264 Belsize Road, London NW6 4BT

Energy Statement

July 2023

Peter Deer and Associates Ltd
Solar House, 282 Chase Road, Southgate, London N14 6HA
T: 020 3232 0080 • **E:** post@pd-a.co.uk
Registered in England No. 3022343

Document Control

Revision History

Number	Reason	Date
1	First issue for comment	26th August 2022
1A	Revised as per comments	07th September 2022
2A	Revised as per comments for submission	05th October 2022
3	Revised to Planning Application Comments	14th July 2023

Quality Assurance

Written by:	Checked by:
Jalil Abdullah	John Pengilly

Contact Author

Jalil Abdullah
Solar House, 282 Chase Road, Southgate, London N14 6HA
T: 020 3232 0080 • E: post@pd-a.co.uk

Contents

List of Figures

List of Tables

Executive summary

This energy assessment has been prepared to support the planning application for the redevelopment of the mixed-use commercial/community building, 264 Belsize Road, Camden, London, NW6 4BT.

The current owner proposes alterations and extensions to the existing redundant non-residential institutional and mixed-used commercial building, replacing it with a new residential development containing 5 dwelling units (5no. two-bedroom duplexes).

The New London Plan "The Spatial Development Strategy for Greater London" March 2021, Policy SI 2 Minimising Greenhouse Gas emissions requires new major developments to achieve 35% energy-related emissions reduction from the current building regulations.

This development is not considered a major development according to the London Plan 2021 (FLA of 506**m² <1000²)** but it is regarded as medium development. The Camden Planning Guidance expects this development to achieve a minimum of 20% carbon emission reduction (refer to Table 2a Energy reduction targets, domestic, Energy efficiency and adaptation, January 2021).

The development is designed to achieve over 50% energy-related carbon emission reduction through the following design measures:

- Efficient fabric design and passive measures to reduce energy demand (Be Lean)
- Onsite energy supply (Be Clean)
- Use of highly efficient energy source like an all-electric air source heat pump and proposed onsite renewable energy generation using photovoltaics (Be Green)

The energy and emission rates are calculated under Part L 2021 of the Building Regulations using SAP 10.2 methodology as per the London Plan Energy Statement Guidance. The results shown in Table 1, Table 2, and 3 which shows compliance against the current building regulations (Part L 2021). SAP 10.2 Block compliance is shown in Table 4. Details of the calculations and worksheets are shown in the Appendices.

GLA Energy Hierarchy

Be Lean

As part of the ‘fabric first approach’, the building fabric has been carefully considered and specified to exceed the current Building Regulation Part L 2021 minimum requirement. The improved fabric U-values reduces the energy demand by 3% in comparison to the Building Regulations

The proposal air permeability target rate (4.0m³/m²h @50Pa) is less than the notional building and will require improved window and wall junction details. This report recommends that the contractor undertakes several early samples of an air permeability test to identify the air leakage rates are achievable before the second fix starts.

Full details of the construction of the thermal elements are shown in Section 4 – Energy Demand Reduction.

Be Clean

Figure 4 indicates that this proposed development is not within the heat network priority area but in proximity to the proposed future heat network

Given the lack of existing nearby district heating or community heating infrastructure to connect to at present and cost-effective connection options in the near future and due to the small scale of the project, it is proposed to provide an onsite energy supply option.

The Government has announced that by 2025, all new homes will be banned from installing gas and oil boilers and will be heated by low-carbon alternatives instead. The ban is part of a UK action plan to reach carbon Net-Zero by 2050. **An all-electric air source heat pump (per dwelling) with an underfloor heating system is proposed.** The proposed schematic of this system is presented in Appendix D.

Be Green

Heat pumps extract heat from the environment to provide space heating and domestic hot water and are included under the "Be Green" assessment of the GLA energy assessment heirarchy. A Vaillant aroTHERM plus 12kW Air source heat pump is proposed for each residential dwelling.

The PV assessment informs us that 2,854 kWh/year with 4kWp of renewable electricity generation is required for the development. This output is sufficient to achieve over 20% CO_2 reduction target using onsite energy generation in accordance with Camden Local Plan. Applying the Be Green measures this development achieves 74% carbon reduction of the regulated energy and 56% carbon savings of the unregulated energy CO_2 emissions, which exceeds the 35% GLA carbon reduction target.

Be seen measures

The new GLA's London Plan Policy requires the major developments to monitor their energy performance and report on the GLA's online post-construction monitoring platform.

This development is not considered as a major development and “Be seen” measures will be voluntary due to the small scale of this project.

Summertime Overheating

The Good Homes overheating design tool and dynamic thermal model confirm that all dwellings achieve an acceptable level of overheating risk.

It is proposed to provide appropriate energy-efficient mechanical ventilation systems such as continuous Mechanical Ventilation with Heat Recovery (MVHR) to meet the overheating and fresh air rates. Additionally, all dwellings will have openable windows; this provides the ability to naturally ventilate the apartments. Natural ventilation can be provided via openable windows and balcony doors. The windows and balcony doors of the dwellings affected by noise will be open during the day and closed at night.

A dynamic daylighting assessment using IES VE 2022 3.0.0 was completed, and a separate report is submitted as part of the Planning application.

A dynamic overheating risk analysis using IES VE 2022 3.0.0 was conducted, and a separate overheating risk analysis report is written and submitted as part of the Planning application.

Energy Hierarchy Tables

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2021 of the Building Regulations Compliant Development	6.5	2.1
After energy demand reduction	4.8	2.1
After heat network / CHP	4.8	2.1
After renewable energy	1.7	2.1

Table 1 Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	**(%)**
Savings from energy demand reduction	1.7	25%
Savings from heat network / CHP	0.0	0%
Savings from renewable energy	3.1	48%
Cumulative onsite savings	4.8	74%
Annual savings from offset payment	1.7	
	(Tonnes CO_2)	
Cumulative savings for offset payment (£95/ tonne)	161.7	-
Cash in-lieu contribution (£)	£4,852	

Table 2 Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for domestic buildings

	Regulated Energy CO_2 savings		TOTAL CO_2 savings
	Tonnes per annum	%	%
Part L 2013 baseline	1.65	25%	19%
Be lean	0.00	0%	0%
Be clean	3.14	48%	36%
Be green	4.80	74%	56%

Table 3 Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for the site

The energy assessment shows that the proposed energy strategy after “Be Green” may result in circa 1.70t CO_2 reduction of regulated CO_2 emissions per annum which equates to circa 74% CO2 reduction. The overall CO_2 emissions from both regulated and unregulated energy is reduced by circa 56%.

The overall reduction in regulated carbon emissions associated with the proposed design is illustrated in Figure 1.

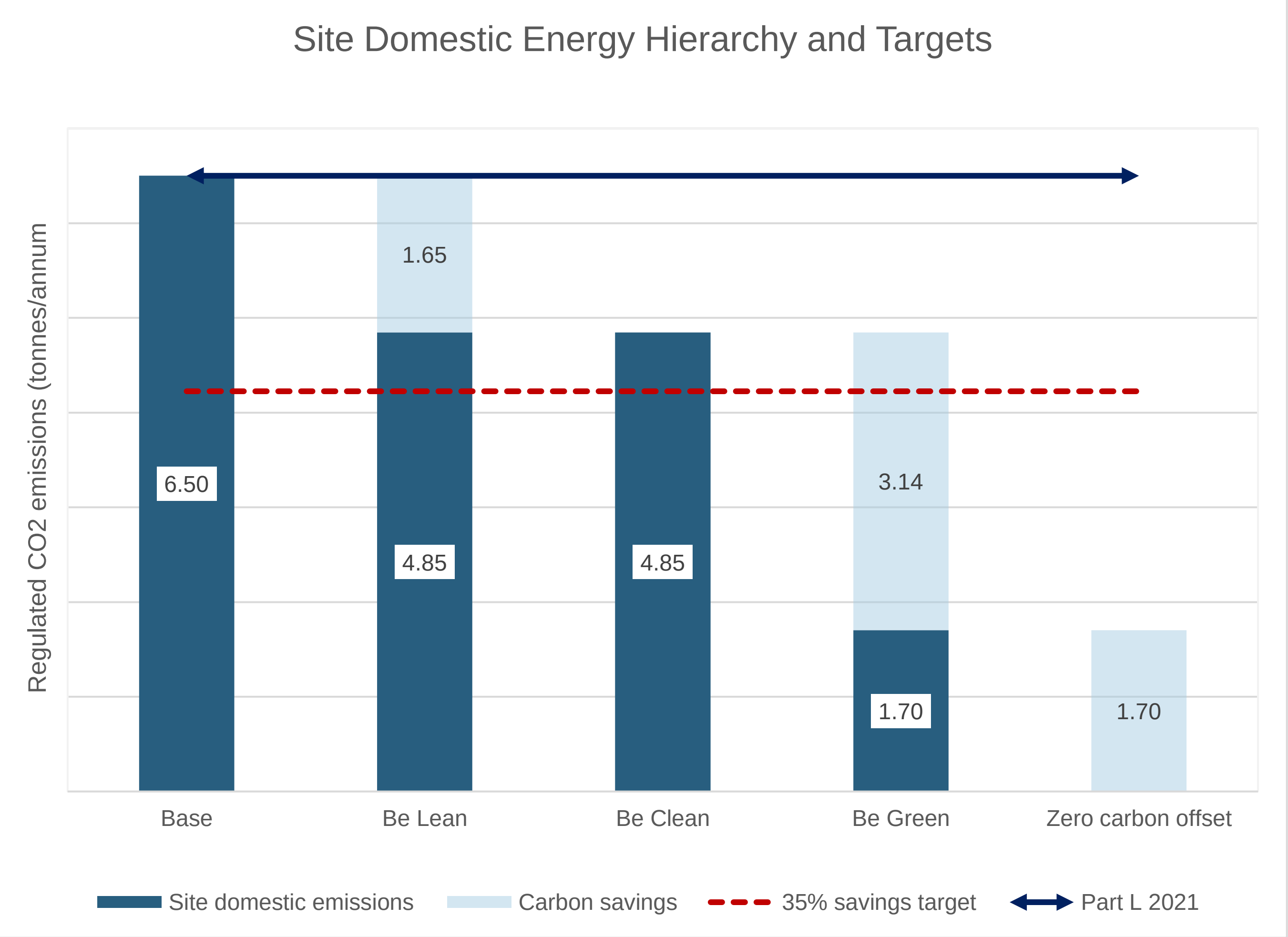


Figure 1 Site Energy relates to Carbon Dioxide Emissions (SAP 10.2)

In summary, the energy assessment shows that the proposed energy strategy for the development:

- Complies with Part L 2021 Building Regulations and meets the minimum planning policy requirements.
- Has the potential to meet circa 56% of the regulated and unregulated operational Net Zero target against Part L 2021 with renewable PV technology and ASHP in place.

The energy strategy will be developed during the detailed design with the aim to reduce fuel poverty and maximise benefits for the residents by implementing practical, cost-effective, and holistic design solutions.

The Part L assessment is based on standardised assumptions which does not reflect intended operation of the development and its energy consumption. It is therefore recommended to consider carrying out a more detailed TM54 operational energy assessment during detailed design of the project to assess CO_2 emissions and savings against the Net Zero target.

SAP 10.2 Block Compliance

Dwelling	Flat Type	Total Floor Area	TER	DER	Saving	TFEE	DFEE	Better
		m²	kgCO₂/m²	kgCO₂/m²	%	W/m²	W/m²	
264 Belsize Road Unit 1	2B_4P	116.5 m²	12.58	3.87	69%	49.71	51.05	3%
264 Belsize Road Unit 2	2B_4P	89.0 m²	10.91	3.33	69%	38	38.31	1%
264 Belsize Road Unit 3	2B_4P	95.5 m²	10.08	3.07	70%	36.33	37.08	2%
264 Belsize Road Unit 4	2B_4P	92.5 m²	10.08	3.07	70%	36.33	37.08	2%
264 Belsize Road Unit 5	2B_4P	112.5 m²	11.02	3.36	70%	42.72	45.72	7%
Average				**Pass**			**Pass**	3%

Table 4 SAP 10.2 Block Compliance

1. Introduction

1.1 Control Electrical Engineers Ltd has appointed Peter Deer and Associates Ltd (PDA) to provide an Energy Statement for the proposed development of the 5 new dwellings to support a full application to Camden Borough Council.

1.2 This report has been prepared by Jalil Abdulla of PDA.

1.3 This document should be read in conjunction with:

- Design and Access Statement
- Sustainability report
- Overheating analysis report
- Ecology Assessment

Site location

1.4 Location: 264 Belsize Road, Kilburn, London, NW6 4BT. Proposed dwelling units face southeast.

Figure 2 Site location (Open Street Map 2022)

1.5 The site is located in Kilburn within the Borough of Camden. It is located on the northern side of Belsize Road (https://www.openstreetmap.org/#map=19/51.53769/-0.19249). The site area is approximately 470m², previously occupied by an existing redundant non-residential institution building.

1.6 It is approximately 40 metres east of Kilburn High Road. It is adjacent to the Priory Road Conservation Area but is not in the Conservation Area itself. The site is within an Archaeological Priority Area due to its close proximity to an old Roman road, now the A5.

1.7 The site is in flood zone 1 and it has a low probability of flooding from rivers and the sea.

Proposed development

1.8 This development contains 5 units and combines various tenures and dwelling types. Each property would have access to a private garden or balcony.

1.9 The residential entrances plus cycle and waste storage areas are accessible from the public street.

1.10 The Architects have designed windows and openable rooflights creating connecting natural ventilation (stack effect mainly) through the dwellings. This recommended design strategy is supported by CIBSE overheating guidance documents.

1.11 Full details of the proposal are set out in Alan Power Architects Ltd.'s Design and Access Statement. The proposed development includes 5 residential units (5 no. two-bedroom duplexes), and it is not considered as a major development according to the London Plan 2021 (FLA of 506m² <1000m²)

Ref	Type	Floor Area	Living Room Area
Unit 01	2B_4P	116.5 m²	56.8 m²
Unit 02	2B_4P	89.0 m²	46.0 m²
Unit 03	2B_4P	95.5 m²	46.0 m²
Unit 04	2B_4P	92.5 m²	46.0 m²
Unit 05	2B_4P	112.5 m²	49.5 m²

Table 5 Accommodation Tenure Schedule

1.12 The top floor living room is located on the mezzanine level which is open to the Kitchen/dining area below.

1.13 The proposed architectural design enhances the use of stack effect ventilation by using lightwell and openable rooflight features so that the warm air will rise sufficiently from the bedrooms and escape naturally from the roof light, which minimises the overheating risk further.

Local air quality

1.14 Air pollution is associated with several adverse health impacts, particularly affecting the most vulnerable in society. The whole of Camden Borough has been declared an Air Quality Management Area (AQMA) for both NO2 (Nitrogen Dioxide) and PM10 (Particulate Matter). Camden is also working to assess and address PM2.5 (the smallest fraction of particulate) because, despite Camden meeting EU limit values for PM2.5, research suggests that particulates of this size have the worst health impacts.

1.15 Kilburn High Road and Belsize Road are on bus routes that increase NOx and particulate emissions that generally dissipate above 5m. The mechanical ventilation will take air from Kilburn Place side. The adjacent building shields the proposed development from the polluted street air.

1.16 Introduction of the ultra-low emission zone within the North Circular Road, general promotion of improved public transport and cycle lanes, and the inclusion of the proposed green roof, will help improve the air quality of this site.

	Estimated	EU Limit	WHO Limit
NO2	41µg/m³	40 µg/m³	40 µg/m³
PM10	24µg/m³	40 µg/m³	20 µg/m³
PM2.5	14µg/m³	25 µg/m³	10 µg/m³

Figure 3 Nitrogen Dioxide (https://londonair.org.uk/map-maker/)

1.17 This map was used with permission from The Greater London Authority and Transport for London, who fund, develop, and maintain the London Atmospheric Emissions Inventory. For more information, please visit https://data.london.gov.uk/.

1.18 Figure 3 shows the annual mean pollution for NO_2, PM10 and PM2.5 for NW6 4BT. The data is based on the most recent year for which an accurate model is available, 2016. The reading is taken on the street and the proposed development is setback from the street; shielded by the neighbouring properties from the pollution sources.

1.19 The site passes the EU airborne particle targets (PM10 & PM2.5). However, the site fails on WHO annual mean Nitrogen Dioxide targets and the WHO airborne particle targets. The airborne particles are mainly caused by roads containing a bus route and railway line close to the site.

	Estimated	EU Limit	WHO Limit	
NO2	41µg/m³	40µg/m³	40µg/m³	Fail (WHO)
PM10	24µg/m³	40µg/m³	20µg/m³	Fail (WHO)
PM2.5	14µg/m³	25µg/m³	10µg/m³	Fail (WHO)

Table 6 Annual Air Quality Limits

1.20 The construction site air quality plan outlines how dust emissions from demolition and construction must be controlled and delivery vehicle movements reduced. The contractor will submit a construction management plan which will outline how dust emissions will be controlled and how delivery vehicle movements will be managed during the demolition and construction.

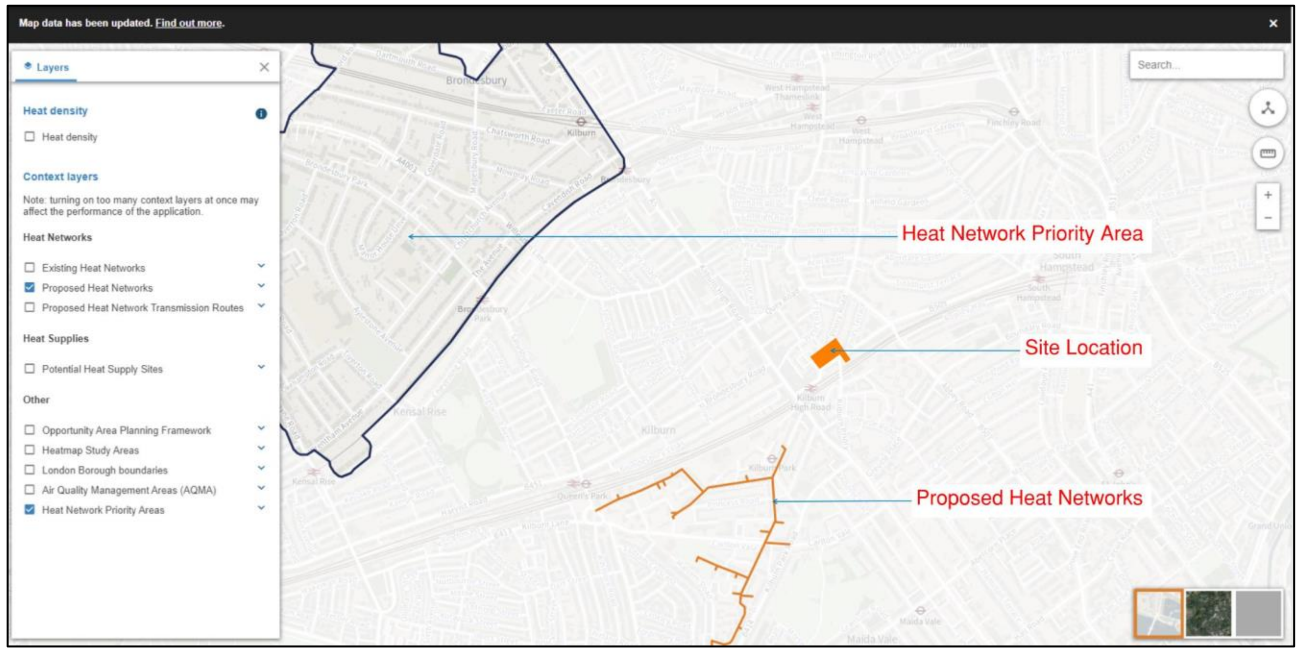
1.21 All air quality parameters are within annual target limits. The prediction is that air quality will improve because of planning policies that limit the use of combustion heating for larger developments, restriction on personal car ownership by reducing the number of car parking spaces per development, expansion of ultra-low emission zone within London, and general promotion of improved public transport and cycle lanes.

1.22 Kilburn High Road and Belsize Road are on bus routes that increase NOx and particulate emissions that generally dissipate above 5m. The mechanical ventilation will take air from the Kilburn Place side. The adjacent buildings shield the proposed development from the polluted street air. As the accommodation is set back from the main roads and they are screened from the pollution sources by surrounding buildings.

Potential for District Heating

1.23 The New London Plan Heating Hierarchy (2021), in line with Policy SI 3 D, states that the priority is for new major developments to connect to local existing or planned district heat networks where the operator has or is in the process of developing a strategy to decarbonise the network and has shared it with the GLA.

1.24 This development is not regarded as a major development (FLA of 580m² <1000²) and is not within the heat network priority area but close to the proposed future heat network as in Figure 4.


Map data has been updated. Find out more.

Layers

Heat density

☐ Heat density

Context layers

Note: turning on too many context layers at once may affect the performance of the application.

Heat Networks

☐ Existing Heat Networks
☑ Proposed Heat Networks
☐ Proposed Heat Network Transmission Routes

Heat Supplies

☐ Potential Heat Supply Sites

Other

☐ Opportunity Area Planning Framework
☐ Heatmap Study Areas
☐ London Borough boundaries
☐ Air Quality Management Areas (AQMA)
☑ Heat Network Priority Areas

Heat Network Priority Area

Site Location

Proposed Heat Networks

Figure 4 Heat Map for the site (https://maps.london.gov.uk/heatmap)

Transport

1.25 The location provides a range of transport options, including the London Overground (50m from Kilburn High Road Overground Station), London Underground (Kilburn Park Underground Station) and excellent links to National Rail. The Public Transport Accessibility Level (PTAL) rating of 6a confirms that the site has good public transport with an Accessibility Index of 30.6.

2. Planning Policy Requirements

2.1 The National Planning Policy Framework ('NPPF') was published in February 2019 and superseded the 2012 and 2018 editions. Paragraphs 2 and 12 within the Framework confirm that the NPPF must be considered a material planning consideration in planning decisions.

2.2 To ensure that sustainable development is pursued positively, a presumption favouring sustainable development is at the heart of the NPPF. This is explained in more detail in NPPF paragraph 11, which requires Local Planning Authorities to:

(a) Approve development proposals that accord with an up-to-date development plan without delay

Or

(b) Where there are no relevant development plan policies or the policies which are most important for determining the application are out-of-date, granting permission unless:

i. The application of policies in the Framework that protect areas of assets of particular importance provides a clear reason for refusing the development proposed;

Or

ii. Any adverse impacts of doing so would significantly and demonstrably outweigh the benefits when assessed against the policies in this Framework when taken as a whole

2.3 The NPPF includes a 'presumption in favour of sustainable development. It states that for plan-making, the presumption means that local authorities should positively seek opportunities to meet the development needs of their area and that plans should meet objectively assessed needs. Plans should also be based on the Local Plan.

London Plan

2.4 The London Plan (March 2021) is the mayor’s planning strategy for Greater London. It sets borough-level housing targets and identifies locations for future growth of London-wide importance.

2.5 The London Plan is the overall strategic Plan for London, setting out an integrated economic, environmental, transport and social Framework for the development of London over the next 20 to 25 years.

2.6 The London Plan is part of the Development Plan. It guides boroughs' development Plans to ensure that they work toward a shared vision for London. It establishes policies that allow everyone involved in new developments to know what is expected.

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 under 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 onsite
  4) be seen: monitor, verify and report on energy performance.

B) Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the Framework of the energy hierarchy.

