will decide at the end of RIBA Stage 4 whether to proceed to formal certification on a project-by-project basis.

Should technical feasibility or financial viability prevent Passivhaus 'Classic' being achieved, design teams will need to demonstrate why and, subject to the London Borough of Haringey's approval, seek agreement on a relaxed set of KPIs, using the same methodology. The quality assurance process in this situation will be the self-certified AECB Standard which uses a similar methodology to Passivhaus.

8 – The AECB Standard

The AECB Standard is a process for self-certification of PHPP calculations and construction quality. The energy consultant would prepare a PHPP calculation and supporting design and construction evidence, then upload to the AECB Low Energy Building database. They take responsibility for certification and for underwriting the standard claim. The AECB self-certification process is designed to make explicit the project's claim to be a low energy design and to provide the consumer with a degree of protection under trading standards. <https://aecb.net/aecb-building-certification/>.

2.3 The London Plan Policies on Energy

Policy SI 2 Minimising greenhouse gas emissions

A Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

- 1) be lean: use less energy and manage demand during operation
- 2) be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly
- 3) be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site
- 4) be seen: monitor, verify and report on energy performance.

This is not a major development, but will follow the energy hierarchy in line with Haringey's requirements. The other London Plan policies do not apply.

3 Energy Strategy

An energy strategy has been developed following the energy hierarchy ‘Be Lean, Be Clean, Be Green’, ‘Be Seen’. Energy calculations using Building Regulations approved and accredited software have been undertaken at each stage to calculate the savings associated with the measures incorporated.

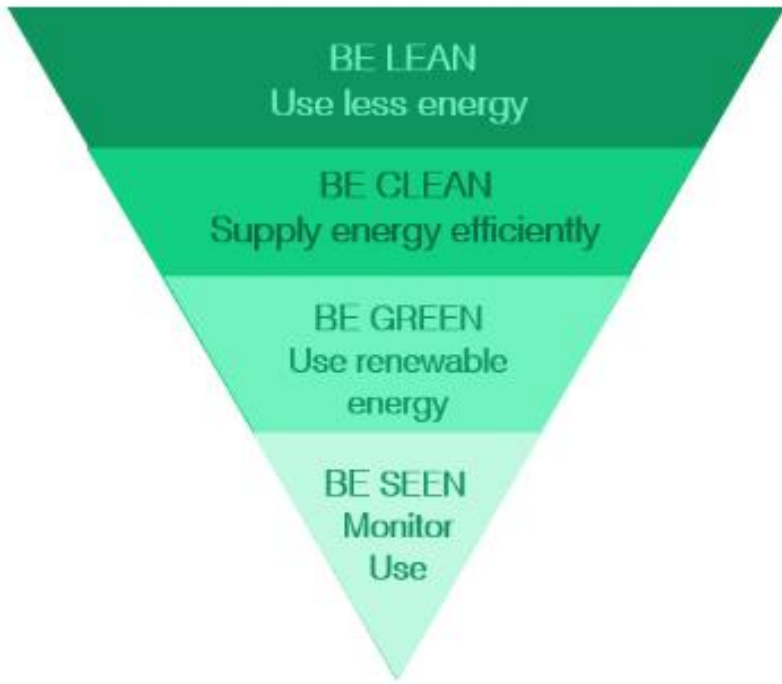


Figure 3.1 The Energy Hierarchy

The energy consumption and carbon emission figures within this report have been calculated using the approved Standard Assessment Procedure for the Energy Rating of Dwellings (SAP).

3.1 Be Lean

As part of the Be Lean approach, passive design measures have been considered throughout the pre-planning stage to reduce initial energy demand.

Solar Gain Control and Daylight

Solar gains are a passive form of heating from the sun’s radiation and are beneficial to a building during winter months as they provide an effective source of heat and reduce internal heating requirements. However, during summer months they must be controlled in order to mitigate the risk of overheating. They can be controlled through glazing and shading design in order to allow low level winter sun to enter the building and to limit access to high level summer sun.

The glazing strategy design has carefully considered orientation and window size in order to maximise daylight while controlling excessive solar gains. Glazing will incorporate low emissivity coatings to limit overheating without compromising light transmittance.

Overheating

In order to meet the requirements for both Passivhaus and the AECB guidelines, a buildings tendency to overheat must be controlled. Guidelines state that a building should not exceed 25 degrees internally for more than 10% of the total annual hours. Due to the site constraints present on this development, passive measures where unable to maintain the internal temperatures within these parameters. As such active cooling measures will need to be utilised to ensure a thermally comfortable internal temperature. The methodology used to test this and the results of these analysis are available in more detail in the overheating assessment report.