C) A minimum onsite reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is demonstrated that the zero-carbon target cannot be fully achieved onsite, any shortfall should be provided, in agreement with the borough, either:
  A. Through cash in lieu contribution to the borough's carbon offset fund, or
  B. off-site provided that an alternative proposal is identified and delivery is certain.

D) Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported annually

E) Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e., unregulated emissions.

F) Development proposals referable to the Mayor should calculate whole lifecycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.

Table 7 GLA Policy SI 2 Minimising greenhouse gas emissions

2.7 Policy SI 2 above is aimed at all major developments but as this development is not considered as a major development, the above policy is not applicable to this project.

2.8 The mayor is committed to London becoming a zero-carbon city. This will require the reduction of all greenhouse gases, of which carbon dioxide is the most prominent. London homes and workplaces are responsible for producing approximately 78% of its greenhouse gas emissions. New developments need to meet the Framework's requirements as London aims to become a zero-carbon city by 2050. Development involving major refurbishment should also aim to meet this Framework.

2.9 The energy hierarchy should inform new buildings' design, construction, and operation. The priority is to minimise energy demand and address how energy will be supplied and renewable technologies incorporated. An important aspect of managing demand will be to reduce peak energy loadings.

2.10 Boroughs should ensure that all developments maximise onsite Electricity and heat production opportunities from solar technologies (photovoltaic and thermal) and use innovative building materials and smart technologies. This approach will reduce carbon emissions, reduce energy costs to occupants, improve London's energy resilience and support the growth of green jobs.

2.11 A zero-carbon target for major residential developments has been in place for London since October 2016 and applies to major non-residential developments on the final publication of this Plan.

2.12 An onsite reduction of at least 35 percent beyond the baseline of Part L of the current Building Regulations is required to meet the zero-carbon target.

2.13 The minimum improvement over the Target Emission Rate (TER) will increase over time to achieve the zero-carbon London target and reflect the costs of more efficient construction methods. This will be reflected in future updates to the London Plan.

2.14 The Mayor recognises that Building Regulations use outdated carbon emission factors and that this will continue to cause uncertainty until Government updates them. Interim guidance has been published in the Mayor's Energy Planning Guidance on using appropriate emissions factors. This guidance will be updated once Building Regulations are updated to help developers determine how these policies are implemented.

2.15 Major Developments are expected to achieve carbon reductions beyond Part L from energy efficiency measures alone to reduce energy demand as far as possible. Residential development should achieve 10%, and non-residential development should achieve 15% over Part L.

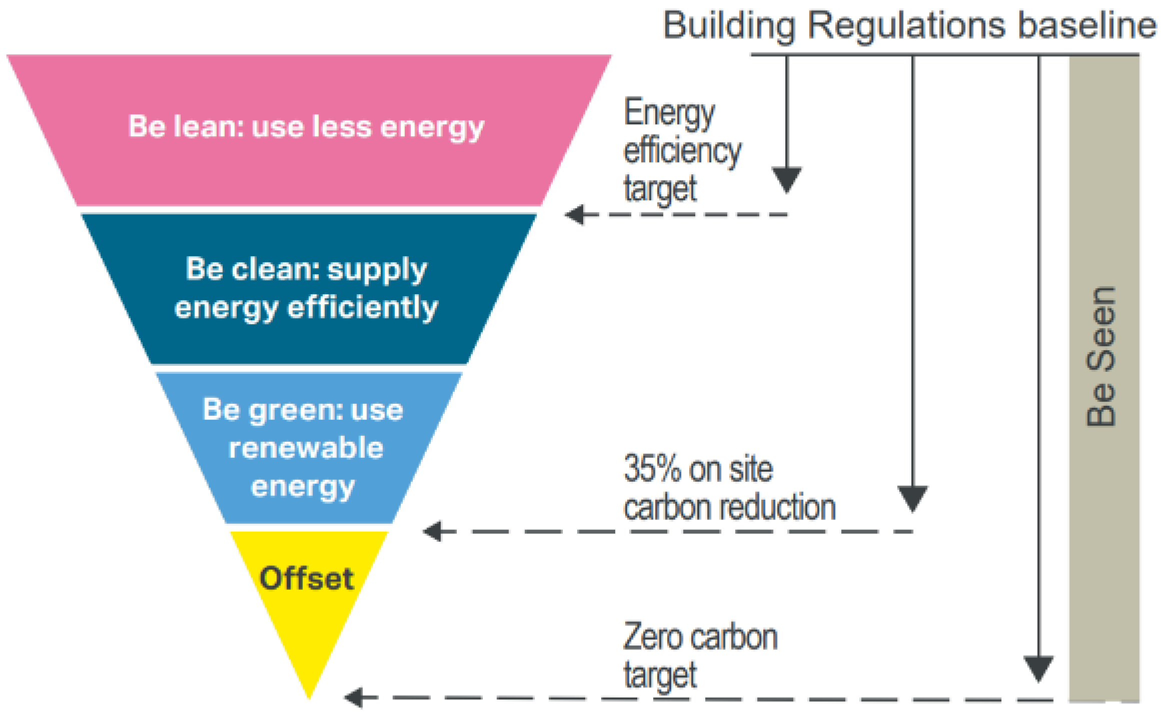


Figure 5 London Plan Energy Hierarchy.

2.16 The cost for offsetting carbon is regularly reviewed. Changes to the GLA's suggested carbon offset price will be updated in future guidance. All new major developments are expected to get as close as possible to zero-carbon target rather than relying on offset fund payments to make up for any shortfall in emissions. However, offset funds can unlock carbon savings from the existing building stock through energy efficiency programmes and by installing renewable technologies – typically more expensive to deliver in London due to the building's age, type, and tenure.

2.17 As this development is not considered as a major development no carbon offset payment is required.

Policy SI 3 Energy Infrastructure

A) Boroughs and developers should engage with relevant energy companies and bodies at an early stage to establish the future energy and infrastructure requirements arising from large-scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new development.

B) Energy masterplans should be developed for large-scale development locations (such as those outlined in Part A and other opportunities), establishing the most effective energy supply options. Energy masterplans should identify:

1) major heat loads (including anchor heat loads, with reference to sites such as universities, hospitals, and social housing)
2) heat loads from existing buildings that can be connected to future phases of a heat network
3) major heat supply plant including opportunities to utilise heat from energy from waste plants
4) secondary heat sources, including both environmental and waste heat
5) opportunities for low and ambient temperature heat networks
6) possible land for energy centres and/or energy storage
7) possible heating and cooling network routes
8) opportunities for futureproofing utility infrastructure networks to minimise the impact of road works
9) infrastructure and land requirements for electricity and gas supplies
10) implementation options for delivering feasible projects, considering issues of procurement, funding and risk, and the role of the public sector
11) opportunities to maximise renewable Electricity generation and incorporate demand-side response measures.

C) Development Plans should:

1) identify the need for, and suitable sites for, any necessary energy infrastructure requirements, including energy centres, energy storage and upgrades to existing infrastructure
2) 2) identify existing heating and cooling networks, identify proposed locations for future heating and cooling networks and identify opportunities for expanding and inter-connecting existing networks and establishing new networks.

D) Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system:

1) the heat source for the communal heating system should be Electricity following the following heating hierarchy:
  a) connect to local existing or planned heat networks b) use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
  b) use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's Electricity demand and provide demand response to the local Electricity network)
  c) use ultra-low NO_x *gas boilers*
2) CHP and ultra-low NO_x *gas boiler communal or district heating systems should be designed to ensure that they meet the requirements in Part B of Policy SI 1 Improving air quality*
3) where a heat network is planned but not yet in existence, the development should be designed to allow a cost-effective connection later.

E) Heat networks should achieve good practice design and specification standards for primary, secondary, and tertiary systems comparable to those in the CIBSE/ADE Code of Practice CP1 or equivalent.

Table 8 GLA Policy SI 3 Energy Infrastructure

2.18 Policy SI 3 above is aimed at all major developments but as this development is not considered as a major development, the above policy is not applicable to this project.

2.19 The Mayor will work with boroughs, energy companies and major developers to promote London's energy system's timely and effective development (energy production, distribution, storage, supply, and consumption).

2.20 London is part of a national energy system and currently sources approximately 95 per cent of its energy from outside the GLA boundary. Meeting the Mayor's zero-carbon target by 2050 requires changes to how we use and supply energy to generate power and heat for our buildings and transport from clean, low-carbon, and renewable sources. London will need to shift from relying on natural gas as its main energy source to a more diverse range of low and zero-carbon sources, including renewable energy and secondary heat sources.

Decentralised energy and local secondary heat sources will become an increasingly important element of London's energy supply. They will help London become more self-sufficient and resilient concerning its energy needs.

2.21 The heating system should be designed to facilitate cost-effective future connections where developments are proposed within Heat Network Priority Areas but are beyond existing heat networks. This may include, for example, allocating space in plant rooms for heat exchangers and thermal stores, safeguarding suitable routes for pipework from the site boundary and making provision for connections to the future network at the site boundary. The Mayor is taking a more direct role in delivering district-level heat networks. Newer communally-heated developments will connect to them and develop a comprehensive decentralised energy support package. Further details are available in the London Environment Strategy.

2.22 Electricity is essential for the functioning of any modern city. Demand is expected to rise in London in response to a long-term growing population and economy, the increased take-up of electric vehicles, and the switch to electric heating systems (such as through heat pumps). The Electricity network and substations are at or near capacity in several areas, especially in central London. The Mayor will work with the Electricity and heat industry, boroughs, and developers to ensure that appropriate infrastructure is integrated within a wider smart energy system designed to meet London's needs.

Policy SI 4 Managing Heat Risk.

A) Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials, and green infrastructure.
B) Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:
  1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation, and the provision of green infrastructure
  2) minimise internal heat generation through energy-efficient design
  3) manage the heat within the building through exposed internal thermal mass and high ceilings
  4) provide passive ventilation
  5) provide mechanical ventilation
  6) provide active cooling systems.

Table 9 GLA Policy SI 4 Managing Heat Risk

2.23 Climate change means London is already experiencing higher than historical average temperatures and more severe hot weather events. This, combined with a growing population, urbanisation, and the urban heat island effect, means London must manage heat risk in new developments, using the cooling hierarchy above. The cooling hierarchy applies to major developments, and the principles can also be applied to minor development.

2.24 In managing heat risk, new developments in London face two challenges – the need to ensure London does not overheat (the urban heat island effect) and that individual buildings do not overheat. The urban heat island effect is caused by extensive built-up areas absorbing and retaining heat day and night, leading to parts of London being several degrees warmer than the surrounding area. This can become problematic on the hottest days of the year as daytime temperatures can reach well over 30°C and not drop below 18°C at night. These circumstances can lead many people to feel too hot or not sleep, but for certain health conditions and 'at risk' groups such as some young or elderly Londoners, the effects can be serious and worsen health conditions. Green infrastructure can mitigate this effect by shading roof surfaces and through evapotranspiration. Development proposals should incorporate green infrastructure in line with Policy G1 Green Infrastructure and Policy G5 Urban Greening.

London Borough of Camden

2.25 The Council aims to tackle the causes of climate change in the borough by ensuring developments use less energy and assessing the feasibility of decentralised energy and renewable energy technologies.

2.26 Any new development in Camden can potentially increase carbon dioxide emissions in the borough. Suppose we are to achieve local and support national carbon dioxide reduction targets. In that case, it is crucial that planning policy limits carbon dioxide emissions from new development wherever possible and supports sensitive energy efficiency improvements to existing buildings.

2.27 The Council will seek to minimise and mitigate climate change by requiring developments to incorporate the three aspects of the energy hierarchy of the London Plan 2021: Firstly, reducing the demand for energy (lean option), secondly supplying energy in the most efficient way (clean option), and thirdly using renewable energy sources (green option).

Policy CC1 Climate change Mitigation

The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest possible environmental standards that are financially viable during construction and occupation.

We will:

a. promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;
b. require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;
c. ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;
d. support and encourage sensitive energy efficiency improvements to existing buildings;
e. require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and
f. expect all developments to optimise resource efficiency.

For decentralised energy networks, we will promote decentralised energy by:

g. working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them;
h. protecting existing decentralised energy networks (e.g. at Gower Street, Bloomsbury, King's Cross, Gospel Oak and Somers Town) and safeguarding potential network routes; and
i. requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment.

Table 10 Camden Local Plan CC1 (March 2021)

2.28 New developments in Camden will be expected to be designed to minimise energy use and CO_2 emissions in operation through the application of the energy hierarchy. The Council's Sustainability Plan' Green Action for Change' commits the Council to seek low and zero-carbon buildings. It is understood that some sustainable design measures may be challenging for listed buildings and some conservation areas, and we would advise developers to engage early with the Council to develop innovative solutions.

2.29 Adapting to a changing climate is identified in Camden's environmental sustainability plan, Green Action for Change (2011-2020). The three key risks that require adaptation are flooding, drought and overheating. Specific design measures and 'green infrastructure' such as green roofs, green walls and open spaces can help mitigate some of these risks.

Policy CC2 Adapting to climate change

The Council will require development to be resilient to climate change. All development should adopt appropriate climate change adaptation measures such as:

The protection of existing green spaces and promoting new appropriate green infrastructure;

a. *not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems;*
b. *incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and*
c. *measures to reduce the impact of urban and dwelling overheating, including the application of the cooling hierarchy.*
d. *Any development involving 5 or more residential units or 500 sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement.*
e. *Sustainable design and construction measures*
f. *The Council will promote and measure sustainable design and construction by:*
g. *ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation;*
h. *encourage new build residential development to use the Home Quality Mark and Passivhaus design standards;*
i. *encouraging conversions and extensions of 500 sqm of residential floorspace or above or five or more dwellings to achieve "excellent" in BREEAM domestic refurbishment; and*
j. *expecting non-domestic developments of 500 sqm of floorspace or above to achieve "excellent" in BREEAM assessments and encouraging zero carbon in new development from 2019.*

Table 11 Camden Local Plan CC2 (March 2021)

2.30 To minimise the risks of climate change, the London Borough of Camden will expect the design of developments to consider anticipated changes to the climate.

2.31 Development should also consider the impacts of overheating and flooding on human health and should be designed so that they are adaptable by policies CC2 Adapting to climate change and CC3 Water and flooding.

2.32 As noted in Policy CC2 Adapting to climate change, flooding and drought are key risks which require mitigation and adaptation measures in the borough. Camden experienced significant flooding in 1975 and 2002, and the probability of such recurring events is likely to increase due to climate change. Changes to our climate can also threaten the quantity and quality of our water supply. Such risks impact the health and well-being of Camden residents.

2.33 This development is retaining the existing ground floor slab and much of the 1st floor slab, boundary walls and the steel frame, therefore utilising much of the embodied carbon of the existing building in the creation of the new dwellings.

2.34 Despite the re-use of most of the existing fabric the development is considered as a newly built development and the BREEAM Domestic Refurbishment is not relevant to this scheme.

Policy CC3: Water and Flooding

Council will seek to ensure that development does not increase flood risk and reduces the risk of flooding where possible.

We will require development to:

a. *incorporate water efficiency measures;*
b. *avoid harm to the water environment and improve water quality;*
c. *consider the impact of development in areas at risk of flooding (including drainage);*
d. *incorporate flood resilient measures in areas prone to flooding;*
e. *utilise Sustainable Drainage Systems (SuDS) in line with the drainage hierarchy to achieve a greenfield run-off rate where feasible; and*
f. *not locate vulnerable development in flood-prone areas.*

Where an assessment of flood risk is required, developments should consider surface water flooding in detail and groundwater flooding where applicable. The Council will protect the borough's existing drinking water and foul water infrastructure, including the reservoirs at Barrow Hill, Hampstead Heath, Highgate and Kidderpore.

Table 12 Camden Local Plan CC3 (March 2021)

2.35 Developments must be designed to be water efficient. This can be achieved by installing water-efficient fittings and appliances (which can help reduce energy consumption and water consumption) and by capturing and reusing rain water and grey water onsite. Residential developments will be expected to meet the requirement of 110 litres per person per day (including 5 litres for external water use). Refurbishments and other non-domestic development will be expected to meet BREEAM water efficiency credits. Major and high or intense water use developments, such as hotels, hostels and student housing, should include grey water and rainwater harvesting system. Where such a system is not feasible or practical, developers must demonstrate to the Council's satisfaction that this is the case.

2.36 Air pollution is associated with many adverse health impacts, and it particularly affects the most vulnerable in society. It is recognised that parts of Camden have some of the poorest air quality levels in London, and since 2000 the whole of the borough has been declared an Air Quality Management Area (AQMA) for both NO_2 (Nitrogen Dioxide) and PM10 (Particulate Matter). Camden is also working to assess and address PM2.5 (the smallest fraction of particulate) despite Camden meeting EU limit values for PM2.5, research suggests that particulates of this size have the worst health impacts.

Policy CC4: Air quality

The Council will ensure that the impact of development on air quality is mitigated and ensure that exposure to poor air quality is reduced in the borough.

The Council will take into account the impact of air quality when assessing development proposals, through the consideration of both the exposure of occupants to air pollution and the effect of the development on air quality. Consideration must be taken to the actions identified in the Council's Air Quality Action Plan.

Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution. Where the AQA shows that a development would cause harm to air quality, the Council will not grant planning permission unless measures are adopted to mitigate the impact. Similarly, developments that introduce sensitive receptors (i.e. housing, schools) in locations of poor air quality will not be acceptable unless designed to mitigate the impact.

Development that involves significant demolition, construction or earthworks will also be required to assess the risk of dust and emissions impacts in an AQA and include appropriate mitigation measures to be secured in a Construction Management Plan.

Table 13 Camden Local Plan CC4 (March 2021)

2.37 To help reduce air pollution and adhere to London planning policy, developments must demonstrate that they comply with Policy 7.14 of the London Plan (to be at least air quality neutral).

2.38 Developments will also be expected to include measures to ensure that occupants' exposure to air pollution is reduced to acceptable levels. In addition to mitigation, major developments in these areas will be expected to address local problems of air quality which may include various design solutions and buffers. Measures that can be taken to reduce exposure to air pollution are contained in our supplementary planning document Camden Planning Guidance on amenity.

Policy CC5: Waste

The Council will seek to make Camden a low waste borough. We will:

g. aim to reduce the amount of waste produced in the borough and increase recycling and the reuse of materials to meet the London Plan targets of 50% of household waste recycled/composted by 2020 and aspiring to achieve 60% by 2031;

h. deal with North London's waste by working with our partner boroughs in North London to produce a Waste Plan, which will ensure that sufficient land is allocated to manage the amount of waste apportioned to the area in the London Plan;

i. safeguard Camden's existing waste site at Regis Road unless a suitable compensatory waste site is provided that replaces the maximum throughput achievable at the existing site; and

j. make sure that developments include facilities for the storage and collection of waste and recycling.

Table 14 Camden Local Plan CC5 (March 2021)

2.39 The Council recognises that Camden cannot adequately deal with its waste in isolation. Therefore, it is a member of the North London Waste Authority, which is responsible for the disposal of waste collected in the boroughs of Barnet, Camden, Enfield, Haringey, Hackney, Islington and Waltham Forest and is working in partnership with these authorities to prepare a joint North London Waste Plan (NLWP).

Conclusion

2.40 The London plan policy summarised in this section apply to major developments and this development is not considered to be a major development according to the London Plan 2021 (FLA of 580m² <1000²) but it is regarded as medium development. The Camden Planning Guidance expects this development to achieve minimum of 20% carbon emission reduction through Be Lean, Be Clean, and Be Green measures in place (refer to Table 2a Energy reduction targets, domestic, Energy efficiency and adaptation, January2021).

2.41 This scheme is design to follow the Camden local plan policies mentioned in this section. All possible design options have been considered to maximise use of sustainable design principle by followings:

- Efficient fabric design and passive measures to reduce energy demand (Be Lean)
- Onsite energy supply (Be Clean)
- Use of highly-efficient energy source such as an all-electric air source heat pump and proposed onsite renewable energy generation (Be Green)
- It is proposed to retain the existing ground floor slab, and much of the 1st floor slab, boundary walls and the steel frame therefore, utilising much of the embodied carbon of the existing building in the creation of the new dwellings.
- The building is setback from the main road and shielded by the neighbouring properties, which indicates the air quality for this site is expected to better than the street.
- The inclusion of a green roof will reduce surface water run-off, reduce overheating risk and improve local air quality.
- The development is in Low Flood risk zone (Zone 1), in addition the proposed green roof will contribute to reducing and delaying surface water run-off
- The dwellings will be fitted with bins to allow for the segregation of waste to allow for recycling in accordance with Local plan policy CC5.

3. Energy Strategy Approach

3.1 The proposed energy strategy for the development will follow the London Plan Energy Hierarchy approach of Be Lean, Be Clean and Be Green, Be Seen to enable the maximum viable reductions in regulated and total CO_2 emissions over the baseline.

- Be Lean - Use less energy
- Be Clean - Supply energy efficiently;
- Be Green - Use renewable energy systems.
- Be Seen – Monitor, verify and report on energy performance.

3.2 The proposed energy supply solutions aim to match the development's energy profiles, ensuring effective use. The proposed solutions also consider the viability and flexibility of the scheme from a technical and economic point of view by identifying an optimal combination of energy efficiency measures as well as decentralised and renewable energy supply solutions. Applying these principles:

- Council is aiming to achieve the following objectives:
- Comply with the relevant regulatory requirements;
- Improve the viability of the scheme by developing a technically robust and viable energy strategy;

3.3 The proposed energy supply solutions aim to match the development's energy profiles, ensuring effective use. The proposed solutions also consider the viability and flexibility of the scheme from a technical and economic point of view by identifying an optimal combination of energy efficiency measures as well as decentralised and renewable energy supply solutions.

SAP Energy Modelling

3.4 The predicted regulated energy consumption defined within the Building Regulations is assessed using BRE Standard Assessment Procedure 10.2 (SAP 10.2). The energy for domestic appliances and cooking is separately calculated using BRE Domestic Energy Model 12, Formula.

3.5 Since January 2019, applicants submitting GLA referable applications have been encouraged to use the SAP 10.2 emission factors.

3.6 This report primarily uses the current SAP 10.2 energy compliance model and emission factors to calculate the regulated emission savings shown in Table 15.

3.7 The DER and DPER are difficult to Pass under the Base and Be Lean scenarios, and Be clean scenarios as a boiler is used to provide space heating and hot water, and renewable energy resources are not included, as it is difficult to achieve the TER and TPER values under Be Lean/Be Clean as the notional building has renewable sources like PV.

3.8 However, SAP results show the dwellings achieve can 7% carbon emission reduction through the proposed improved building fabric U-values. The dwelling fabric energy efficiency rate (DFEE) is better than the target fabric energy efficiency rate (TFEE).

3.9 Using a Heat pump and renewable energy source like PV in Be Green scenario, the dwelling achieves a minimum of 35% carbon emission reduction, and the DPER is better than TPER.

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	6.5	2.1
After energy demand reduction	4.8	2.1
After heat network / CHP	4.8	2.1
After renewable energy	1.7	2.1

Table 15 Carbon Dioxide Emissions after each stage of the Energy Hierarchy.

3.10 The SAP methodology is used for assessing the energy performance of dwellings. The indicators of energy performance are Fabric Energy Efficiency (FEE), energy consumption per unit floor area, energy cost rating (the SAP rating), Environmental Impact rating based on CO2 emissions (the EI rating) and Dwelling CO2 Emission Rate (DER).