Building Fabric

Designing an efficient thermal envelope will greatly reduce the need for space heating and cooling, as heat transmittance through the thermal elements is reduced. Low air permeability rates will also reduce heating and cooling energy demand by reducing the volume of air that can penetrate the building. As part of a ‘fabric first’ approach, the building fabric has been carefully considered and specified to meet or exceed current Building Regulations minimum requirements, as detailed in table 3.1. In order to comply with Passivhaus and AECB standards U-values, where technically viable, should be between 0.10 W/m²K and 0.15 W/m²K. This is the case in all but two areas of the proposed design. External wall EWS is the wall of a dormer window, the reduced build up thickness inherent to dormer windows prevents a lower U value from being applied here. The exposed floor leading to the bike store is and exposed floor leading into a sheltered space. The shelter factor applied functionally lowers the U value to within the desired range.

Fabric Component	Residential Specification
External Wall EWS 01	0.14 W/m²K
External Wall EWS 02	0.19 W/m²K
Roof RFS 01	0.12 W/m²K
Roof RFS 02	0.09 W/m²K
Roof RFS 03	0.10 W/m²K
Ground Floor	0.10 W/m²K
Exposed Floor to Bike Store	0.16 W/m²K
Windows	Triple Glazing 0.67 W/m²K, g=0.52
Rooflights	0.67 W/m²K, g=0.52
External Doors	1 W/m²K
Air Tightness	0.60 m³/m²/h
Thermal Bridging	Maximum Psi values are outlined in table 3.2 Requires further calculation at detailed design

Table 3.1 Proposed Be Lean passive design measures

Party wall cavities must be fully filled. Partially filled cavities will not comply.

Thermal Bridge	Psi Value
Other lintels (including other steel lintels)	0.01
Sill	0.01
Jamb	0.01
Basement Floor	0.01
Intermediate floor within a dwelling	0.01
Flat roof with parapet	0.01
Corner (normal)	0.01
Corner (inverted)	0.01
Party wall – Roof	0.01

Table 3.2 Initial thermal bridge Psi values used in the model

Passivhaus requires that construction be completed in such a way that non repeating thermal bridges are eliminated. As such Psi values in initial modelling have been set to 0.01 for all potential junctions as shown in table 3.3 above. These junctions will need to be effectively designed at a later stage and have their psi values calculated to ensure they comply with the criteria.

Building Services

Services have been specified to maximise efficiency therefore reducing energy used. Table 3.3 shows the proposed services strategy and energy efficiency measures for the development.

Services Component	Residential Specification
Heating distribution & water storage	Underfloor Heating 210L hot water cylinder Measured Loss: 1.8kwh\day
Cooling	Air Conditioning 0.5 EER
Heating Controls	Time and temperature zone control
Ventilation	Zehnder ComfoAir 550 SFP 0.99 86% Efficiency
Lighting & Controls	60 lm/W

Table 3.3 Proposed energy efficient design measure

The proposed specifications are preliminary only and calculations will need to be updated at the detailed design stage, based on actual specifications.

The MVHR units will be located in the utility at ground floor level. These will discharge air on the front elevation with insulated ducting to and from the unit.

3.2 Be Green

Renewable systems

An Air Source Heat Pump (ASHP) and Photovoltaic Panels have been identified as the most appropriate technologies for the development.

System	Residential Specification
ASHP	Induvial Air Source Heat Pump (ASHP) system providing 100% of heat and hot water SCOP@35: 4.99 SCOP@55: 3.45
Photovoltaic Panels	3.2 kWp Southeast 30° Min. 20% Efficiency

Table 3.4 Proposed LZC specifications

ASHP System

The specified heat pump will need to be taken from the SAP appendix Q database to allow the correct efficiencies to be applied. For the purposes of this preliminary assessment, we have used the Panasonic WH-ADC0309J3E5UK + WH-UD03JE5.

Photovoltaic Panels (PVs)

The PV specification is based on a 400W Trina Vertex solar panel for the preliminary assessment. Upon detailed design, calculations will need to be updated.

Battery storage has been deemed not viable for the development due to cost and maintenance concerns. It is not anticipated that enough electricity will be produced by the solar panels to justify the initial and maintenance cost of battery storage.

3.3 Energy and Carbon Savings

Carbon Savings

Table 3.5 demonstrates the percentage improvement in emission reduction over the notional baseline levels for the development considering only regulated energy use and associated emissions.