3.11 The Dwelling CO2 Emission Rate is used to comply with building regulations. It equals the annual CO2 emissions per unit floor area for space heating, water heating, ventilation, and lighting, less the emissions saved by energy generation technologies, expressed in kg CO2/m²/year.

3.12 The Baseline Energy Emission is calculated per GLA Energy Assessment Guidance (2022) Appendix 4. It uses the information of the building services equipment installed, which has produced a similar EPC rating to the published EPC rating.

Energy	Base	Be Lean	Be Clean	Be Green
FLA	506 m²	506 m²	506 m²	506 m²
Heating	19,518 kWh/year	13,547 kWh/year	13,547 kWh/year	4,591 kWh/year
Cooling	0 kWh/year	0 kWh/year	0 kWh/year	0 kWh/year
Aux Energy	430 kWh/year	1,406 kWh/year	1,406 kWh/year	976 kWh/year
Lighting	1,096 kWh/year	1,017 kWh/year	1,017 kWh/year	1,017 kWh/year
Hot Water	13,692 kWh/year	16,381 kWh/year	16,381 kWh/year	6,816 kWh/year
PV Energy Produced	-7,612 kWh/year	0 kWh/year	0 kWh/year	-1,941 kWh/year
Equipment	15,756 kWh/year	15,756 kWh/year	15,756 kWh/year	15,756 kWh/year
Total	42,881 kWh/year	48,107 kWh/year	48,107 kWh/year	27,215 kWh/year
Regulated	27,124 kWh/year	32,351 kWh/year	32,351 kWh/year	11,458 kWh/year
Unregulated	15,756 kWh/year	15,756 kWh/year	15,756 kWh/year	15,756 kWh/year
Regulated /m²	84.7 kWh/year/m2	95.1 kWh/year/m2	95.1 kWh/year/m2	53.8 kWh/year/m2

Table 16 Site Energy Table SAP 10.2

CO_2 Emissions	Base	Be Lean	Be clean	Be Green
FLA	506 m^3	506 m^3	506 m^3	506 m^3
Heating	4,099 kg CO_2/year	2,845 kg CO_2/year	2,845 kg CO_2/year	736 kg CO_2/year
Cooling	0 kg CO_2/year	0 kg CO_2/year	0 kg CO_2/year	0 kg CO_2/year
Aux Energy	60 kg CO_2/year	197 kg CO_2/year	197 kg CO_2/year	135 kg CO_2/year
Lighting	158 kg CO_2/year	152 kg CO_2/year	152 kg CO_2/year	152 kg CO_2/year
Hot Water	2,875 kg CO_2/year	3,440 kg CO_2/year	3,440 kg CO_2/year	959 kg CO_2/year
PV Energy Produced	-1,580 kg CO_2/year	0 kg CO_2/year	0 kg CO_2/year	-265 kg CO_2/year
Equipment	2,143 kg CO_2/year	2,143 kg CO_2/year	2,143 kg CO_2/year	2,143 kg CO_2/year
Total	7,755 kg CO_2/year	8,776 kg CO_2/year	8,776 kg CO_2/year	3,859 kg CO_2/year
Regulated	5,612 kg CO_2/year	6,633 kg CO_2/year	6,633 kg CO_2/year	1,716 kg CO_2/year
Unregulated	2,143 kg CO_2/year	2,143 kg CO_2/year	2,143 kg CO_2/year	2,143 kg CO_2/year
Regulated /m^2	11.1kgCO_2/year/m^2	13.1 kg CO_2/year/m^2	13.1 kg CO_2/year/m^2	3.4 kg CO_2/year/m^2

Table 17 Site Energy Related Emission Table SAP 10.2

Fuel	SAP 10 .2(Residential)
Natural Gas	0.2100 kgCO_2 /kWh
Grid Electricity	0.1360 kgCO_2 /kWh

Table 18 Emissions Factors

Building use	Energy demand following energy efficiency measures (kWh/year)			
	Space Heating	Hot Water	Lighting	Auxiliary
Domestic	4,591 kWh/year	6,816 kWh/year	1,017 kWh/year	976 kWh/year

Table 19 Energy demand following energy efficiency measures

	Target Fabric Energy Efficiency (kWh/m^2)	Dwelling Fabric Energy Efficiency (kWh/m^2)	Improvement (%)
Development total	40.618	41.848	3%

Table 20 Part L 2021 Fabric Energy Efficiency Standard

3.13 The energy modelling uses SAP 10.2 Grid Electricity emission factor (0.1360 kgCO_2 /k,Wh).

Carbon Offset

Camden Council, Carbon Offset Fund

3.14 Changes were made to the Carbon Offset Fund on 1st October 2016. The London Plan forms part of the Council's development plan and is considered in planning decisions. In March 2016, the Greater London Authority (GLA) adopted a revised Housing Supplementary Planning Guidance (SPG), which includes changes in the level and type of financial contributions to Borough Level Carbon Offset Funds to mitigate additional carbon emissions from new housing developments. Financial contributions will be required to offset all carbon emissions from housing developments, i.e., 100% of carbon emissions.

3.15 The calculation, which equates to **£95 a tonne over 30 years**, is:

CO_2 emitted from the development (tonnes) per year minus CO_2 target emissions (tonnes) per year x £2,850

3.16 Through the London Plan (Policy SI 2), all major developments are required to meet net zero carbon targets. Where these emissions targets cannot be met on-site the London Plan states any short fall should be provided off-site or through cash-in-lieu contribution which is used to secure carbon dioxide savings elsewhere. As this development is only a medium development requirement of meeting net zero carbon is not applicable.

3.17 Camden Local Plan requires developments of 5 or more dwellings to achieve a 20% reduction in carbon dioxide emissions from on-site renewable energy generation. The proposed photovoltaic array and use of ASHP allows this development to comply with the requirements of Camden Local Plan.

3.18 Carbon offset payments are not required to be made for this project as the carbon emission targets in the Local Plan are being achieved through the use of ASHP and photovoltaic installation.

Baseline CO_2 Emissions

3.19 A CO_2 emissions baseline must be established to assess the CO_2 performance of the proposed energy strategy. This section sets out the approach taken to calculate the baseline CO_2 emissions for the development.

3.20 The total baseline CO_2 emissions for the proposed development are defined as regulated CO_2 emissions covered by Building Regulations Part L and unregulated CO_2 emissions not covered by Part L. Unregulated CO_2 emissions should be excluded when compliance with the planning policy is calculated.

3.21 In line with current GLA guidance, the heating strategy at the baseline level will be a Boiler with a Radiator. Therefore, it isn't easy for DER & DPER to comply with TER & TPER as a renewable energy source is not included in the baseline scenario.

3.22 The regulated CO_2 emissions baseline is based on all dwellings' Part L1A 2021 Target Emission Rate (TER) performance. The baseline CO_2 performance has been determined by carrying out SAP 10.2 modelling to establish the TER of the dwellings.

3.23 The Part L GLA Carbon emission reporting spreadsheet will be submitted as part of the planning application document and it will include Baseline TER reports of the dwellings and predicts the residential regulated CO_2 emissions baseline.

4. Energy Demand Reduction (Be Lean)

4.1 In accordance with the London Plan Energy Hierarchy, the key focus of the proposed energy strategy is to reduce the energy demands of the development as far as practically possible and viable by implementing various energy demand reduction measures. The aim is to achieve Part L 2021 Building Regulations compliance without contribution from low carbon or renewable energy sources.

4.2 Part L GLA Carbon emission reporting spreadsheet will be submitted as part of the planning application document and it will include Be Lean DER reports of the dwellings and predicts the residential regulated CO_2 emissions baseline.

4.3 The proposed development design follows sustainable design principles and standards, aiming to use natural resources efficiently, reduce energy consumption, avoid internal overheating and contributing to the urban heat island effect.

4.4 A range of measures to reduce CO_2 emissions and increase resilience to climate change is proposed to be incorporated into the building design, including good building fabric standards and energy-efficient M&E systems and lighting.

4.5 Through adopting best design practices and in response to the planning policies, the development has considered sustainable design and construction standards to reduce potential overheating and reliance on comfort cooling systems through the following approaches and measures.

4.6 The development will incorporate passive solar design measures. The proposed windows will aim to maximise daylight and, at the same time, minimise overheating. The glazing specification will be selected to provide a balance of solar control and access to passive solar gain.

4.7 It is assumed that dwellings will utilise openable windows for purge ventilation, with a background mechanical ventilation system. The MVHR provides background ventilation with heat recovery from the exhaust air and a summer bypass of the heat recovery element

4.8 Openable windows are proposed, albeit they will not be essential to provide a fresh air supply. Nonetheless, they will allow residents and occupiers to control their indoor environment further. The openable windows can also be used for purge ventilation.

4.9 The ventilation strategy will be reviewed as the design progresses to ensure compliance with all the relevant regulations and standards.

4.10 More recently, the selection of wall insulation has become an issue. All building materials and wall insulation are to be specified as non-combustible materials where possible.

Thermal Elements

4.11 A "fabric first" approach to building design includes maximising the components and materials that make up the building fabric before considering mechanical or electrical building services systems. This can help to reduce capital and operational costs, improve energy efficiency, and reduce carbon emissions whilst reducing ongoing maintenance costs.

4.12 A "fabric first" approach is to reduce building energy usage and CO_2 through five different factors as follows:

- High-Quality Insulation
- Promotes heat retention
- Reduces heat loss
- Increased air-tightness
- Consider air leakage through gaps/cracks in the building envelope
- The best result is dependent on the construction method
- Structural Insulated Panels (SIP) or Insulated Concrete Form (ICF) generally provide good airtightness
- Check the frames on windows and doors

Avoid Thermal Bridging

- Thermal bridging occurs in areas with higher thermal conductivity, allowing an easier path for heat loss, e.g., where the Floor and walls meet
- Consider your insulation system to reduce thermal bridging

Maximise Solar Gain

- Think about your build orientation
- Choose your window positions carefully
- Consider triple glazed windows for further heat retention
- Mixed-mode Natural Ventilation
- Mechanical ventilation with heat recovery
- Reduces condensation and mould
- Consider a low-level air inlet for fresh air and a high-level vent to remove stale air
- Think about the amount of wind around your location

4.13 The proposed U Values for the thermal elements are the same as the expected standard U values in Table 21 Building Fabric construction and thermal U Values.

4.14 Most manufacturers of building materials consider these U values the lowest possible U values and have not developed details for building elements with better thermal U values. The manufacturer's accredited details consider the thermal and structural properties of the thermal building element.

Element	% Improvement from Part L1 2021	Proposed U Value	Building Regulation Notional dwelling	Building Regulation Limiting fabric parameters
External wall	42%	0.15 W/m²K	0.18 W/m²K	0.26 W/m²K
Flat roof	38%	0.10 W/m²K	0.11 W/m²K	0.16 W/m²K
Ground/external floor	39%	0.11 W/m²K	0.13 W/m²K	0.18 W/m²K
Party wall	100%	0.00 W/m²K	0.00 W/m²K	0.20 W/m²K
All windows, including frames Window frame Factor 0.8. g value 0.38	29%	1.00 W/m²K	1.20 W/m²K	1.40 W/m²K
Rooflight (FF:0.80, g value:0.38)	55%	1.00 W/m²K	1.70 W/m²K	2.20 W/m²K
External Door (Secure by design PAS 24)	25%	1.20 W/m²K	1.00 W/m²K	1.60 W/m²K
Air permeability rate	50%	4m³/m².h@50pa	5m³/m².h@50pa	8m³/m².h@50pa
Linear thermal transmittance (thermal bridging)		Accredited details		

Table 21 Building Fabric construction and thermal U Values

4.15 The proposed detailed building fabric build-up is included in Appendix C Thermal Fabric Efficiency (U values).

Proposed Construction of the Thermal Elements

Exposed Element	Construction	Cm kJ/m2K
Ground (supported) Floor	Slab on ground, screed over insulation	110
Exposed Wall	Cavity wall: dense plaster, AAC block, filled cavity, any outside structure	70
Roof	Plasterboard, insulated flat roof	9
Party wall	Fully filled cavity wall-Plaster on dabs and single plasterboard on both sides, dense cellular block, cavity	70
Door	Solid wood door (PAS 24 Locks)	
Window	Solar shading glass (g value 0.38), High-performance acoustic glazing comprising 10/16/8.8 or equivalent having an Rw+Ctr of 38dB.	

Table 22 Exposed Thermal Element U values

4.16 Party wall elements are also included in the current Building Regulations as these walls contribute toward the thermal mass of the dwelling that attenuates internal temperatures.

Thermal Bridging and Accredited Construction Details (PSI Values)

4.17 Thermal bridges occur at junctions between building elements. Heat loss is associated with a thermal bridge's linear thermal transmittance (PSI, Ψ). This is a property of a thermal bridge, and the heat flow rate per degree per unit length of the bridging is not accounted for in the U-values of the basic building elements containing the thermal bridge.

4.18 Accredited construction details for thermal bridging elements are to be found on the BRE website https://tools.bregroup.com/certifiedthermalproducts/podpage.jsp?id=3075

4.19 The Certified Thermal Details and Products scheme and database allow users to search a wide range of accurate and independently assessed thermal junction details, products, and elements, ensuring accuracy, consistency, credibility and quality throughout the design and specification process.

Linear	Description	Detail	Value
E2	Other lintels (including other steel lintels)	Accredited	0.05
E3	Sill	Accredited	0.05
E4	Jamb	Accredited	0.05
E5	Ground Floor (normal)	Accredited	0.16
E14	Flat Roof	Accredited	0.08
P3	Intermediate Floor within dwellings	Accredited	0
E16	Corner (normal)	Accredited	0.09
E18	Party wall between dwellings	Accredited	0.06

Table 23 Linear Thermal Bridging Elements

Air Tightness

4.20 Building airtightness is a major saving of heating energy, more important than external wall U values. Most new domestic dwellings typically achieve permeability rates of less than 4m³/m²h@50Pa.

4.21 The buildings will be designed to achieve an airtightness of less than $4m^3/m^2h@50Pa$. This is a challenging but achievable target. The design team will be required to specify taping corner and sealing joints and detailing window-wall interfaces to reduce air movement into the dwelling. Air leakage is usually caused either by a lack of awareness of the importance of airtightness or by a lack of contractual responsibility for this requirement.

Thermal Mass

4.22 Thermal mass is the ability of a material to absorb and store heat energy. Significant heat energy is required to change the temperature of high-density materials like concrete, bricks, and tiles. They are therefore said to have a high thermal mass. Lightweight materials such as timber have a low thermal mass. Appropriate use of thermal mass throughout the home can significantly affect thermal comfort.

4.23 The dwellings being considered to have a medium level of thermal mass, as shown in the SAP Building Regulation compliance model.

Water

4.24 The UK has less water per person than most other European countries. London is drier than Istanbul, and the South East of England has less water available per person than Sudan and Syria. As our population grows, more and more people share this limited resource. The more water consumed, the less available for the environment. Therefore, it is important that we use water wisely and not waste it.

4.25 This development aims to reduce water consumption to less than 110 litres per person per day (including 5 litres for external water use), in line with the recommended target set out in the London Plan using water-efficient fittings and those listed below (Table 24).

Fitting	Fitting specification
WC	6/4 litres dual flush
Kitchen sink tap	6 litres per min
Washbasin tap	4 litres per min
Shower	8 litres per min
Bath	180 litres
Washing machine	8.17 litres/kg
Dishwasher	1.25 litres/place setting

Table 24 Recommended specification for sanitary fittings

4.26 The design team is committed to achieving a target of maximum internal water use of 105 litres per person/day.

4.27 This will be incorporated into the design and the sanitary ware/fittings selection at the detailed design stage to ensure that this target is achieved.

4.28 The above target can be achieved though specifying all or some of the following water saving fittings:

- A low and water saving dual flush WC
- Aerated showerhead
- Flow regulating access valve for showers
- Water saving flow regulator for basin
- Water efficient lever operated monobloc tap
- Water efficient monobloc kitchen tap and water saving tub.

Hot water

4.29 Hot water cylinders designed specifically to be used with heat pumps have larger heat transfer surfaces (bigger coils) within the cylinder. The hot water storage temperature is set at 60°C in accordance with guidance from WRAS. The lower hot water storage temperature requires a greater hot to cold water ratio to achieve the required useable 40°C water temperature.

4.30 The lower hot water storage temperature requires a regular disinfecting anti-legionella control cycle. The hot water cylinder is heated above 60°C for an extended period, usually weekly to eliminate any bacteria growth and risk of legionella. Most manufacturers use backup electric immersion heaters for this purpose when using a heat pump to generate domestic hot water.

4.31 A cylinder with 400 litres of the storage volume is proposed for each dwelling, and the proposed Cylinder is suitable to be used with a heat pump. The specification of the proposed Cylinder is shown in Appendix E.

Mechanical Ventilation with Heat Recovery

4.32 Whole house mechanical ventilation units (MVHR) provide filtered fresh air from outside and extract air from kitchen, toilets & utility rooms. MVHR units are generally designed to meet the minimum requirements of the Building Regulations, which only require a background airflow rate to replace window trickle vents.

4.33 At this stage, it is proposed to provide appropriate energy-efficient mechanical ventilation systems such as continuous Mechanical Ventilation with Heat Recovery (MVHR) to meet the overheating and fresh air supply requirements. Additionally, all dwellings will have openable windows and, therefore, the ability to naturally ventilate should the occupant desire.

4.34 It is proposed to provide MVHR ventilation which can provide 0.5 air changes per hour within the dwellings. This reduces the number of times the occupants must leave the window open to maintain internal comfort.

4.35 Indoor Air Pollution, also called poor indoor air quality, is the term used to describe build-up of harmful pollutants in the home that negatively affect health and well-being of the occupants. A grown adult requires more than 10,000 litres of air daily, breathing approximately 20,000 times. We spend up to 80% of our time indoors, and indoor air can be up to 50 times more polluted than outdoor air, so achieving good indoor air quality is now more important than ever.

4.36 Many pollutants in the home are generated from simple, everyday activities like cooking with gas, use of cleaning sprays and beauty products, and even air fresheners. Without adequate ventilation, these pollutants remain trapped inside the home, where, over time, they can seriously impact our health. Long-term exposure to a damp environment or polluted air is linked to serious health conditions, including asthma, respiratory infections, lung disease and heart disease.

4.37 In areas with poor outdoor air quality, the standard filters in MVHR units are not able to capture all of the contaminants before supplying the air to rooms. Figure 6 indicates the Typical MVHR Installation with carbon filter supply air valves which provide enhanced filtration of fresh air, and the specification of the proposed MVHR is shown in Table 25 MVHR specification.

4.38 It is also important to consider the future impact of climate change on the occupant's thermal comfort experience. Providing adequate natural cross ventilation through the living areas delivers relief from overheating. Low-level air movement through the dwelling reduces the internal relative humidity, providing a small natural cooling effect on the occupants.

4.39 The window openings enable safe and secure ventilation day or night.

4.40 Approved Document Part F requires that:

'There shall be adequate means of ventilation provided for people in the building.'

4.41 It should be noted that failure of the MVHR fans does not result in the total loss of ventilation as the units are designed with very low frictional losses and will operate in passive mode.

4.42 The MVHR unit will include an internal humidity sensor monitoring the extracted air. The MVHR fan will operate in boost mode when the unit senses elevated humidity, e.g., drying clothes within the dwelling. The homeowner manual will encourage use of external balconies and bathrooms as natural clothes drying areas. This avoids internal condensation in the winter months.

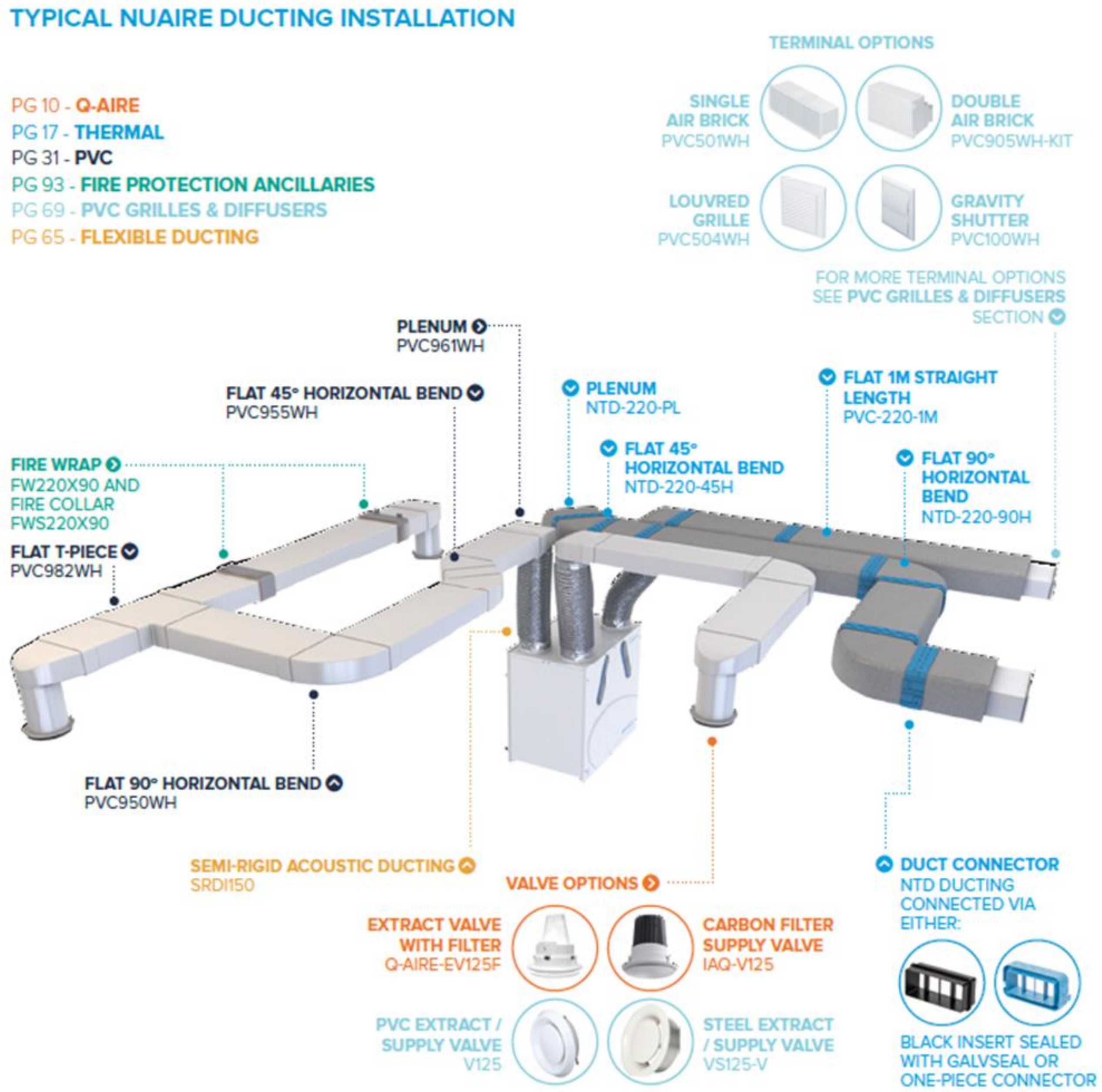


Figure 6 Typical MVHR Installation with Carbon filter supply air Valves. (Nuaire Brochure May 2021).

Manufacturer	The Nuaire Group
Brand	Nuaire
Model Name	MRXBOX-ECO3
Main Type	Balanced whole-house mechanical ventilation with heat recovery
Efficiency (heat exchanger)	91%

Table 25 MVHR specification

Kitchen Extract

4.43 A separate cooker hood extractor unit is specified to extract air above the cooker and vent to the outside through dedicated ductwork. This is required to avoid contaminating the MVHR heat exchanger unit with grease from cooking.

4.44 An alternative to whole-house mechanical ventilation units is to fit large trickle vent grills built into the windows or walls with the mechanical extract. These manually operated grilles often cause cold draughts in winter, and the grilles are often left closed off by the occupants. Once closed, the grills are rarely reopened, resulting in the loss of background ventilation to the dwellings. Trickle vents are unsuitable for developments in an urban environment with poor background air quality.

Lighting

4.45 The proposed windows maximise daylight to minimise the need for artificial lighting. The specified lighting for the dwellings will be 100% low energy using integrated LED light fittings.

4.46 Recent advances in LED lighting technology with the development of multichip LED Lamps mean it is now possible to install high-quality, low-energy lights with short warm-up periods and low fading loss over the life of the lamps. The lighting industry continually develops stylish compact LED luminaries to replace the less efficient halogen luminaries.

4.47 The external lighting designers will be required to consult with the local crime officer and ensure the energy efficiency lighting measures do not compromise the occupant's health, safety, and security internally and externally. The lighting design also needs to demonstrate that it reduces intrusive light pollution. The Electricity of the lampposts and luminaires will be positioned to avoid directing light through residential windows. As the primary requirement, the communal areas provide suitable daylight from windows and artificial lighting to maintain a safe and secure space.

- The designers have taken the following measures to reduce consumption:
- Automatic presence-controlled lighting
- Use long-life, energy-saving LED lamps.
- Natural daylight where appropriate
- Time control and daylight sensors for external luminaires
- Reduce external lighting from midnight to 06:00
- All security lighting to have dual lamp luminaries

Energy Efficient Appliances

4.48 It is very challenging to design and construct living spaces to reduce unregulated electricity demands because this is almost entirely dependent on the occupant and can vary substantially.

4.49 Unregulated energy demand and the associated CO_2 emissions can be reduced by providing energy-efficient white goods. Quality saving is difficult, but it is assumed that these measures can reduce the unregulated CO_2 emissions associated with residential development by circa 6-10%. These savings have not been accounted for in this report.

External Communal Lighting

4.50 The designer will use LED lighting.

4.51 The presence detection control will be specified in internal spaces, stairwells.

4.52 Wall-mounted luminaires along walkways linked to daylight sensors for on/off operations. The fitting should allow for a lower light level after midnight and before dawn. This may be made up of a second luminaire at a lower level.

4.53 Courtyard lighting will be designed to light to comply with 'Secured by Design standards, using low energy LED with daylight on/off control and reduced light levels between midnight and dawn.

Onsite electricity supply

4.54 The electricity supply for the residential units will be from the local LV Network supplied by the local DNO. Each unit will be metered individually with a separate landlord meter for common areas.

Overheating and Cooling

4.55 There is an expectation that designers can design new residential properties without the assistance of an active cooling system to avoid overheating. GLA and Camden Council guidance requires that natural ventilation and other passive measures are used to address the risk of overheating to avoid unnecessarily increasing a development's energy demand and carbon emissions. The GLA requires London Borough Councils to reject planning proposals for active cooling in new residential developments.

4.56 All homes use a combination of natural purge ventilation and passive mechanical ventilation to mitigate the overheating risk. However, due to the commercial requirements of the project, active cooling is proposed for this development.

4.57 A dynamic overheating analysis is completed for this development and submitted as a separate document as part of the planning application. The results show that all dwellings are at the acceptance level of overheating risk.

4.58 The GHA Early-Stage Overheating risk tool indicates the dwelling presents a low risk of overheating, and the detailed results are included in Appendix G Early-Stage Overheating Risk Tool, Good Homes Alliance (2019).

5. Heating Infrastructure (Be Clean)

5.1 The New London Plan Heating Hierarchy (2021), in line with Policy SI 3 D, states that the priority is for new major developments to connect to local existing or planned district heat networks where the operator has or is in the process of developing a strategy to decarbonise the network and has shared it with the GLA. The London plan outlines the following order of preference:

- Connection to existing heating or cooling network
- Site-wide heat network
- Communal heating and cooling

5.2 The inclusion of decentralised heating has been investigated in terms of appropriateness to the proposed development as it can help to provide the greatest reductions in CO_2 emissions.

5.3 The Part L GLA carbon emission reporting spreadsheet will be submitted as part of the planning application document and it will include 'Be Clean' DER reports of the dwellings and predicts the residential regulated CO_2 emissions baseline.

Connection to existing district heating networks

5.4 The London Heat Map was investigated to identify an existing or planned district heating network. Figure 4 indicates that this proposed development is not within the heat network priority area but the close distance to the proposed future heat network

5.5 Given the lack of existing nearby district heating or community heating infrastructure to connect to at present and cost-effective connection options in the near future and due to the small scale of the project, it is proposed to provide an onsite energy supply option.

Onsite Heat Supply

5.6 The provision of a communal heating system for the development has been considered. The assessment showed that, due to the small size and the development layout, it is not well suited for a communal heating system. In addition, the communal heating system will require significant plant room and riser space, which is very difficult and costly to accommodate within the design. In addition, due to its small size, the communal heating system will likely significantly increase the residents' energy bills, which will go against the target to reduce fuel poverty.

5.7 Technically, a small communal heating system can be provided for the development. However, practically, it will unnecessarily complicate the design and significantly increase the heating system's capital and operating costs. The provision of the community heating system for the development is considered impractical.

5.8 The Government has announced that by 2025, all new homes will be banned from installing gas and oil boilers and will be heated by low-carbon alternatives instead. The ban is part of a UK action plan to reach carbon Net-Zero by 2050. **An all-electric air source heat pump (per dwelling) with an underfloor heating system is proposed.** The proposed schematic of this system is presented in Appendix D.

5.9 A Vaillant aroTHERM plus 12kW Air source heat pump is proposed for each residential dwelling, and the specification of ASHP is shown in Appendix E Propose Heat Pump Specification for Heating. The proposed location for the outdoor unit is within the plantroom. However, the effect of Heat Pump is assessed under "Be Green" Category according to the GLA Energy Assessment Guidance (June 2022).

5.10 The heat distribution system using underfloor heating is far more efficient than radiators because lower water temperatures can be utilised which further improves heat pump efficiency, ensuring maximum benefit from the heat pump system.

5.11 An air source heat pump extracts heat from the outside air like a fridge extracts heat from its inside. It can get heat from the air even when it is as low as -15° C. The heat that is extracted from the ground, air, or water is constantly being renewed naturally, saving on fuel costs and reducing harmful CO_2 emissions.

5.12 Underfloor heating with an air source heat pump:

- Low flow temperature solution – maximising the air source heat pump efficiency
- Up to 40% more efficient than a boiler and radiator system
- Reduces carbon footprint

5.13 There is a preference for using natural refrigerants created using substances that exist inherently in the environment with a zero-ozone depletion potential (ODP) and very low or zero global warming potential (GWP). Natural refrigerants are the definitive solution to the environmental damage caused by all commonly used synthetic refrigerants. Many natural refrigerants have better heating thermal properties than synthetic refrigerants and are commonly used in domestic appliances designed for use in kitchens and utility rooms without additional safety measures. Most natural refrigerants are flammable but safe for domestic use when used in sealed, low-volume systems.

Affordability of heat

5.14 In line with the GLA London plan, the following measures will be taken into consideration to achieve the affordability of heat:

- Use the "fabric first approach" by improving the U-values for building fabric elements to increase fabric energy efficiency and reduce the energy demand of the building.
- Use highly efficient heat pumps to improve the efficiency of the heating system.
- Install PV and use electricity generated by PV to operate heat pumps.

5.15 An all-electric air source heat pump heating system is proposed to futureproof this development and ensure that the development can be constructed post-2025. The system schematic is included in Appendix D Proposed Air Source Heat Pump Heating System Schematic.

5.16 The development will employ a registered energy supplier (one of the heat trust scheme participants) to protect the occupier. This includes support for consumers in vulnerable circumstances, responding to faults and emergencies, guaranteed service payments for interruptions in supply, metering and billing and complaints handling.

5.17 This developer is encouraged to apply to be a registered site for the heat trust scheme when connected to the future District Heat Network.

6. Renewable Energy (Be Green)

6.1 In accordance with GLA London Plan Policy SI 2, Development proposals should seek to utilise renewable energy technologies such as biomass heating, cooling and electricity; renewable energy from waste; photovoltaics; solar water heating; wind and heat pumps. The mayor encourages using a full range of renewable energy technologies, which should be incorporated wherever site conditions make them feasible and where they contribute to the highest overall and most cost-effective carbon dioxide emissions savings for a development proposal.

6.2 The GLA London Plan Policy SI 2 expects all major development proposals to maximise onsite renewable energy generation. In particular, the use of solar PV should be maximised on roof spaces. This is regardless of whether the 35% onsite target has already been reached through earlier stages of the energy hierarchy.

6.3 This development is not considered a major development according to the London Plan 2021 (FLA of 580m² <1000²) but it is regarded as medium development by Camden. The Camden Planning Guidance expects this development to achieve minimum of 20% carbon emission reduction (refer to Table 2a Energy reduction targets, domestic, Energy efficiency and adaptation, January 2021).

6.4 The Part L GLA carbon emission reporting spreadsheet will be submitted as part of the planning application document and it will include Be Green DER reports of the dwellings and predicts the residential regulated CO_2 emissions baseline.

Heat Pumps

6.5 Heat pumps should always be categorised under 'Be Green' of the energy hierarchy unless they serve district heating networks. In that case, they should be categorised under Be Clean category.

6.6 Where heat pumps are proposed, a high energy efficiency specification will be expected to ensure the system operates efficiently and reduce peak electricity demand. This applies to any heat pump proposal, including air source heat pumps (ASHPs), ground source heat pumps (GSHPs), water source heat pumps (WSHPs), or hybrid ambient loop systems.

6.7 Heat pumps operate on a similar principle to a domestic refrigerator. Low-grade heat is extracted from ground, air or an ambient water loop and absorbed by a refrigerant solution which is then compressed to a high temperature. The compressed heat is used to generate hot water and heating.

6.8 Heat pumps are better suited for use with low-temperature underfloor heating systems and are less efficient when used to provide higher-temperature domestic hot water.

6.9 Heat pumps are not boilers and should not be set up like a boiler. For efficient operation, the heat installation should include a thermal buffer and reduced hot water storage temperatures. In the past, there has been a failure by the manufacturers to train installers and owners of the heat pumps to correctly set up and use the heat pump efficiently, resulting in higher operational costs.

6.10 The following low and zero carbon technologies have been considered and compared for this particular development:

- Photovoltaic Panels (PV)
- Ground Source Heat Pump (GSHP)
- Wind Turbines
- Biomass Boiler
- Solar Thermal

6.11 The assessment of these technologies shows that PV systems are considered to be the most suitable renewable energy technology option for this development.

Photovoltaics

6.12 PV is the most practical renewable energy technology, which can be applied to almost any building; 1kWp of PV generates around 850 kWh in an average year. Since the feed-in tariff incentive removal in April 2019, the financial payback for PV has typically lengthened to about 15 years.

6.13 The proposal is to install a low-angle PV array on the roof of the building to offset 35% of the building's regulated energy carbon emission.

6.14 Photovoltaic cells are panels you can attach to your roof or walls. There are many different types available, e.g., panels, tile cladding, and other bespoke finishes. Each cell is made from one or two layers of semiconducting material, usually silicon.

6.15 When light shines on the PV cell, it creates an electric field across the layers. The stronger the sunshine, the more electricity is produced.

6.16 Generally, 5m² (1KW) of conducting material such as a crystalline array will provide an average output of 900-110 kW hours per year.

Figure 7 Van De Valk PV Green Roof PV Racking System.

Financial Inputs		Financial Inputs	
System Size		Financial Inputs	
System Cost	4.0 kW	FiT	£0.00
RPI	-£6,000.0	Exported	£69.21
Fuel inflation	3.00%	Saving	£193.36
Number of years	0.25%	Total income	£262.58
Feed in Tariff	20 years	Yield	4.38%
Cost of Electricity	0.00 p/kWh	Payback (years)	22 years
Export Price	16.00 p/kWh	PV Variables	
Electricity Exported	4.85 p/kWh	Location	Thames
Electricity Used In-House	50.00%	Direction	SSE/SSW
Generated Electricity	50.00%	Panel Angle	30°
Export	2,854 kWh	Shading Factor	Modest
Used	1,427 kWh	Array Sizes	4.0 kW
Return after 20 years	1,427 kWh	Annual electricity	2,854 kWh

Table 26 Financial Input Summary of PV Energy Generation

	Days	Day Length	kWh/kW Month	PV Panel Factors	Total	Cumulative
January	31	8	33	1	85 kW	85 kW
February	28	9	50	1	129 kW	214 kW
March	31	11	86	1	221 kW	434 kW
April	30	13	121	1	309 kW	743 kW
May	31	15	146	1	374 kW	1117 kW
June	30	16	154	1	395 kW	1512 kW
July	31	17	150	1	385 kW	1897 kW
August	31	16	134	1	342 kW	2239 kW
September	30	14	103	1	264 kW	2504 kW
October	31	11	69	1	177 kW	2681 kW
November	30	10	40	1	103 kW	2784 kW
December	31	8	27	1	70 kW	2854 kW

Table 27 Summary of PV Energy Generation per month

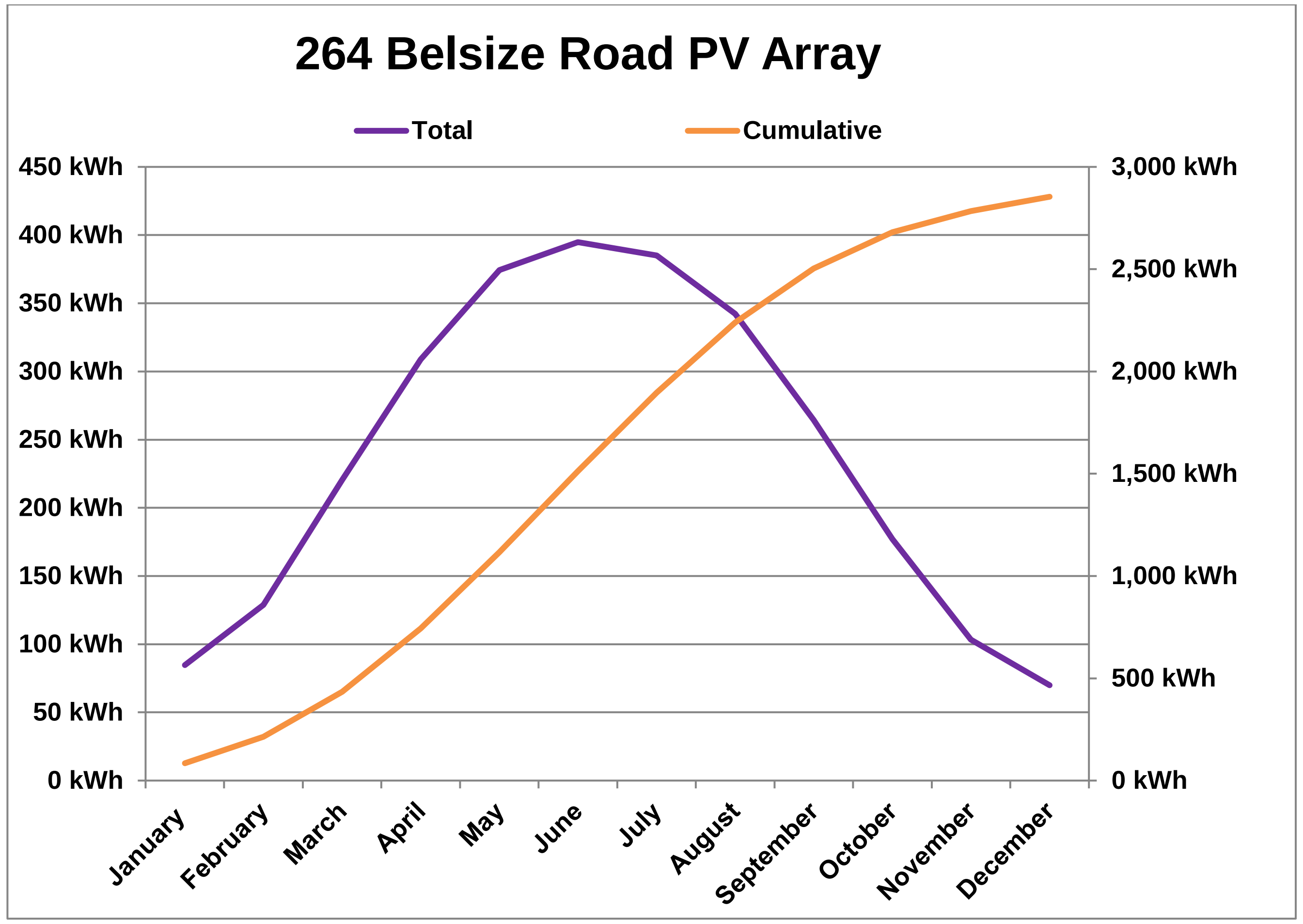


Figure 8 Annual Zero Carbon Energy Generation from PV array

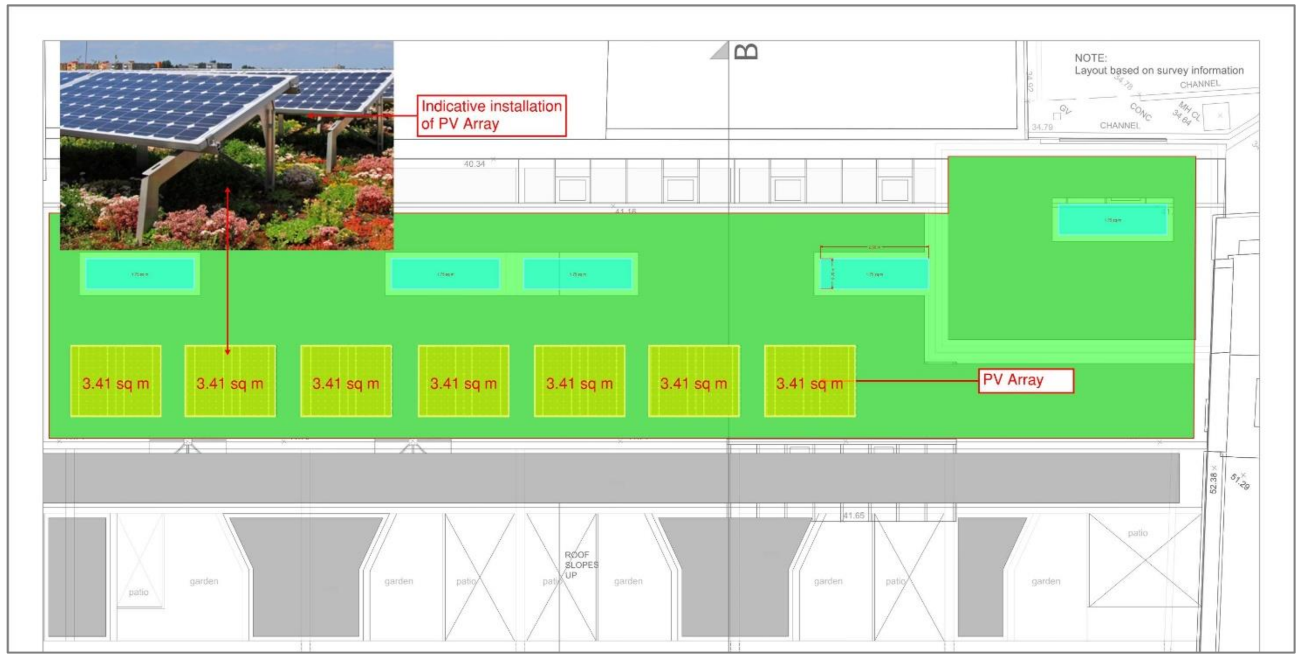


Figure 9 Proposed Location of 4kW PV array

6.17 The PV assessment shows that circa 2,854kWh/year with 4kWp of renewable electricity generation, which would require a PV Array area of 24m².

6.18 PV systems should ideally face south with an incline of 30º, although orientations within 45º of south and other angles can still generate outputs if panels are not overshaded. Optimum design of the PV installation is required to ensure maximum electricity generation per kWp installed. There are several design considerations to be made to ensure the best use of the system. The key design considerations for designing and installing PV systems are:

- Design of PV installation to optimise inclination and orientation;
- Ensure that PV panels are not overshadowed;
- Ensure correct installation of PV arrays for good ventilation
- Ensure that the electrical wiring from PV arrays to inverters is kept to a minimum to reduce electrical losses;
- Provide sufficient space around PV installations for safe access and maintenance of the modules and other equipment installed on the roof.

6.19 The Electricity generating potential of PV panels is not dependent on development demand but on suitable available roof space for installation. Figure 9 identifies suitable roof space for PV to be installed. This will provide a suitable unshaded location for the PV required to meet the London Plan 35% reduction target.

Alternative renewable energy options

6.20 The following alternative renewable options have been considered but found not to be appropriate for this scheme:

- **Solar thermal collector**- it can be used to provide hot water using the irradiation from the sun. They can generally provide approximately 50% of domestic hot water demand. However, the carbon savings are quite low and it is a high-cost technology. **So solar thermal collectors are not recommended for this scheme.**
- **Biomass** – Solid, liquid or gaseous fuels derived from plant material can provide boiler heat for space and water heating. A biomass boiler would supplement a standard gas heating system so some of the cost may be offset through money saved on using smaller traditional boiler's reliability of fuel access/supply can be a problem. **Not suitable for an urban location** as installation will reduce local air quality through smoke emission and increase vehicle movement from the transportation of biomass fuel. **So, it is not recommended for this scheme.**

  Ground Source Heat Pump – Ground Source Heat pump (GSHP) Utilise horizontal loops or vertical boreholes, GSHP make use of the grounds almost constant temperature to provide heating and/or cooling using a heat exchanger connected to a space/water heating delivery system. Optimum efficiency with underfloor heating systems. **It is not a feasible technology for the site** since there is limited external space available to install boreholes. **So, it is not recommended for this scheme.**
- **Wind Turbines** – Vertical and horizontal axis wind turbines enable electricity to be generated using the power within the wind are not suitable for urban environments due to low wind conditions and obstructions. It is unsuitable in an urban location with turbulent airflow around the building, generating a reasonable amount of electricity requires a substantial unit with a blade diameter over 6m. **So, it is not recommended for this scheme.**

7. Glossary

Building Emissions Rate (BER) or Dwelling Emission Rate (DER)

The actual building/dwelling CO_2 emission rate, is expressed in terms of the mass of CO_2 emitted per year per square metre of the total useful floor area of the building (kg/m^2/year). In order to comply with Part L of the Building Regulations, the BER/DER must be less than the TER (see below).

Target CO_2 Emission Rate (TER)

The minimum energy performance requirement for a new dwelling/building. It is expressed in terms of the mass of CO_2 emitted per year per square metre of the total useful floor area of the building (kg/m^2/year).