	CO ₂ Emissions (T/yr)	CO ₂ Savings (T/yr)	% Saving
Building Regulations 2021 Baseline	2.80		
Be Lean	0.70	2.1	
Be Clean	0.70	0.0	
Be Green	0.80	-0.1	
Total Savings		2.0	71%

Table 3.5 Regulated emissions improvements over Part L

Carbon savings at the Be Green stage show a negative value, this is due to changes in the London Plan methodology for assessing carbon at the Be Lean and Be Green stages, since the introduction of Part L 2021 methodology. However, carbon savings have been maximised on site through renewable technologies. Highly efficient ASHPs have been specified, and the PV array maximised.

The SAP calculations also confirm that the proposed development performs above the Fabric Energy Efficiency (TFEE) and Primary Energy Rate (TPER) targets. This is outlined in Table 3.6.

Dwelling Fabric Energy Efficiency Improvement Over the TFEE	Dwelling Primary Energy Rate over the TPER
49.39%	25.22%

Table 3.6 performance of the proposed development over the TFEE, TPER

Preliminary PHPP Results

Figure 3.2 below shows the preliminary results of the PHPP calculation method, utilising the specification outlined in the above report. This shows that the total heating and cooling demand of the proposed design exceeds that required to achieve Passivhaus classic (15 kWh/(m²yr)). This is largely due to site constraints. As a terraced house it is difficult to incorporate the passive measures which would generally allow a Passivhaus to operate, whilst consuming very little energy for space heating and cooling. As a result, in line with the London Borough of Haringey’s Energy and Carbon ER’s, the development will be designed to meet the AECB targets shown below in Table 3.7. Figure 3.2 below shows that based on the preliminary fabric and systems specification outlined within this report that these requirements are achievable.

Specific building characteristics with reference to the treated floor area					
			Criteria	Alternative criteria	Fulfilled?
Space heating	Treated floor area m²	114.0			
	Heating demand kWh/(m²a)	26	≤	15	-
	Heating load W/m²	13	≤	-	10
Space cooling	Cooling & dehum. demand kWh/(m²a)	4	≤	15	-
	Frequency of overheating (> 25 °C) %	-	≤	-	-
	Frequency of excessively high humidity (> 12 g/kg) %	0	≤	10	-
Airtightness	Pressurisation test result n ₅₀ 1/h	0.6	≤	0.6	-
Non-renewable Primary Energy (PE)	PE demand kWh/(m²a)	56	≤	85	-
Primary Energy Renewable (PER)	PER demand kWh/(m²a)	45	≤	-	-
	Renew. energy generation (in rel. to projected building footprint area) kWh/(m²a)	8	≥	-	-

Figure 3.2 Preliminary outputs of PHPP calculation using preliminary building and systems specifications

Parameter	Target	Notes
Delivered Heat and Cooling	≤40kWh/(m².a)	According to the methodology described in the PHPP* handbook
Primary Energy (P.E)	Varies kWh/(m².a)***	As per PHPP for each country
Primary Energy Renewable (P.E.R)	< 75 kWh/(m².a)	Ditto
Air Tightness (n50)	≤ 1.5h ⁻¹ (≤ 3 h ⁻¹)	With MVHR (with MEV)**
Thermal Bridges***	Psi _{external} <0.01 W/mK	Calculated if > 0.01 W/mK
Summer Overheating	< 10%	<5% recommended

Table 3.7 AECB Standard Requirements

3.4 Carbon Offset Payment

On site carbon reductions have been maximised. On site there is a target of zero carbon, which can be achieved through an offset payment when there is a shortfall on site. The carbon offset payment for the application is detailed in Table 3.8 below.

	Carbon (tonnes / annum)	30 year carbon emissions	Offset payment (£95/tonne)
Residential	1	30	£2,850

Table 3.8 Proposed Carbon Offset Payment

The carbon offset figures are preliminary only and will need to be calculated post construction and confirmed with the London Borough of Haringey.

4 Conclusion

This energy strategy has been prepared for the development at Frederick Morfill House. The development comprises a two three-bedroom dwellings.

The development follows the energy hierarchy, incorporating passive design measures and energy efficient equipment. The development employs an efficient building fabric, including highly

efficient insulation and highly efficient glazing, and an ASHP to maximise carbon savings for the site, resulting in 71% savings over the Target Emissions Rate. Measures are also incorporated to minimise pollution and reduce water use. The development complies with sustainability policy of the London Borough of Haringey, Haringey's Energy and Carbon ER's and the London Plan, for minor developments.

The proposed design of the development fails to meet the total heating and cooling usage requirement of 15 kWh/(m²yr) with a total figure of 30 kWh/(m²yr). This is calculated according to the PHPP methodology as required by the AECB standard and meets the criteria within.

The figures within this report are based on preliminary analysis only and further detailed studies will be required at the detailed design stage before specifying any of the proposed systems.