DER Dwelling Emission Rate

This is the dwelling Emission Rate as kgCO_2/m^2

TPER Target Primary Energy Rate

The Target Primary Energy Rate will consider how much energy (in kilowatt hours) is required to provide heating and hot water to a newly built dwelling. It will also include energy used by lighting, ventilation, cooling systems and showers et of flow and return pipes circulating hot water to the apartment blocks (and dwellings contained therein) and non-domestic buildings on a development. Expressed as kWhPE/m^2/year and determined using the standard assessment procedure. The maximum primary energy use for the dwelling in a year

DPER

The Dwelling Primary Energy Rate is **the actual primary energy rate of the actual new dwelling, expressed as** Expressed as kWh_{PE}/m^2/year and determined using the standard assessment procedure.

TFEE Target Fabric Energy Efficiency Rate

The Target Fabric Energy Efficiency Rate is defined as the space heating and cooling requirements per square metre of floor area, presented in kWh/m^2/year, and is based on how well the fabric of the dwelling performs. This is the target dwelling heat loss through the building fabric expressed as kWh/m². year

DFEE Dwelling Fabric Energy Efficiency Rate

The Dwelling Fabric Energy Efficiency rate is **the actual energy performance of the new dwelling**. In accordance with regulation 26A of the building regulations, the calculated Dwelling Fabric Energy Efficiency rate must not be greater than the Target Fabric Energy Efficiency rate. kWh/m^2/year and determined using the standard assessment procedure.

Dwelling

A dwelling is self-contained unit to accommodate a single household.

Energy Assessment/Strategy

An energy assessment/strategy is a document which explains how the London Plan targets for CO_2 reduction will be met for a particular development within the context of the energy hierarchy.

Air Source Heat Pump

An air source heat pump, sometimes referred to as an air-to-water source heat pump, **transfers heat from the outside air to water, which heats your rooms via radiators or underfloor heating**. It can also heat water stored in a hot water cylinder for your hot taps, showers and baths.

Kilowatt (kW)

One thousand watts. A watt is a measure of power.

Part L of the Building Regulations

Approved documents L1A and L2A of the Building Regulations relate to the conservation of fuel and power in new dwellings and buildings.

Regulated CO_2 emissions

The CO_2 emissions arising from energy used by fixed building services, as defined in Approved Document Part L of the Building Regulations. These include fixed systems for lighting, heating, hot water, air conditioning and mechanical ventilation.

Standard Assessment Procedure (SAP)

A methodology for assessing and comparing the energy and environmental performance of dwellings. Its purpose is to provide accurate and reliable assessments of dwelling energy performances that are needed to underpin Building Regulations and other policy initiatives.

Air permeability

The measure of airtightness of the building fabric. It is defined as the air leakage rate per hour per m^2 of envelope area at the test reference pressure differential of 50Pa or 4Pa.

- The limiting air permeability is the worst allowable air permeability.
- The design air permeability is the target value set at the design stage.
- The assessed air permeability is the value used in establishing the building emission rate and the building primary energy rate. The assessed air permeability is based on a measurement of the air permeability of the building concerned.

Airtightness

The resistance of the building envelope to infiltration when ventilators are closed. The greater the airtightness at a given pressure difference across the envelope, the lower the infiltration.

Renewable technology

Technology that uses renewable resources, which are naturally replenished on a human timescale, to produce Electricity. Resources include wind, wave, marine, hydro, biomass and solar.

Existing district heat network

A district heat network that is either in operation or is under construction on 15th June 2022. For these purposes, under construction means any of the following.

- The building to house the energy centre has been constructed.
- There is a heat offtake agreement signed between the heat network and a third party.
- Excavation for pipework has been completed.

.

8. Appendices

Appendix A. Energy and Carbon Tables

Energy	Base	Be Lean	Be Clean	Be Green
FLA	506 m^2	506 m^2	506 m^2	506 m^2
Heating	19,518 kWh/year	13,547 kWh/year	13,547 kWh/year	4,591 kWh/year
Cooling	0 kWh/year	0 kWh/year	0 kWh/year	0 kWh/year
Aux Energy	430 kWh/year	1,406 kWh/year	1,406 kWh/year	976 kWh/year
Lighting	1,096 kWh/year	1,017 kWh/year	1,017 kWh/year	1,017 kWh/year
Hot Water	13,692 kWh/year	16,381 kWh/year	16,381 kWh/year	6,816 kWh/year
PV Energy Produced	-7,612 kWh/year	0 kWh/year	0 kWh/year	-1,941 kWh/year
Equipment	15,756 kWh/year	15,756 kWh/year	15,756 kWh/year	15,756 kWh/year
Total	42,881 kWh/year	48,107 kWh/year	48,107 kWh/year	27,215 kWh/year
Regulated	27,124 kWh/year	32,351 kWh/year	32,351 kWh/year	11,458 kWh/year
Unregulated	15,756 kWh/year	15,756 kWh/year	15,756 kWh/year	15,756 kWh/year
Regulated /m^2	84.7 kWh/year/m2	##############	95.1 kWh/year/m2	53.8 kWh/year/m2

Site Energy Table using Elmhurst SAP 10.2

CO_2 Emissions	Base	Be Lean	Be clean	Be Green
FLA	506 m^3	506 m^3	506 m^3	506 m^3
Heating	4,099 kg CO_2/year	2,845 kg CO_2/year	2,845 kg CO_2/year	736 kg CO_2/year
Cooling	0 kg CO_2/year	0 kg CO_2/year	0 kg CO_2/year	0 kg CO_2/year
Aux Energy	60 kg CO_2/year	197 kg CO_2/year	197 kg CO_2/year	135 kg CO_2/year
Lighting	158 kg CO_2/year	152 kg CO_2/year	152 kg CO_2/year	152 kg CO_2/year
Hot Water	2,875 kg CO_2/year	3,440 kg CO_2/year	3,440 kg CO_2/year	959 kg CO_2/year
PV Energy Produced	-1,580 kg CO_2/year	0 kg CO_2/year	0 kg CO_2/year	-265 kg CO_2/year
Equipment	2,143 kg CO_2/year	2,143 kg CO_2/year	2,143 kg CO_2/year	2,143 kg CO_2/year
Total	7,755 kg CO_2/year	8,776 kg CO_2/year	8,776 kg CO_2/year	3,859 kg CO_2/year
Regulated	5,612 kg CO_2/year	6,633 kg CO_2/year	6,633 kg CO_2/year	1,716 kg CO_2/year
Unregulated	2,143 kg CO_2/year	2,143 kg CO_2/year	2,143 kg CO_2/year	2,143 kg CO_2/year
Regulated /m^2	11.1 kg CO_2/year/m^2	13.1 kg CO_2/year/m^2	13.1 kg CO_2/year/m^2	3.4 kg CO_2/year/m^2

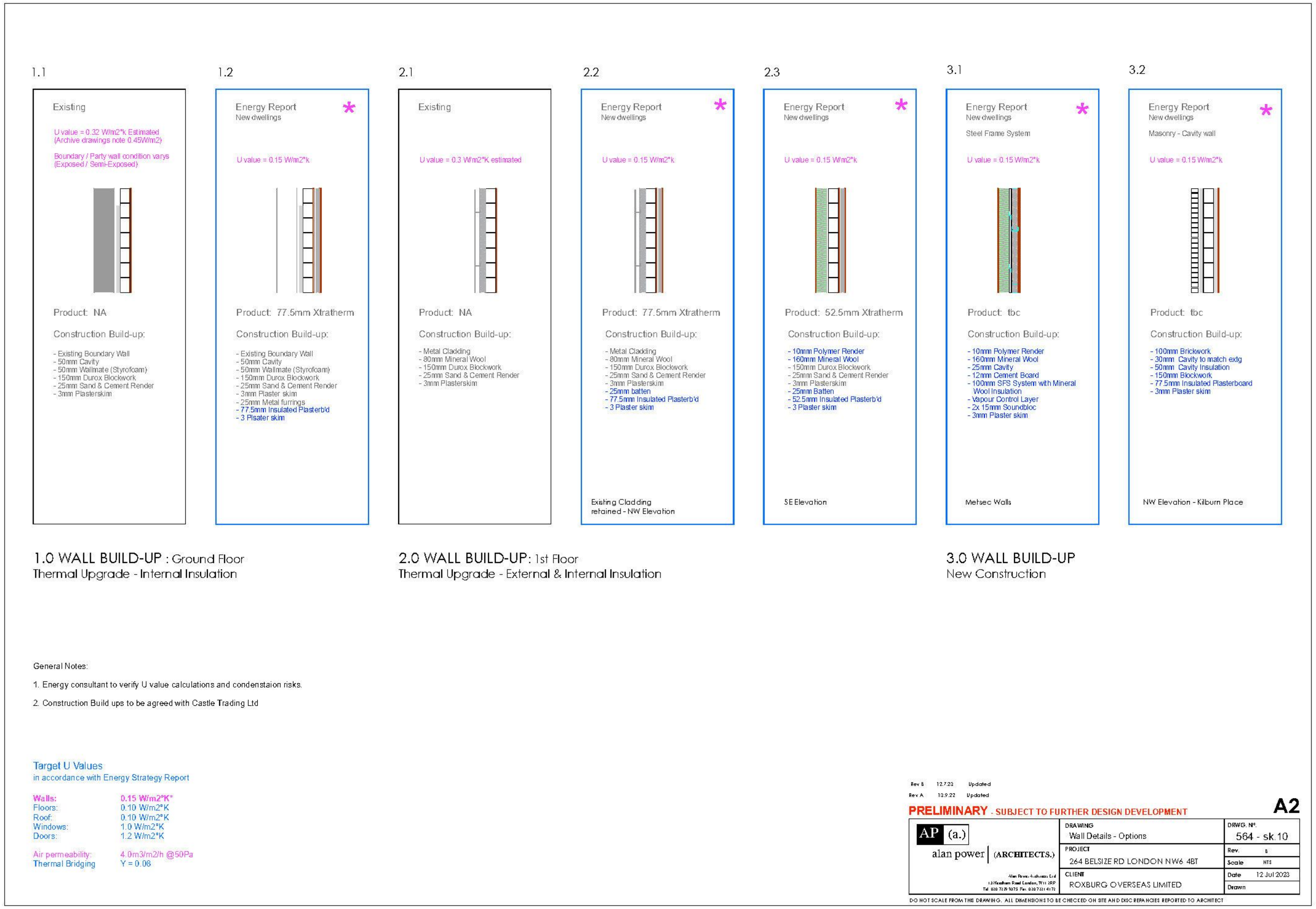
Site Energy Related Emission Table using Elmhurst SAP 10.2

Appendix B. Block Compliance

Dwelling	Flat Type	Total Floor Area	TER	DER	Saving	TFEE	DFEE	Better
		m²	kgCO2/m²	kgCO2/m²	%	W/m²	W/m²	
264 Belsize Road Unit 1	2B_4P	116.5 m²	12.58	3.87	69%	49.71	51.05	3%
264 Belsize Road Unit 2	2B_4P	89.0 m²	10.91	3.33	69%	38	38.31	1%
264 Belsize Road Unit 3	2B_4P	95.5 m²	10.08	3.07	70%	36.33	37.08	2%
264 Belsize Road Unit 4	2B_4P	92.5 m²	10.08	3.07	70%	36.33	37.08	2%
264 Belsize Road Unit 5	2B_4P	112.5 m²	11.02	3.36	70%	42.72	45.72	7%
Average				Pass			Pass	3%

Appendix C. Thermal Fabric Efficiency (U values)

External Wall



1.1

Existing

U value = 0.32 W/m2°k Estimated
(Archive drawings note 0.45W/m2)

Boundary / Party wall condition varys
(Exposed / Semi-Exposed)

Product: NA

Construction Build-up:

- Existing Boundary Wall
- 50mm Cavity
- 50mm Wallmate (Styrofoam)
- 150mm Durox Blockwork
- 25mm Sand & Cement Render
- 3mm Plasterskim

1.2

Energy Report *
New dwellings

U value = 0.15 W/m2°k

Product: 77.5mm Xtratherm

Construction Build-up:

- Existing Boundary Wall
- 50mm Cavity
- 50mm Wallmate (Styrofoam)
- 150mm Durox Blockwork
- 25mm Sand & Cement Render
- 3mm Plaster skim
- 25mm Metal furrings
- 77.5mm Insulated Plasterb'd
- 3 Plsater skim

2.1

Existing

U value = 0.3 W/m2°K estimated

Product: NA

Construction Build-up:

- Metal Cladding
- 80mm Mineral Wool
- 150mm Durox Blockwork
- 25mm Sand & Cement Render
- 3mm Plasterskim

2.2

Energy Report *
New dwellings

U value = 0.15 W/m2°k

Product: 77.5mm Xtratherm

Construction Build-up:

- Metal Cladding
- 80mm Mineral Wool
- 150mm Durox Blockwork
- 25mm Sand & Cement Render
- 3mm Plasterskim
- 25mm batten
- 77.5mm Insulated Plasterb'd
- 3 Plaster skim

Existing Cladding
retained - NW Elevation

2.3

Energy Report *
New dwellings

U value = 0.15 W/m2°k

Product: 52.5mm Xtratherm

Construction Build-up:

- 10mm Polymer Render
- 160mm Mineral Wool
- 150mm Durox Blockwork
- 25mm Sand & Cement Render
- 3mm Plasterskim
- 25mm Batten
- 52.5mm Insulated Plasterb'd
- 3 Plaster skim

SE Elevation

3.1

Energy Report *
New dwellings

Steel Frame System

U value = 0.15 W/m2°k

Product: tbc

Construction Build-up:

- 10mm Polymer Render
- 160mm Mineral Wool
- 25mm Cavity
- 12mm Cement Board
- 100mm SFS System with Mineral Wool Insulation
- Vapour Control Layer
- 2x 15mm Soundbloc
- 3mm Plaster skim

Metsec Walls

3.2

Energy Report *
New dwellings

Masonry - Cavity wall

U value = 0.15 W/m2°k

Product: tbc

Construction Build-up:

- 100mm Brickwork
- 30mm Cavity to match extg
- 50mm Cavity Insulation
- 150mm Blockwork
- 77.5mm Insulated Plasterboard
- 3mm Plaster skim

NW Elevation - Kilburn Place

1.0 WALL BUILD-UP : Ground Floor
Thermal Upgrade - Internal Insulation

2.0 WALL BUILD-UP: 1st Floor
Thermal Upgrade - External & Internal Insulation

3.0 WALL BUILD-UP
New Construction

General Notes:

1. Energy consultant to verify U value calculations and condenstaion risks.

2. Construction Build ups to be agreed with Castle Trading Ltd

Target U Values
in accordance with Energy Strategy Report

Walls:	**0.15 W/m2°K***
Floors:	0.10 W/m2°K
Roof:	0.10 W/m2°K
Windows:	1.0 W/m2°K
Doors:	1.2 W/m2°K
Air permeability:	4.0m3/m2/h @50Pa
Thermal Bridging	Y = 0.08

Rev B 12.7.23 Updated
Rev A 13.9.22 Updated

PRELIMINARY - SUBJECT TO FURTHER DESIGN DEVELOPMENT

A2

AP (a.)
alan power | (ARCHITECTS.)

Alan Power Architects Ltd
13 Needham Road London, W11 2RP
Tel 020 7229 9375 Fax 020 7221 4172

DRAWING
Wall Details - Options

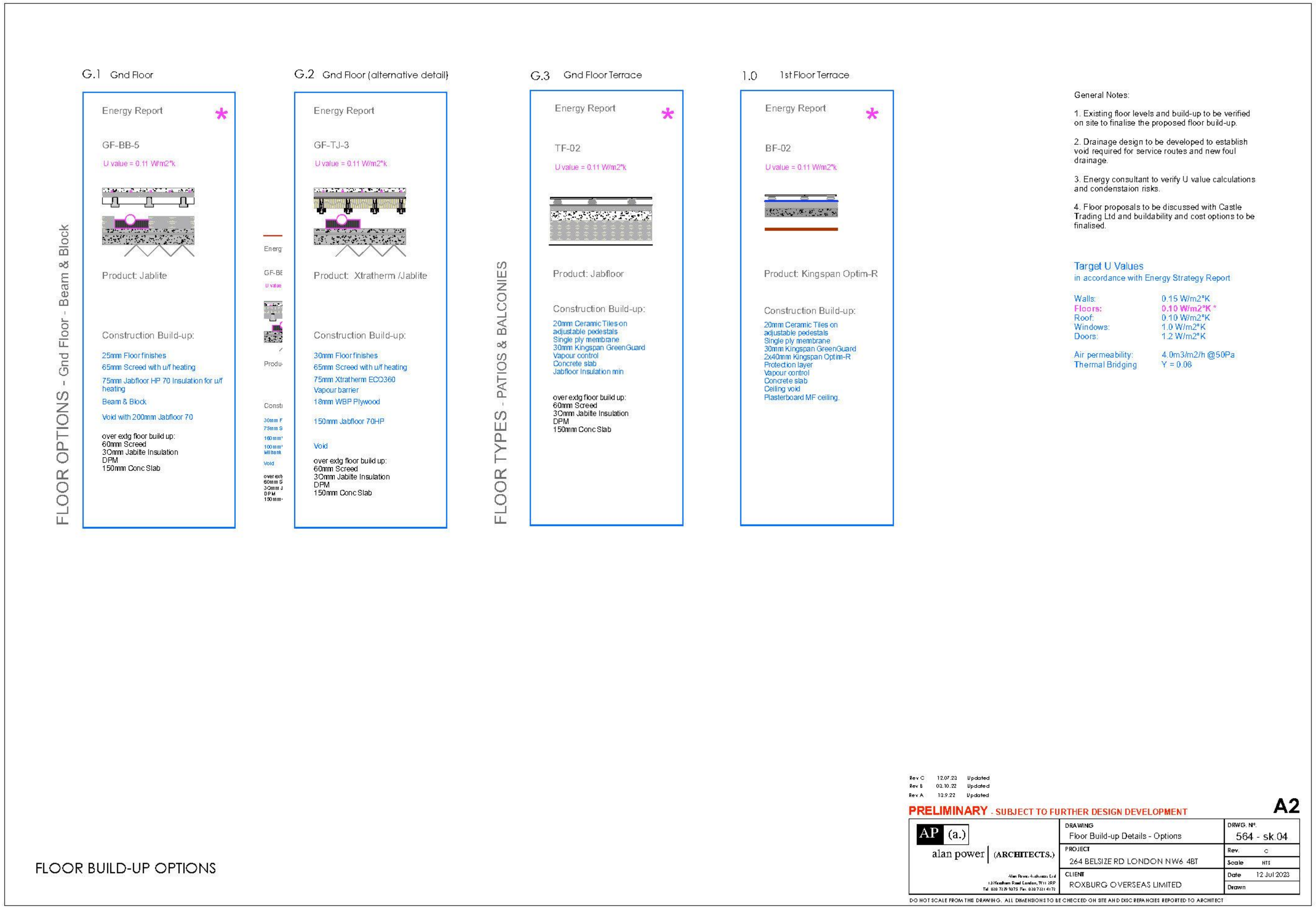
PROJECT
264 BELSIZE RD LONDON NW6 4BT

CLIENT
ROXBURG OVERSEAS LIMITED

DRWG. Nº. 564 - sk.10
Rev. B
Scale NTS
Date 12 Jul 2023
Drawn

DO NOT SCALE FROM THIS DRAWING. ALL DIMENSIONS TO BE CHECKED ON SITE AND DISCREPANCIES REPORTED TO ARCHITECT

Ground Floor



FLOOR OPTIONS - Gnd Floor - Beam & Block

G.1 Gnd Floor

Energy Report *

GF-BB-5

U value = 0.11 W/m2°k

Product: Jablite

Construction Build-up:

25mm Floor finishes
65mm Screed with u/f heating
75mm Jabfloor HP 70 Insulation for u/f heating
Beam & Block
Void with 200mm Jabfloor 70

over extg floor build up:
60mm Screed
30mm Jabilte Insulation
DPM
150mm Conc Slab

G.2 Gnd Floor (alternative detail)

Energy Report

GF-TJ-3

U value = 0.11 W/m2°k

Product: Xtratherm /Jablite

Construction Build-up:

30mm Floor finishes
65mm Screed with u/f heating
75mm Xtratherm ECO360
Vapour barrier
18mm WBP Plywood
150mm Jabfloor 70HP
Void

over extg floor build up:
60mm Screed
30mm Jabilte Insulation
DPM
150mm Conc Slab

FLOOR TYPES - PATIOS & BALCONIES

G.3 Gnd Floor Terrace

Energy Report *

TF-02

U value = 0.11 W/m2°k

Product: Jabfloor

Construction Build-up:

20mm Ceramic Tiles on adjustable pedestals
Single ply membrane
30mm Kingspan GreenGuard
Vapour control
Concrete slab
Jabfloor Insulation min

over extg floor build up:
60mm Screed
30mm Jabilte Insulation
DPM
150mm Conc Slab

1.0 1st Floor Terrace

Energy Report *

BF-02

U value = 0.11 W/m2°k

Product: Kingspan Optim-R

Construction Build-up:

20mm Ceramic Tiles on adjustable pedestals
Single ply membrane
30mm Kingspan GreenGuard
2x40mm Kingspan Optim-R
Protection layer
Vapour control
Concrete slab
Ceiling void
Plasterboard MF ceiling.

General Notes:

1. Existing floor levels and build-up to be verified on site to finalise the proposed floor build-up.

2. Drainage design to be developed to establish void required for service routes and new foul drainage.

3. Energy consultant to verify U value calculations and condenstaion risks.

4. Floor proposals to be discussed with Castle Trading Ltd and buildability and cost options to be finalised.

Target U Values
in accordance with Energy Strategy Report

Walls:	0.15 W/m2°K
Floors:	**0.10 W/m2°K ***
Roof:	0.10 W/m2°K
Windows:	1.0 W/m2°K
Doors:	1.2 W/m2°K
Air permeability:	4.0m3/m2/h @50Pa
Thermal Bridging	Y = 0.08

Rev C	12.07.23	Updated
Rev B	03.10.22	Updated
Rev A	13.9.22	Updated

PRELIMINARY - SUBJECT TO FURTHER DESIGN DEVELOPMENT

A2

AP (a.)
alan power (ARCHITECTS.)

Alan Power Architects Ltd
13 Needham Road London, W11 2RP
Tel 020 7229 9375 Fax 020 7221 4172

DRAWING
Floor Build-up Details - Options

PROJECT
264 BELSIZE RD LONDON NW6 4BT

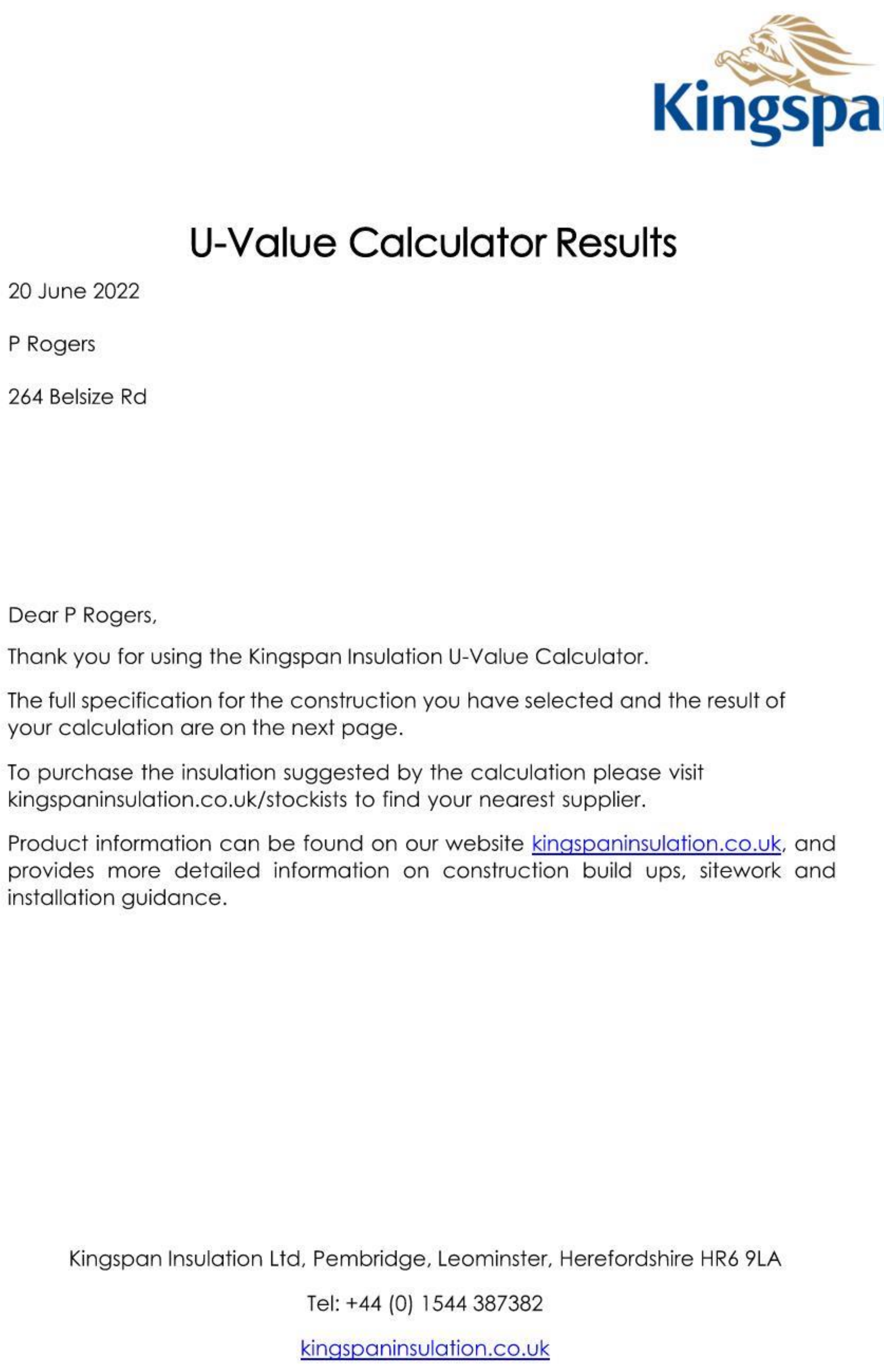
CLIENT
ROXBURG OVERSEAS LIMITED

DRWG. Nº. 564 - sk.04
Rev. C
Scale NTS
Date 12 Jul 2023
Drawn

DO NOT SCALE FROM THIS DRAWING. ALL DIMENSIONS TO BE CHECKED ON SITE AND DISCREPANCIES REPORTED TO ARCHITECT

FLOOR BUILD-UP OPTIONS

Roof



U-Value Calculator Results

20 June 2022

P Rogers

264 Belsize Rd

Dear P Rogers,

Thank you for using the Kingspan Insulation U-Value Calculator.

The full specification for the construction you have selected and the result of your calculation are on the next page.

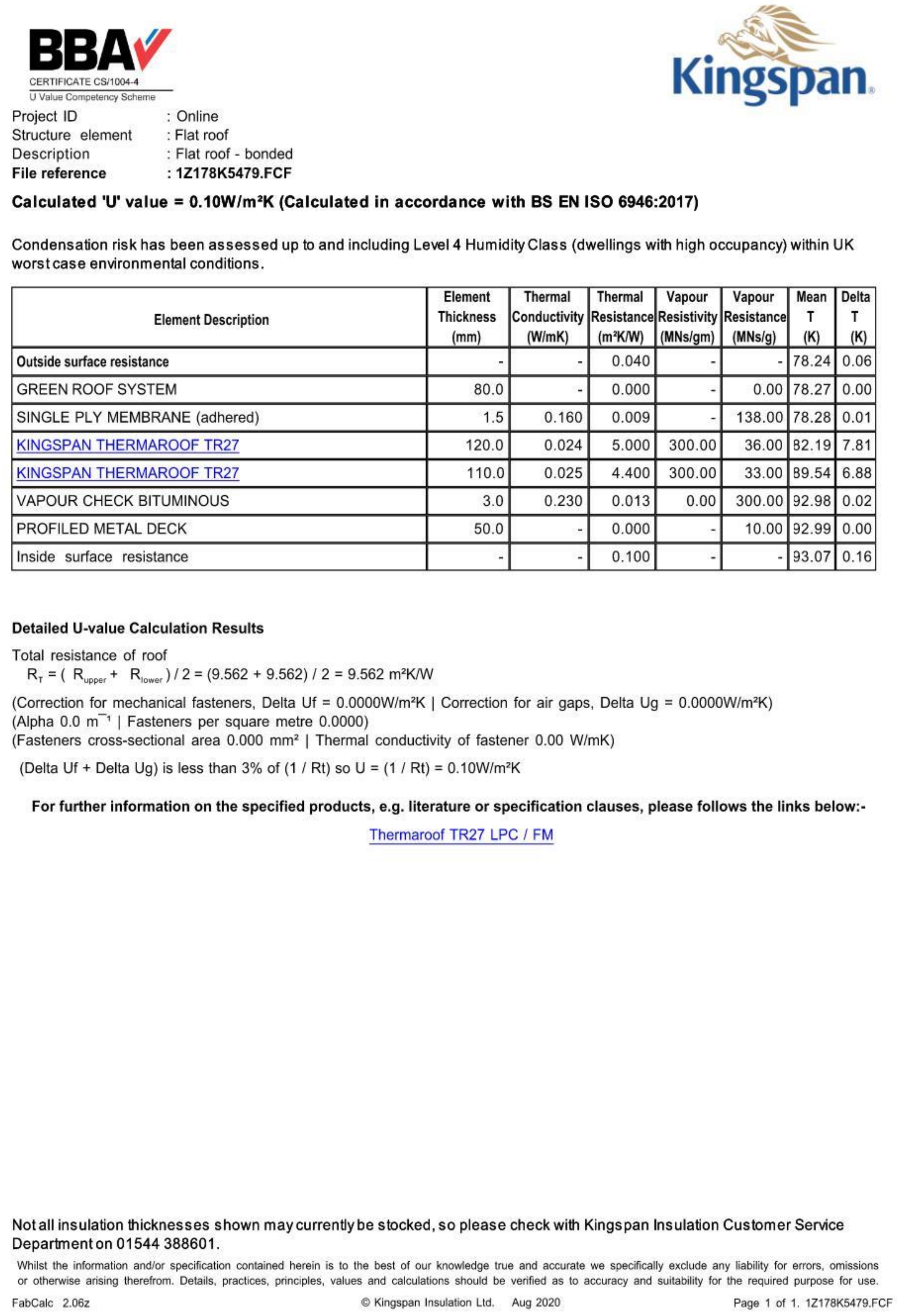
To purchase the insulation suggested by the calculation please visit kingspaninsulation.co.uk/stockists to find your nearest supplier.

Product information can be found on our website kingspaninsulation.co.uk, and provides more detailed information on construction build ups, sitework and installation guidance.

Kingspan Insulation Ltd, Pembridge, Leominster, Herefordshire HR6 9LA

Tel: +44 (0) 1544 387382

kingspaninsulation.co.uk



CERTIFICATE CS/1004-4
U Value Competency Scheme

Project ID : Online
Structure element : Flat roof
Description : Flat roof - bonded
File reference : **1Z178K5479.FCF**

Calculated 'U' value = 0.10W/m²K (Calculated in accordance with BS EN ISO 6946:2017)

Condensation risk has been assessed up to and including Level 4 Humidity Class (dwellings with high occupancy) within UK worst case environmental conditions.

Element Description	Element Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m²K/W)	Vapour Resistivity (MNs/gm)	Vapour Resistance (MNs/g)	Mean T (K)	Delta T (K)
Outside surface resistance	-	-	0.040	-	-	78.24	0.06
GREEN ROOF SYSTEM	80.0	-	0.000	-	0.00	78.27	0.00
SINGLE PLY MEMBRANE (adhered)	1.5	0.160	0.009	-	138.00	78.28	0.01
KINGSPAN THERMAROOF TR27	120.0	0.024	5.000	300.00	36.00	82.19	7.81
KINGSPAN THERMAROOF TR27	110.0	0.025	4.400	300.00	33.00	89.54	6.88
VAPOUR CHECK BITUMINOUS	3.0	0.230	0.013	0.00	300.00	92.98	0.02
PROFILED METAL DECK	50.0	-	0.000	-	10.00	92.99	0.00
Inside surface resistance	-	-	0.100	-	-	93.07	0.16

Detailed U-value Calculation Results

Total resistance of roof
$R_T = (R_{upper} + R_{lower}) / 2 = (9.562 + 9.562) / 2 = 9.562$ m²K/W

(Correction for mechanical fasteners, Delta Uf = 0.0000W/m²K | Correction for air gaps, Delta Ug = 0.0000W/m²K)
(Alpha 0.0 m^{-1} | Fasteners per square metre 0.0000)
(Fasteners cross-sectional area 0.000 mm² | Thermal conductivity of fastener 0.00 W/mK)

(Delta Uf + Delta Ug) is less than 3% of (1 / Rt) so U = (1 / Rt) = 0.10W/m²K

For further information on the specified products, e.g. literature or specification clauses, please follows the links below:-

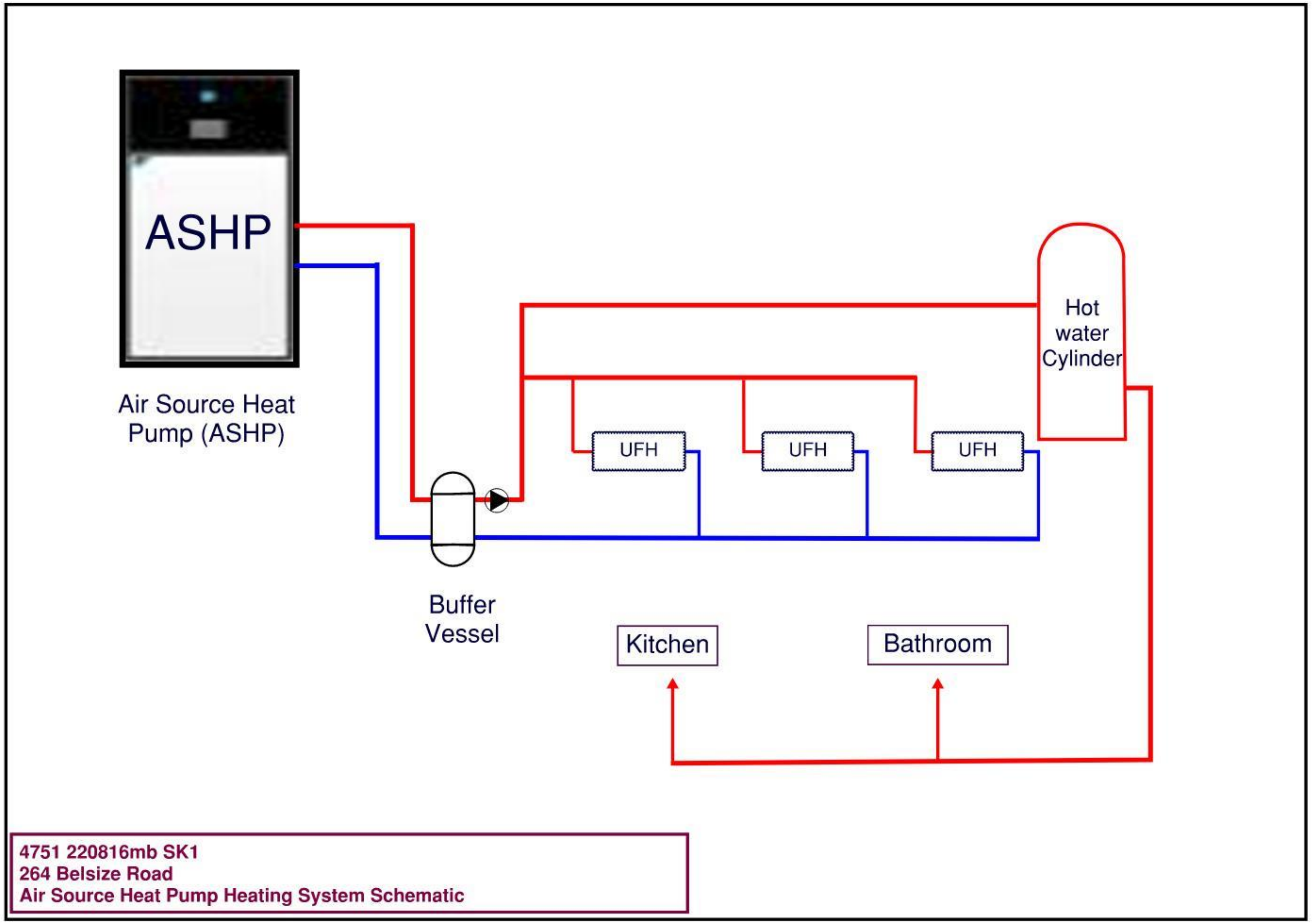
Thermaroof TR27 LPC / FM

Not all insulation thicknesses shown may currently be stocked, so please check with Kingspan Insulation Customer Service Department on 01544 388601.

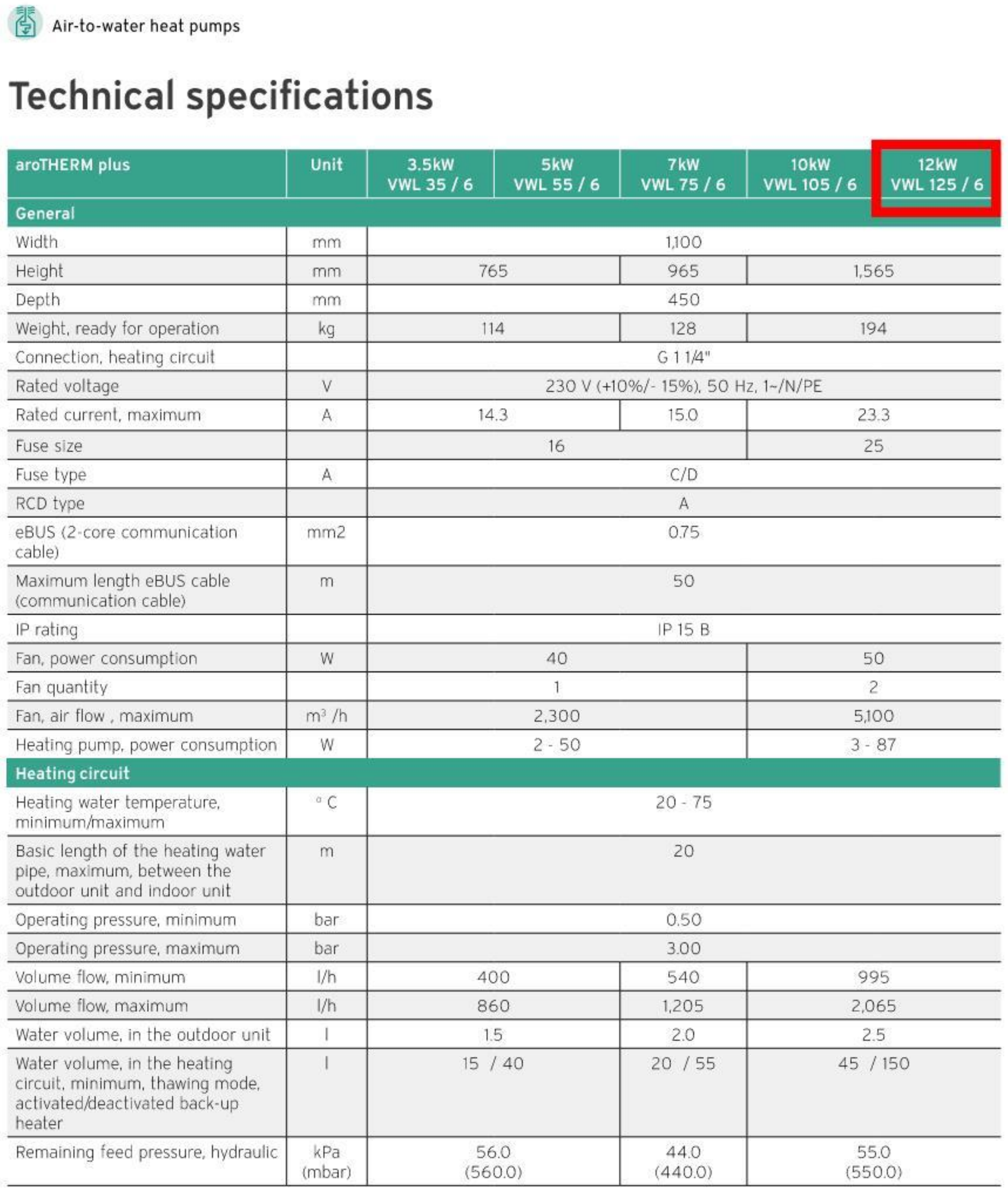
FabCalc 2.06z

Page 1 of 1. 1Z178K5479.FCF

Appendix D. Proposed Air Source Heat Pump Heating System Schematic



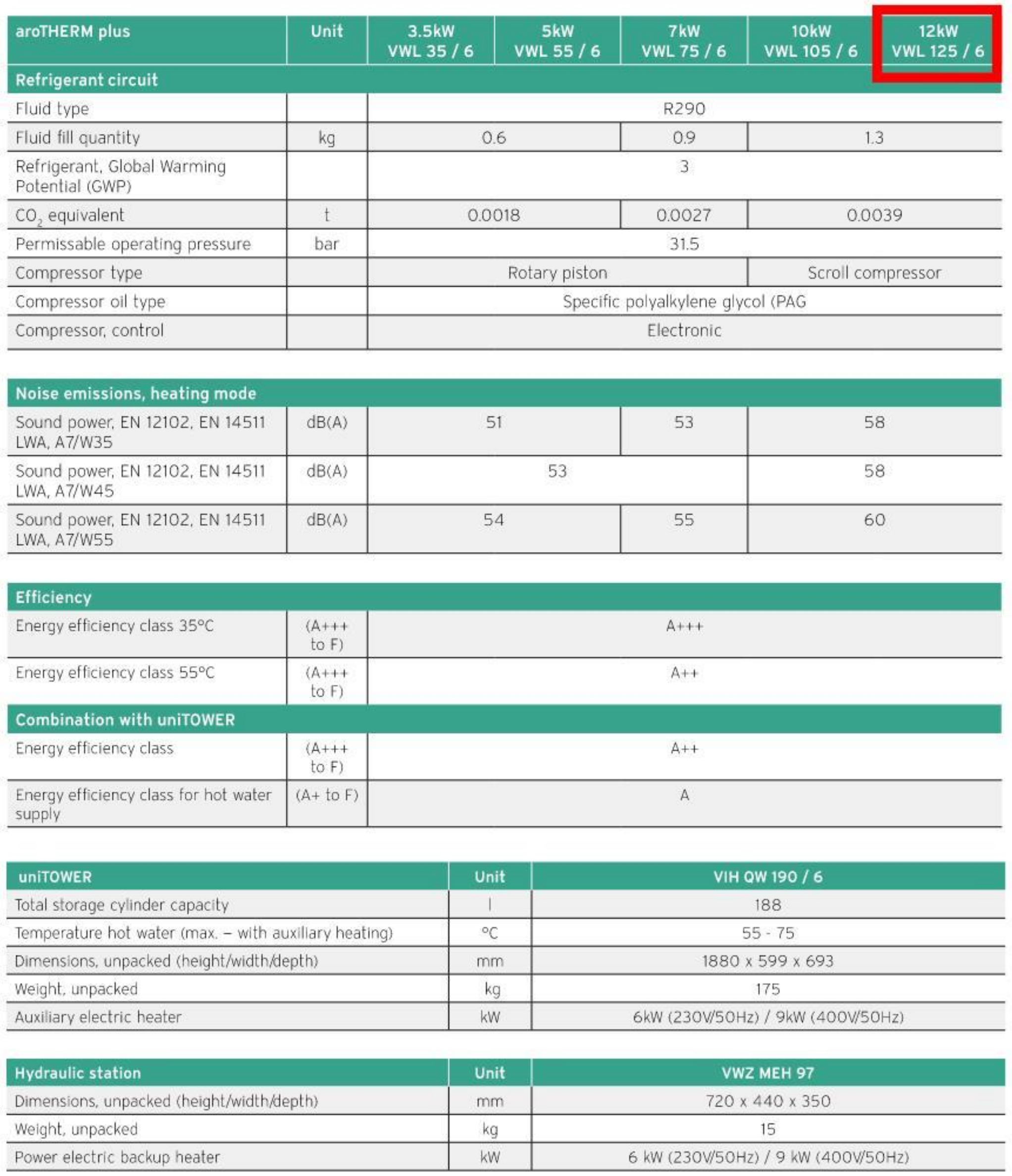
Appendix E. Propose Heat Pump Specification for Heating



Air-to-water heat pumps

Technical specifications

aroTHERM plus	Unit	3.5kW VWL 35 / 6	5kW VWL 55 / 6	7kW VWL 75 / 6	10kW VWL 105 / 6	12kW VWL 125 / 6
General						
Width	mm	1,100				
Height	mm	765		965	1,565	
Depth	mm	450				
Weight, ready for operation	kg	114		128	194	
Connection, heating circuit		G 1 1/4"				
Rated voltage	V	230 V (+10%/- 15%), 50 Hz, 1~/N/PE				
Rated current, maximum	A	14.3		15.0	23.3	
Fuse size		16			25	
Fuse type	A	C/D				
RCD type		A				
eBUS (2-core communication cable)	mm2	0.75				
Maximum length eBUS cable (communication cable)	m	50				
IP rating		IP 15 B				
Fan, power consumption	W	40			50	
Fan quantity		1			2	
Fan, air flow , maximum	m^3 /h	2,300			5,100	
Heating pump, power consumption	W	2 - 50			3 - 87	
Heating circuit						
Heating water temperature, minimum/maximum	° C	20 - 75				
Basic length of the heating water pipe, maximum, between the outdoor unit and indoor unit	m	20				
Operating pressure, minimum	bar	0.50				
Operating pressure, maximum	bar	3.00				
Volume flow, minimum	l/h	400		540	995	
Volume flow, maximum	l/h	860		1,205	2,065	
Water volume, in the outdoor unit	l	1.5		2.0	2.5	
Water volume, in the heating circuit, minimum, thawing mode, activated/deactivated back-up heater	l	15 / 40		20 / 55	45 / 150	
Remaining feed pressure, hydraulic	kPa (mbar)	56.0 (560.0)		44.0 (440.0)	55.0 (550.0)	



aroTHERM plus	Unit	3.5kW VWL 35 / 6	5kW VWL 55 / 6	7kW VWL 75 / 6	10kW VWL 105 / 6	12kW VWL 125 / 6
Refrigerant circuit						
Fluid type		R290				
Fluid fill quantity	kg	0.6		0.9	1.3	
Refrigerant, Global Warming Potential (GWP)		3				
CO_2 equivalent	t	0.0018		0.0027	0.0039	
Permissable operating pressure	bar	31.5				
Compressor type		Rotary piston			Scroll compressor	
Compressor oil type		Specific polyalkylene glycol (PAG				
Compressor, control		Electronic				

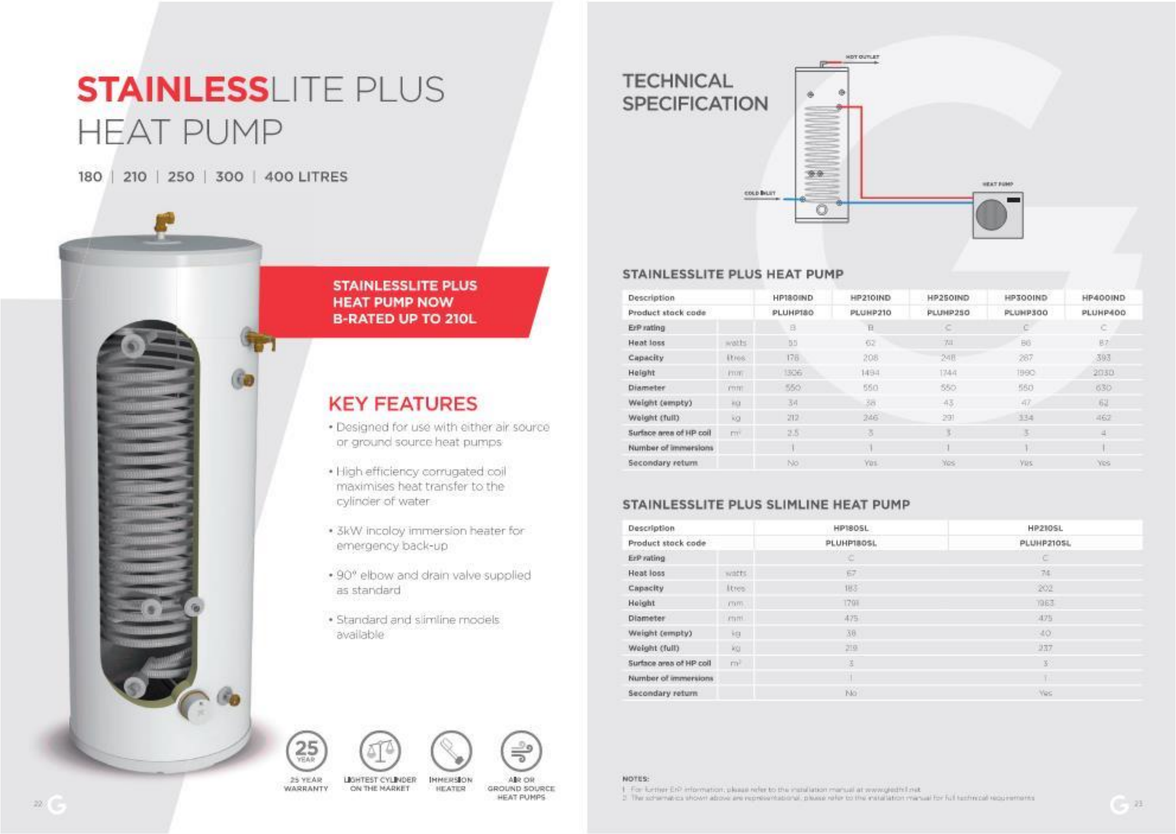
Noise emissions, heating mode						
Sound power, EN 12102, EN 14511 LWA, A7/W35	dB(A)	51		53	58	
Sound power, EN 12102, EN 14511 LWA, A7/W45	dB(A)	53			58	
Sound power, EN 12102, EN 14511 LWA, A7/W55	dB(A)	54		55	60	

Efficiency		
Energy efficiency class 35°C	(A+++ to F)	A+++
Energy efficiency class 55°C	(A+++ to F)	A++
Combination with uniTOWER		
Energy efficiency class	(A+++ to F)	A++
Energy efficiency class for hot water supply	(A+ to F)	A

uniTOWER	Unit	VIH QW 190 / 6
Total storage cylinder capacity	l	188
Temperature hot water (max. – with auxiliary heating)	°C	55 - 75
Dimensions, unpacked (height/width/depth)	mm	1880 x 599 x 693
Weight, unpacked	kg	175
Auxiliary electric heater	kW	6kW (230V/50Hz) / 9kW (400V/50Hz)

Hydraulic station	Unit	VWZ MEH 97
Dimensions, unpacked (height/width/depth)	mm	720 x 440 x 350
Weight, unpacked	kg	15
Power electric backup heater	kW	6 kW (230V/50Hz) / 9 kW (400V/50Hz)

Appendix F. Proposed Cylinder specification



STAINLESSLITE PLUS HEAT PUMP

180 | 210 | 250 | 300 | 400 LITRES

STAINLESSLITE PLUS HEAT PUMP NOW B-RATED UP TO 210L

KEY FEATURES

- Designed for use with either air source or ground source heat pumps
- High efficiency corrugated coil maximises heat transfer to the cylinder of water
- 3kW incoloy immersion heater for emergency back-up
- 90° elbow and drain valve supplied as standard
- Standard and slimline models available

25 YEAR WARRANTY
LIGHTEST CYLINDER ON THE MARKET
IMMERSION HEATER
AIR OR GROUND SOURCE HEAT PUMPS

22

TECHNICAL SPECIFICATION

STAINLESSLITE PLUS HEAT PUMP

Description		HP180IND	HP210IND	HP250IND	HP300IND	HP400IND
Product stock code		PLUHP180	PLUHP210	PLUHP250	PLUHP300	PLUHP400
ErP rating		B	B	C	C	C
Heat loss	watts	55	62	74	86	87
Capacity	litres	178	208	248	287	393
Height	mm	1306	1494	1744	1990	2030
Diameter	mm	550	550	550	550	630
Weight (empty)	kg	34	38	43	47	62
Weight (full)	kg	212	246	291	334	462
Surface area of HP coil	m^2	2.5	3	3	3	4
Number of immersions		1	1	1	1	1
Secondary return		No	Yes	Yes	Yes	Yes

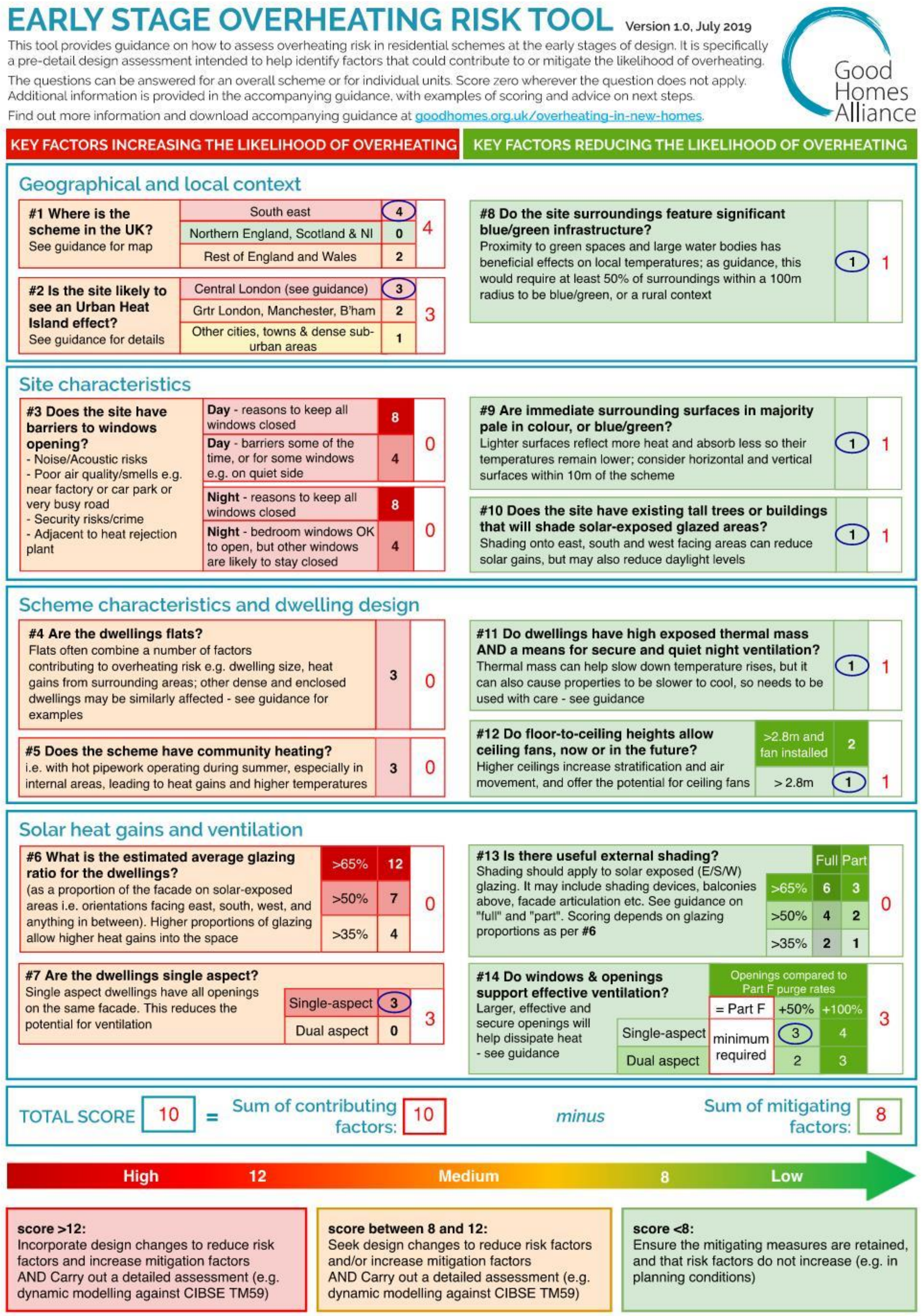
STAINLESSLITE PLUS SLIMLINE HEAT PUMP

Description		HP180SL	HP210SL
Product stock code		PLUHP180SL	PLUHP210SL
ErP rating		C	C
Heat loss	watts	67	74
Capacity	litres	183	202
Height	mm	1791	1963
Diameter	mm	475	475
Weight (empty)	kg	38	40
Weight (full)	kg	219	237
Surface area of HP coil	m^2	3	3
Number of immersions		1	1
Secondary return		No	Yes

NOTES:
1 For further ErP information, please refer to the installation manual at www.gledhill.net
2 The schematics shown above are representational, please refer to the installation manual for full technical requirements

23

Appendix G. Early-Stage Overheating Risk Tool, Good Homes Alliance (2019).



EARLY STAGE OVERHEATING RISK TOOL

Version 1.0, July 2019

This tool provides guidance on how to assess overheating risk in residential schemes at the early stages of design. It is specifically a pre-detail design assessment intended to help identify factors that could contribute to or mitigate the likelihood of overheating.

The questions can be answered for an overall scheme or for individual units. Score zero wherever the question does not apply. Additional information is provided in the accompanying guidance, with examples of scoring and advice on next steps.

Find out more information and download accompanying guidance at goodhomes.org.uk/overheating-in-new-homes.

Good Homes Alliance

KEY FACTORS INCREASING THE LIKELIHOOD OF OVERHEATING | **KEY FACTORS REDUCING THE LIKELIHOOD OF OVERHEATING**

Geographical and local context

#1 Where is the scheme in the UK? See guidance for map	South east	[✓ 4]	4
	Northern England, Scotland & NI	0	
	Rest of England and Wales	2	
#2 Is the site likely to see an Urban Heat Island effect? See guidance for details	Central London (see guidance)	[✓ 3]	3
	Grtr London, Manchester, B'ham	2	
	Other cities, towns & dense sub-urban areas	1	

#8 Do the site surroundings feature significant blue/green infrastructure? Proximity to green spaces and large water bodies has beneficial effects on local temperatures; as guidance, this would require at least 50% of surroundings within a 100m radius to be blue/green, or a rural context	[✓ 1]	1

Site characteristics

#3 Does the site have barriers to windows opening? - Noise/Acoustic risks - Poor air quality/smells e.g. near factory or car park or very busy road - Security risks/crime - Adjacent to heat rejection plant	**Day** - reasons to keep all windows closed	8	0
	Day - barriers some of the time, or for some windows e.g. on quiet side	4	
	Night - reasons to keep all windows closed	8	0
	Night - bedroom windows OK to open, but other windows are likely to stay closed	4	

#9 Are immediate surrounding surfaces in majority pale in colour, or blue/green? Lighter surfaces reflect more heat and absorb less so their temperatures remain lower; consider horizontal and vertical surfaces within 10m of the scheme	[✓ 1]	1
#10 Does the site have existing tall trees or buildings that will shade solar-exposed glazed areas? Shading onto east, south and west facing areas can reduce solar gains, but may also reduce daylight levels	[✓ 1]	1

Scheme characteristics and dwelling design

#4 Are the dwellings flats? Flats often combine a number of factors contributing to overheating risk e.g. dwelling size, heat gains from surrounding areas; other dense and enclosed dwellings may be similarly affected - see guidance for examples	3	0
#5 Does the scheme have community heating? i.e. with hot pipework operating during summer, especially in internal areas, leading to heat gains and higher temperatures	3	0

#11 Do dwellings have high exposed thermal mass AND a means for secure and quiet night ventilation? Thermal mass can help slow down temperature rises, but it can also cause properties to be slower to cool, so needs to be used with care - see guidance		[✓ 1]	1
#12 Do floor-to-ceiling heights allow ceiling fans, now or in the future? Higher ceilings increase stratification and air movement, and offer the potential for ceiling fans	>2.8m and fan installed	2	1
	> 2.8m	[✓ 1]	

Solar heat gains and ventilation

#6 What is the estimated average glazing ratio for the dwellings? (as a proportion of the facade on solar-exposed areas i.e. orientations facing east, south, west, and anything in between). Higher proportions of glazing allow higher heat gains into the space	>65%	12	0
	>50%	7	
	>35%	4	
#7 Are the dwellings single aspect? Single aspect dwellings have all openings on the same facade. This reduces the potential for ventilation	Single-aspect	[✓ 3]	3
	Dual aspect	0	

		Full	Part	
#13 Is there useful external shading? Shading should apply to solar exposed (E/S/W) glazing. It may include shading devices, balconies above, facade articulation etc. See guidance on "full" and "part". Scoring depends on glazing proportions as per **#6**	>65%	6	3	0
	>50%	4	2	
	>35%	2	1	

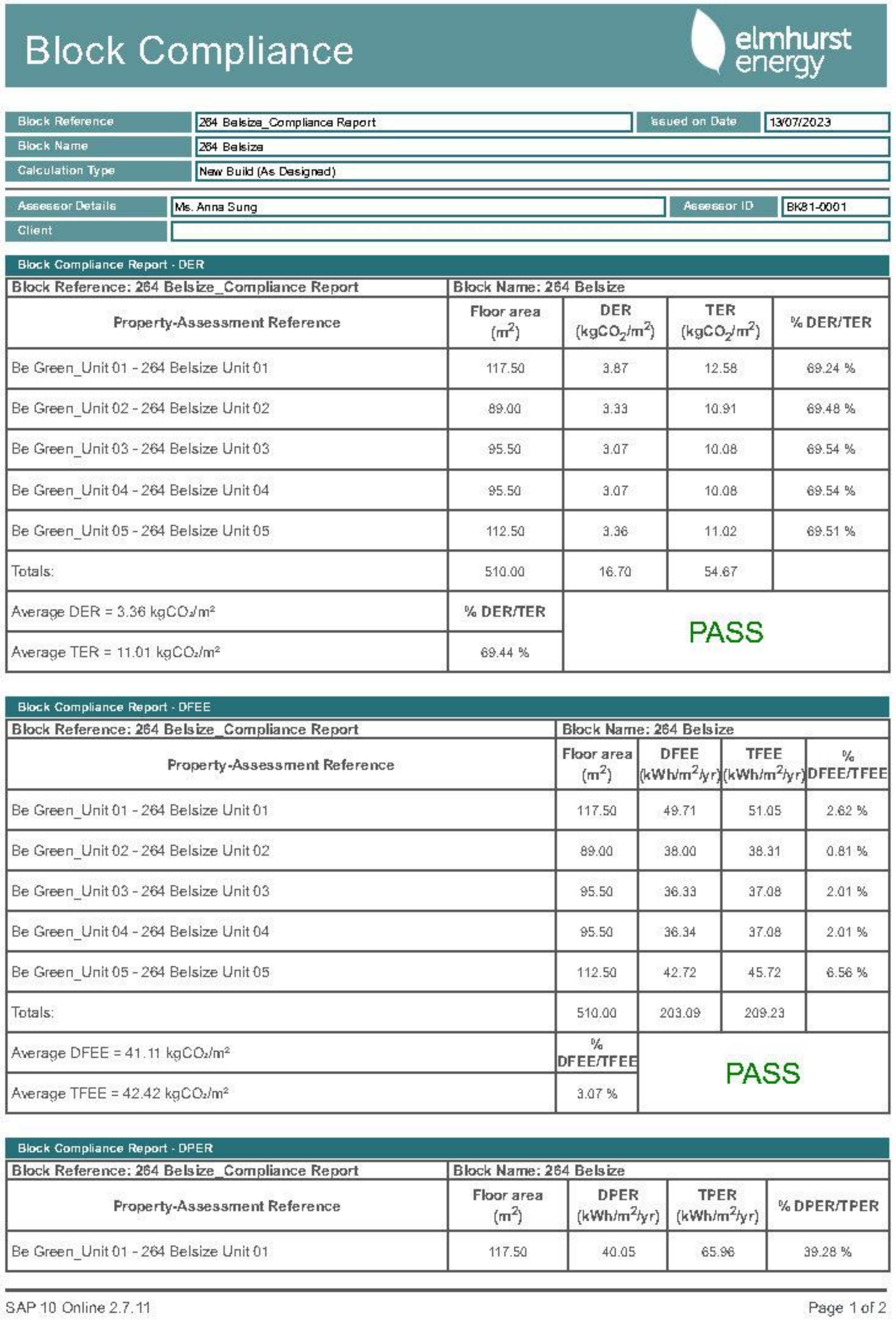
		Openings compared to Part F purge rates			
#14 Do windows & openings support effective ventilation? Larger, effective and secure openings will help dissipate heat - see guidance		= Part F	+50%	+100%	3
	Single-aspect	minimum required	[✓ 3]	4	
	Dual aspect		2	3	

TOTAL SCORE	10	=	Sum of contributing factors: 10	*minus*	Sum of mitigating factors:	8

High 12 Medium 8 Low

score >12: Incorporate design changes to reduce risk factors and increase mitigation factors AND Carry out a detailed assessment (e.g. dynamic modelling against CIBSE TM59)	**score between 8 and 12:** Seek design changes to reduce risk factors and/or increase mitigation factors AND Carry out a detailed assessment (e.g. dynamic modelling against CIBSE TM59)	**score <8:** Ensure the mitigating measures are retained, and that risk factors do not increase (e.g. in planning conditions)

Appendix H. Block Compliance & EPC



Block Compliance

elmhurst energy

Block Reference	264 Balsiza_Compliance Raport	Issued on Date	13/07/2023
Block Name	264 Balsiza		
Calculation Type	New Build (As Dasignad)		

Assessor Details	Ms. Anna Sung	Assessor ID	BK81-0001
Client			

Block Compliance Report - DER

Block Reference: 264 Belsize_Compliance Report **Block Name: 264 Belsize**

Property-Assessment Reference	Floor area (m^2)	DER ($kgCO_2/m^2$)	TER ($kgCO_2/m^2$)	% DER/TER
Be Green_Unit 01 - 264 Belsize Unit 01	117.50	3.87	12.58	69.24 %
Be Green_Unit 02 - 264 Belsize Unit 02	89.00	3.33	10.91	69.48 %
Be Green_Unit 03 - 264 Belsize Unit 03	95.50	3.07	10.08	69.54 %
Be Green_Unit 04 - 264 Belsize Unit 04	95.50	3.07	10.08	69.54 %
Be Green_Unit 05 - 264 Belsize Unit 05	112.50	3.36	11.02	69.51 %
Totals:	510.00	16.70	54.67	
Average DER = 3.36 $kgCO_2/m^2$	% DER/TER	PASS		
Average TER = 11.01 $kgCO_2/m^2$	69.44 %			

Block Compliance Report - DFEE

Block Reference: 264 Belsize_Compliance Report **Block Name: 264 Belsize**

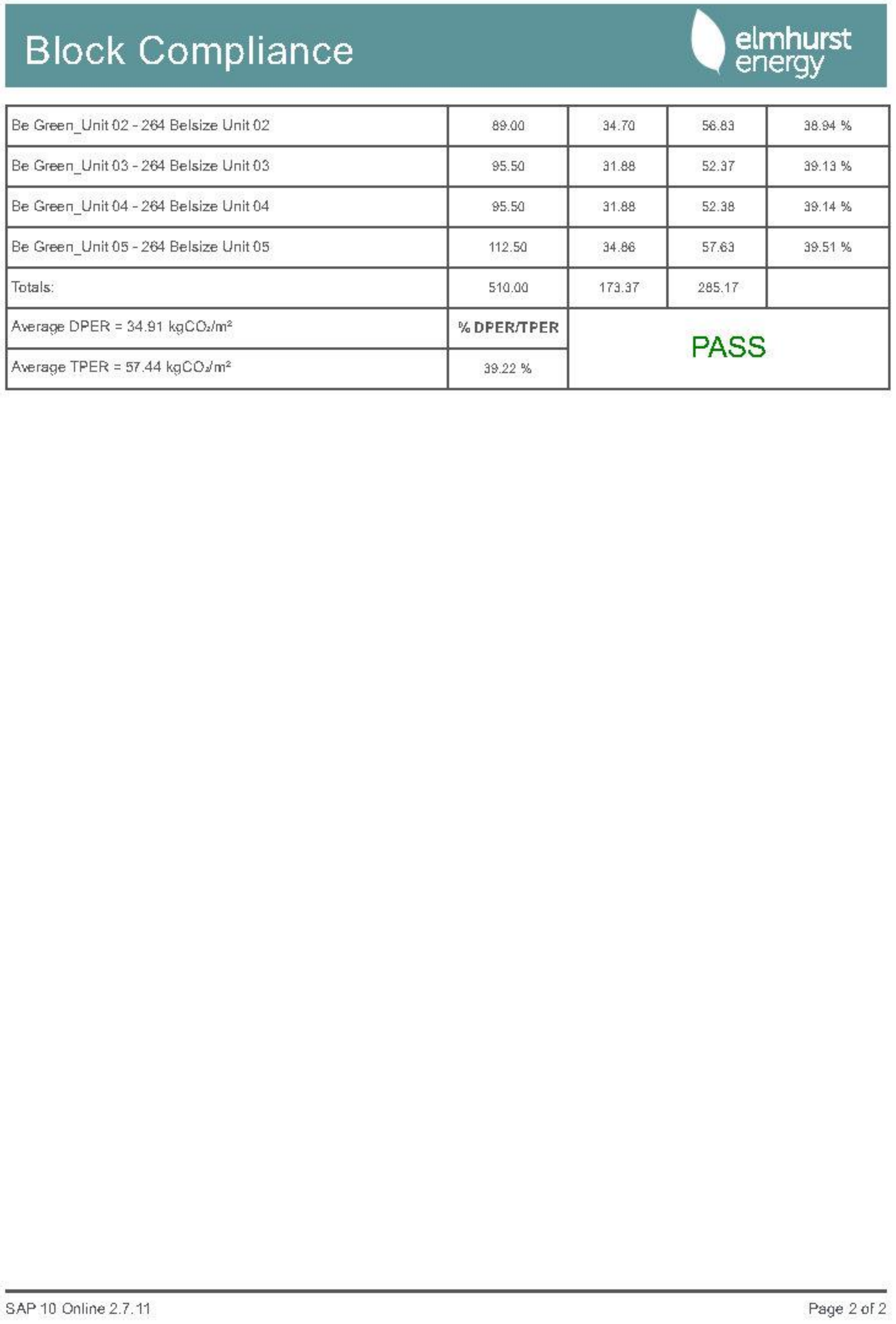
Property-Assessment Reference	Floor area (m^2)	DFEE ($kWh/m^2/yr$)	TFEE ($kWh/m^2/yr$)	% DFEE/TFEE
Be Green_Unit 01 - 264 Belsize Unit 01	117.50	49.71	51.05	2.62 %
Be Green_Unit 02 - 264 Belsize Unit 02	89.00	38.00	38.31	0.81 %
Be Green_Unit 03 - 264 Belsize Unit 03	95.50	36.33	37.08	2.01 %
Be Green_Unit 04 - 264 Belsize Unit 04	95.50	36.34	37.08	2.01 %
Be Green_Unit 05 - 264 Belsize Unit 05	112.50	42.72	45.72	6.56 %
Totals:	510.00	203.09	209.23	
Average DFEE = 41.11 $kgCO_2/m^2$	% DFEE/TFEE	PASS		
Average TFEE = 42.42 $kgCO_2/m^2$	3.07 %			

Block Compliance Report - DPER

Block Reference: 264 Belsize_Compliance Report **Block Name: 264 Belsize**

Property-Assessment Reference	Floor area (m^2)	DPER ($kWh/m^2/yr$)	TPER ($kWh/m^2/yr$)	% DPER/TPER
Be Green_Unit 01 - 264 Belsize Unit 01	117.50	40.05	65.96	39.28 %

SAP 10 Online 2.7.11 Page 1 of 2

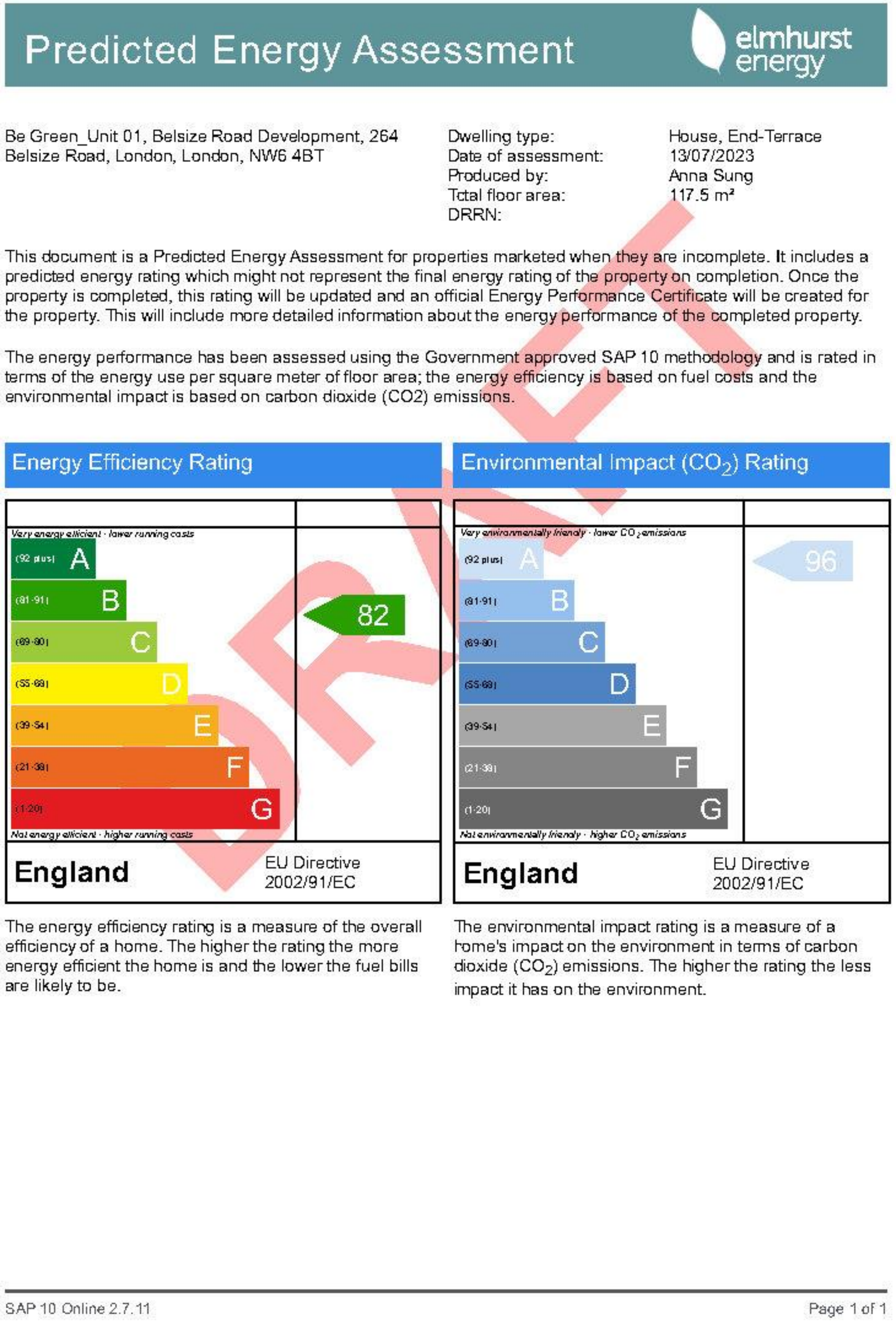


Block Compliance

elmhurst energy

Be Green_Unit 02 - 264 Belsize Unit 02	89.00	34.70	56.83	38.94 %
Be Green_Unit 03 - 264 Belsize Unit 03	95.50	31.88	52.37	39.13 %
Be Green_Unit 04 - 264 Belsize Unit 04	95.50	31.88	52.38	39.14 %
Be Green_Unit 05 - 264 Belsize Unit 05	112.50	34.86	57.63	39.51 %
Totals:	510.00	173.37	285.17	
Average DPER = 34.91 $kgCO_2/m^2$	% DPER/TPER	PASS		
Average TPER = 57.44 $kgCO_2/m^2$	39.22 %			

SAP 10 Online 2.7.11 Page 2 of 2



Predicted Energy Assessment

elmhurst energy

Be Green_Unit 01, Belsize Road Development, 264
Belsize Road, London, London, NW6 4BT

Dwelling type: House, End-Terrace
Date of assessment: 13/07/2023
Produced by: Anna Sung
Total floor area: 117.5 m²
DRRN:

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

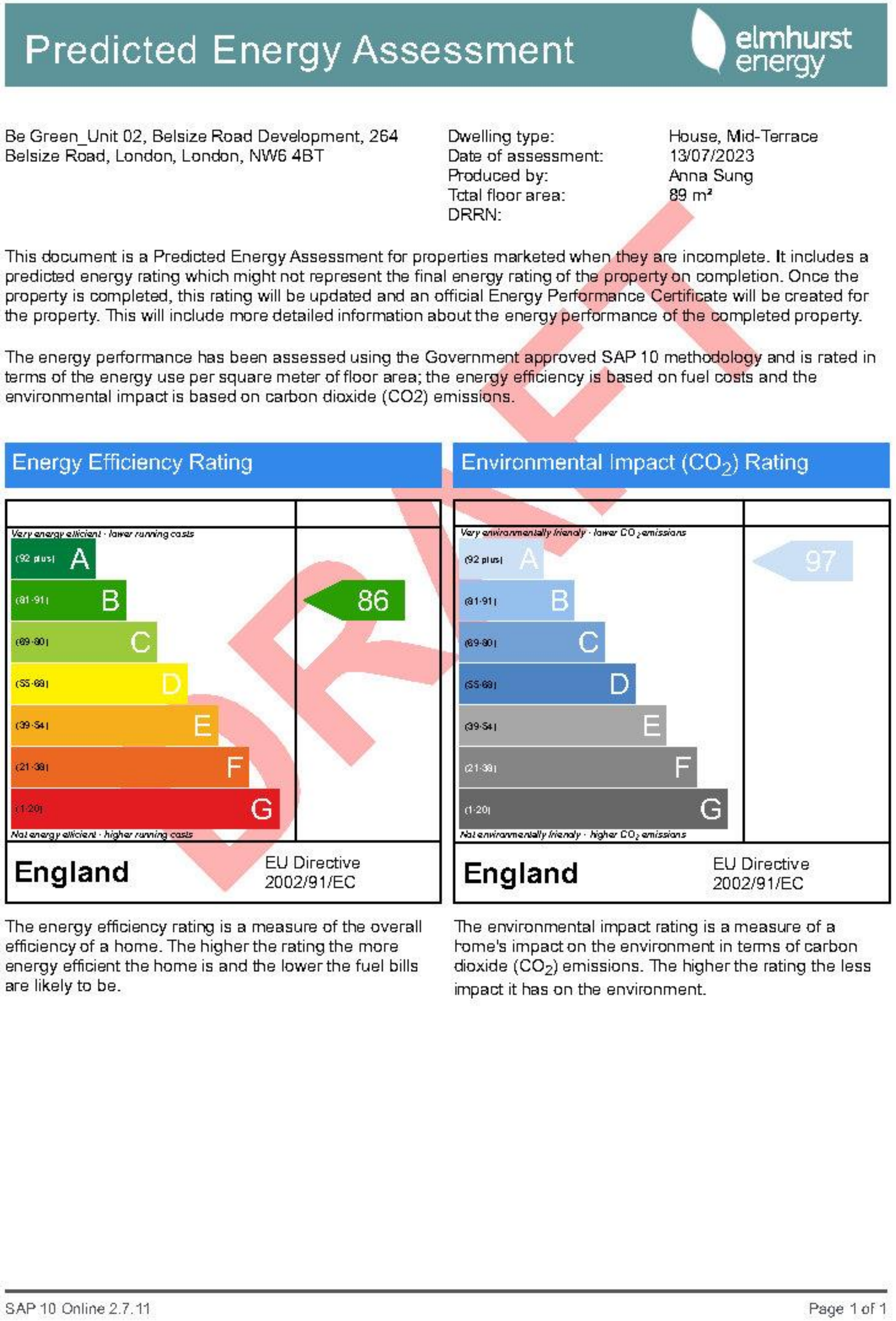
Energy Efficiency Rating

Environmental Impact (CO_2) Rating

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

SAP 10 Online 2.7.11 Page 1 of 1



Predicted Energy Assessment

elmhurst energy

Be Green_Unit 02, Belsize Road Development, 264
Belsize Road, London, London, NW6 4BT

Dwelling type: House, Mid-Terrace
Date of assessment: 13/07/2023
Produced by: Anna Sung
Total floor area: 89 m²
DRRN:

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

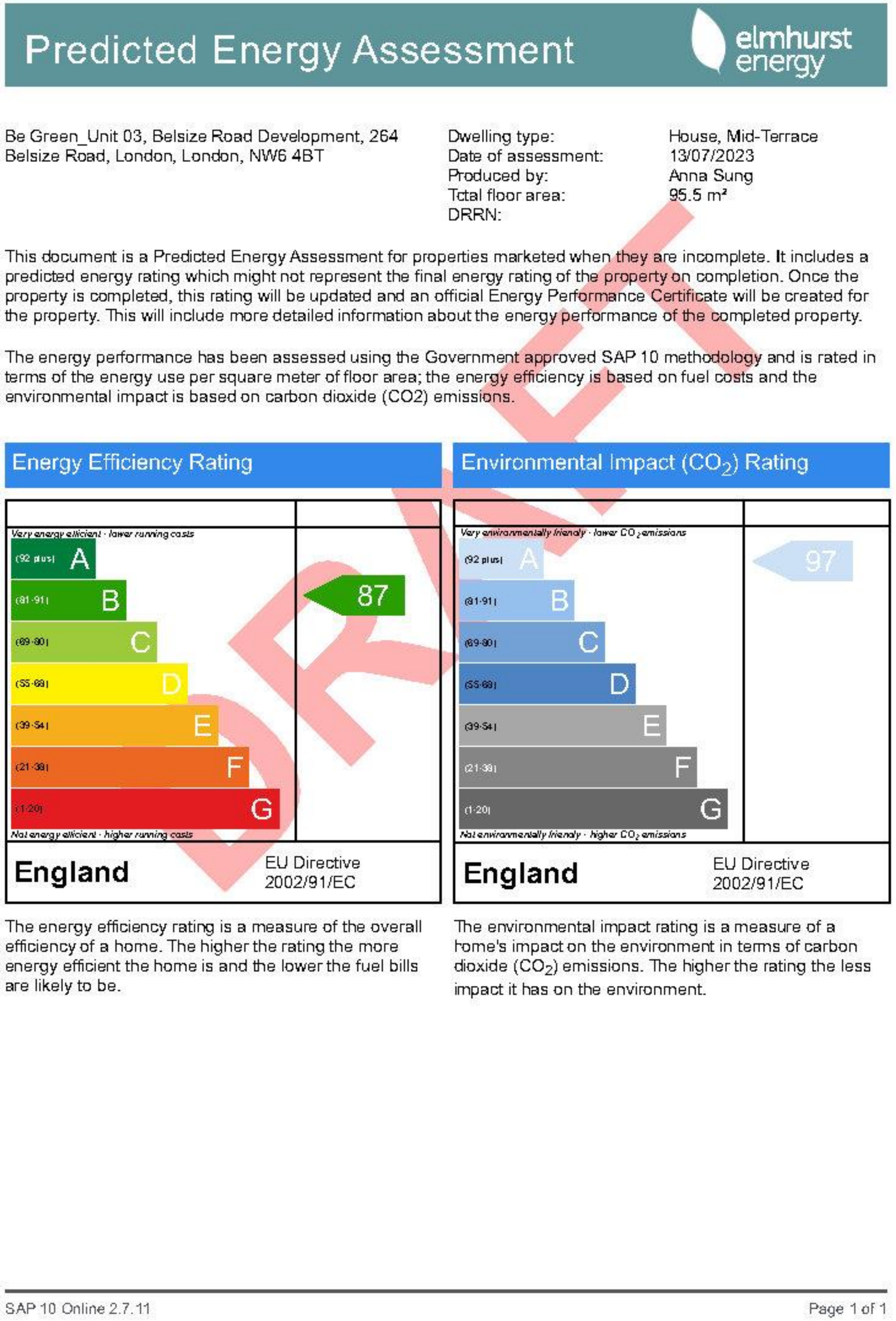
Energy Efficiency Rating

Environmental Impact (CO_2) Rating

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

SAP 10 Online 2.7.11 Page 1 of 1



Predicted Energy Assessment

elmhurst energy

Be Green_Unit 03, Belsize Road Development, 264
Belsize Road, London, London, NW6 4BT

Dwelling type: House, Mid-Terrace
Date of assessment: 13/07/2023
Produced by: Anna Sung
Total floor area: 95.5 m²
DRRN:

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

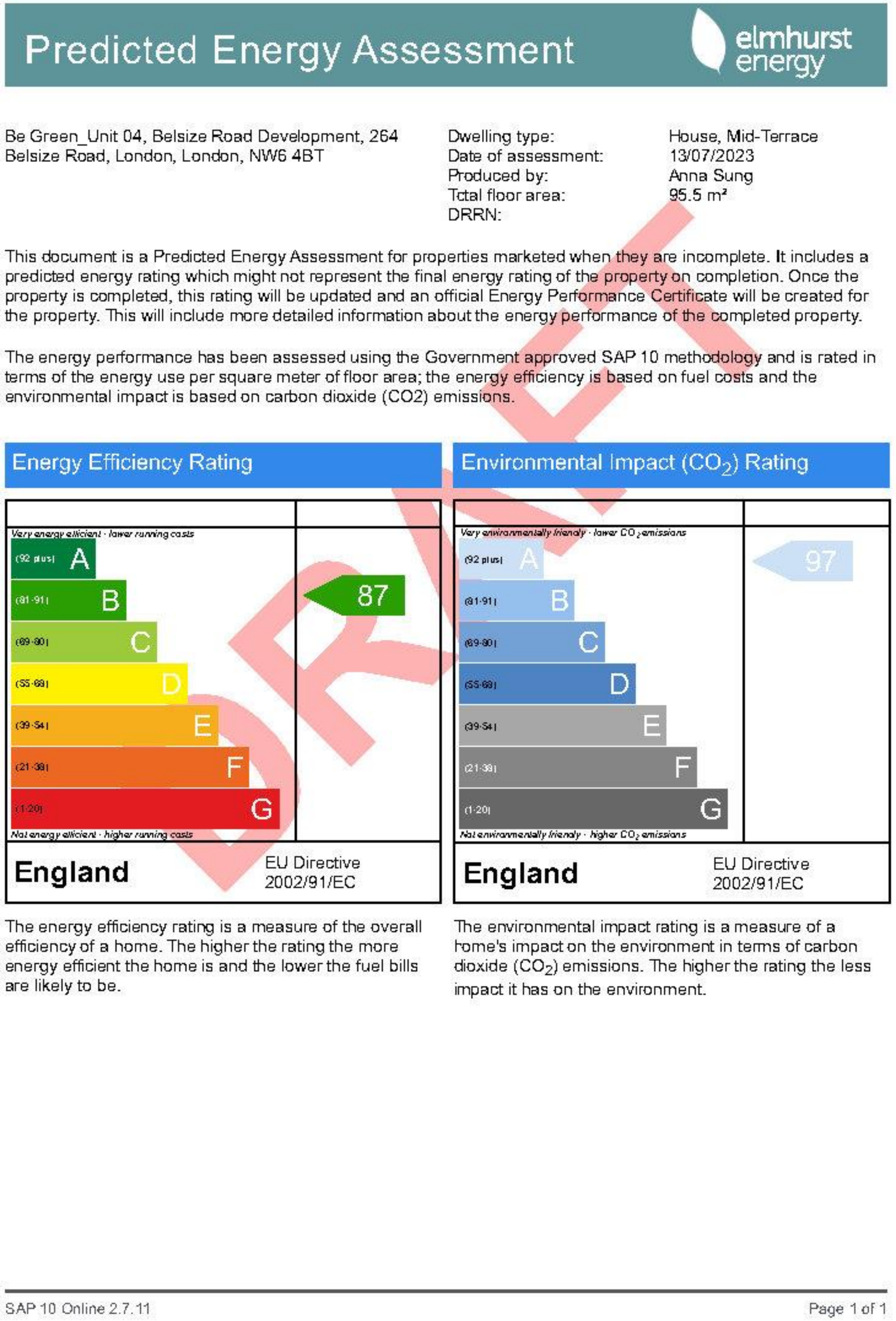
Energy Efficiency Rating

Environmental Impact (CO_2) Rating

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

SAP 10 Online 2.7.11 Page 1 of 1



Predicted Energy Assessment

elmhurst energy

Be Green_Unit 04, Belsize Road Development, 264
Belsize Road, London, London, NW6 4BT

Dwelling type: House, Mid-Terrace
Date of assessment: 13/07/2023
Produced by: Anna Sung
Total floor area: 95.5 m²
DRRN:

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

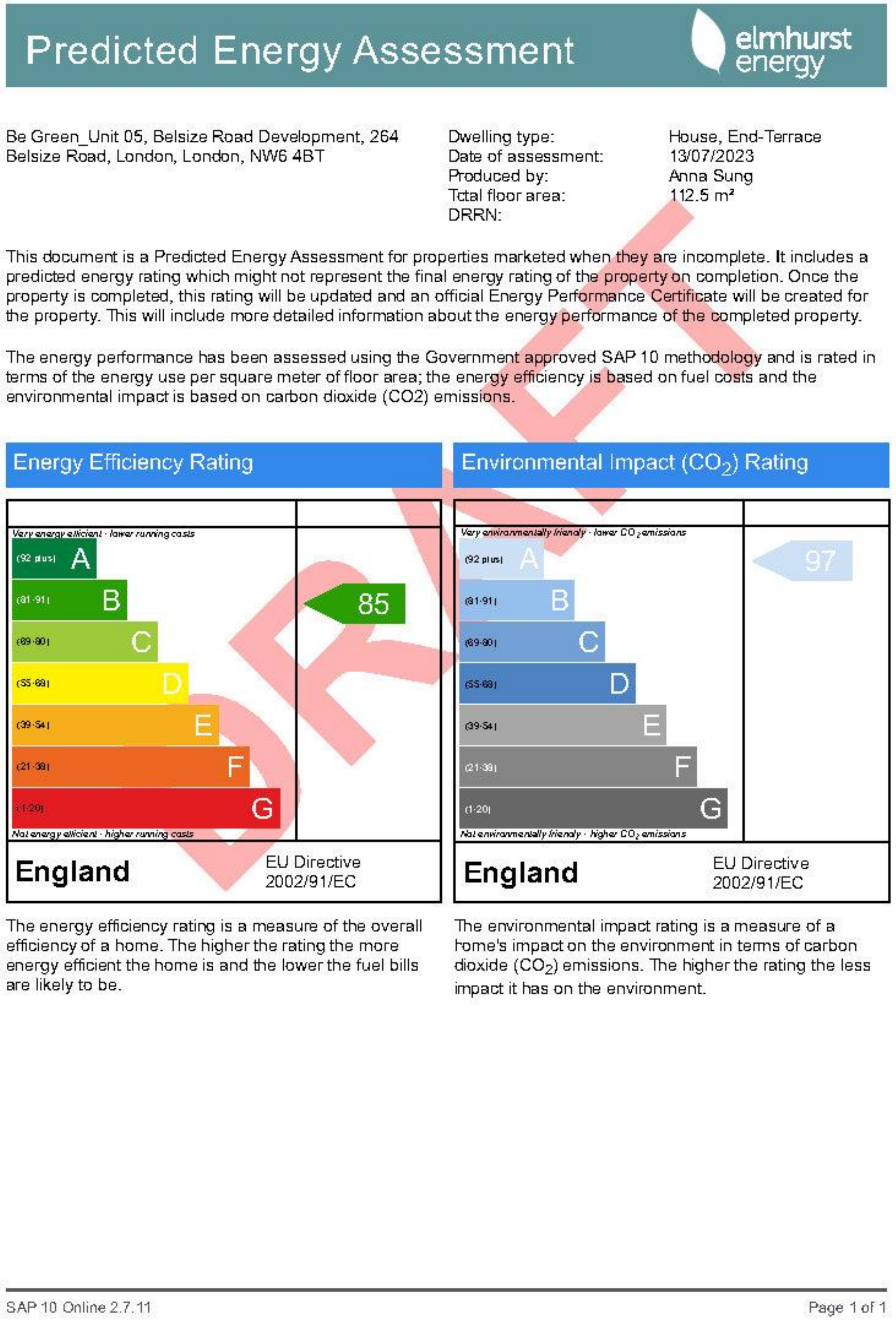
Energy Efficiency Rating

Environmental Impact (CO_2) Rating

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

SAP 10 Online 2.7.11 Page 1 of 1



Predicted Energy Assessment

elmhurst energy

Be Green_Unit 05, Belsize Road Development, 264
Belsize Road, London, London, NW6 4BT

Dwelling type:	House, End-Terrace
Date of assessment:	13/07/2023
Produced by:	Anna Sung
Total floor area:	112.5 m²
DRRN:	

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating

Environmental Impact (CO_2) Rating

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

SAP 10 Online 2.7.11

Page 1 of 1