ENERGY & SUSTAINABILITY STATEMENT

(To Accompany Planning Application)

Site
29 THE AVENUE, ICKENHAM, HILLINGDON UB10 8NR

Proposal
ERECTION OF RESIDENTIAL UNIT

Client
MR V BOWLER

21st SEPTEMBER 2022
Ref. E1260-ESS-00

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1.0 SUMMARY OF RECOMMENDATIONS

a) This development is for the erection of a new dwelling at 29 The Avenue, Ickenham, Hillingdon, UB10 8NR. This will be in the form of a detached five bedroom house.

b) It is proposed that in order to meet the policy requirements of the London Borough of Hillingdon's Planning Policy and the London Plan, this development will adopt a high standard of design with regard to energy efficiency principles.

c) This development is at the planning stage and the detailed construction drawings have not been prepared, therefore initial stage SAP calculations and procedures provided in the Renewables Toolkit, which form the basis of the London Plan's "Energy Hierarchy", have been used to estimate that the baseline carbon dioxide emissions of this development.

d) This report has demonstrated, by using initial SAP Assessments to calculate carbon dioxide emissions for the development, that it is possible to achieve a 52.3% reduction in carbon dioxide emissions by making fabric and energy efficiency measures and the use of low or zero carbon technologies. It is envisaged during detailed construction design, these figures can be improved.

e) The remaining carbon emissions of 2.2 Tonnes Carbon Dioxide per year will be met via a payment to the Borough's Carbon Offset Fund.

f) This Energy Statement demonstrates that the proposed development complies with the requirements of planning policies with regard to reducing carbon dioxide emissions and incorporation of low and zero carbon technologies. It is for these reasons it is considered that this application should be viewed favorably by the London Borough of Hillingdon.

2.0 INTRODUCTION

a) Doherty Energy Limited have been instructed by Mr V Bowler to prepare an Energy Statement to support the submission of a planning application for the redevelopment of 29 The Avenue, Ickenham, Hillingdon UB10 3NR. This report must be read in conjunction with the application forms, certificates, detailed plans and other supporting documents submitted to the Local Authority as part of the application.

b) The Application is for the erection of a residential unit, which shall be a five bed detached dwellings.

c) The objectives of this Energy and Sustainability Statement are to outline the possible measures that can be incorporated into the development during detailed design, to make an appraisal of the carbon dioxide emissions of the proposed development, assess the potential fabric and building services efficiencies to reduce the carbon dioxide emission and to suggest the most appropriate means by which the development can contribute towards the aspiration of policy relating to reducing carbon dioxide emissions and energy consumption. It also investigates the water usage of the development with a view to reducing the water consumption of the dwelling.

d) The Assessment shall be carried out following the principles set out in the "Energy Hierarchy". These principles can be summarised as follows:

- Be Lean –use less energy
- Be Clean – supply energy efficiently
- Be Green - use renewable energy
- Be Seen – monitor energy performance

e) At this stage in the design of the development, the detailed Building Regulations construction information has not been prepared and therefore following detailed construction design, the energy calculations will be revisited to ensure the energy requirements and carbon dioxide emissions are up to date.

f) In order to demonstrate the carbon dioxide emissions, it is proposed to use the Standard Assessment Procedure (SAP) for the calculations to obtain initial baseline carbon dioxide emissions figures for the dwellings. The Approved Document L:2021 of the Building Regulations has been updated with the new version coming into force on the 15th June 2022. This uses SAP 10 to demonstrate compliance with the Building Regulations and the calculations in this report have been updated to reflect the Approved Document L1:2021.

g) Further calculations will be used to demonstrate the potential carbon dioxide emission savings from the initial calculations by enhancements to the building fabric, plant and controls – BE LEAN. The suitability of supplying energy, both heat and power, through the use of a combined heat and power system shall be assessed – BE CLEAN. The carbon dioxide emission saving by the use of renewable energy shall be assessed through the outputs from the SAP calculations – BE GREEN. Finally, the energy performance shall be monitored – BE SEEN.

3.0 POLICY CONTEXT

a) The London Borough of Hillingdon, through their Local Plan Part 2, January 2020, Policy DME2 – Reducing Carbon Emissions, requires developments to aim to reduce their carbon dioxide emissions in accordance with the levels set out in the London Plan. Planning applications for development should include evidence of how the energy requirements and carbon dioxide emissions of proposed developments have been assessed and propose a clear reduction strategy in line with the energy hierarchy.

b) The carbon dioxide reduction target should be met on site unless it can be demonstrated that it is not feasible. Any shortfall may be met through an identified project off-site or through a payment in lieu to a local carbon off-setting scheme.

c) The Local Authority expects development proposals to meet the carbon emissions reduction requirement set out in the London Plan. This includes the application of the Mayor of London's Energy Hierarchy.

d) The Great London Authority, through the London Plan, March 2021, will require developments to contribute towards London's ambitious target to become zero-carbon by 2050 by increasing energy efficiency, including through the use of smart technologies, and utilising low carbon energy sources.

e) The GLA have also produced Energy Planning Guidance specifically to address the Approved Document L:2021 of the national Building Regulations which took effect on the 15 June 2022 and the Carbon Emissions reporting Spreadsheet has been updated accordingly.

f) The London Plan, March 2021, Policy SI 2 – Minimising greenhouse gas emissions, expects development proposals to be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the energy hierarchy:

- Be Lean – use less energy and manage demand during operation
- Be Clean – exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly
- Be Green – maximise opportunities for renewable energy by producing, storing and using renewable energy on-site
- Be Seen – monitor, verify and report on energy performance

g) The Policy SI 2 sets a minimum on-site reduction of at least 35 per cent beyond Building Regulations for all developments and major developments should aim for zero carbon. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures.

h) Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

1. through a cash in lieu contribution to the borough's carbon offset fund, or
2. off-site provided that an alternative proposal is identified and delivery is certain.

i) It also requires Boroughs to establish and administer a carbon offset fund and the offset fund payments must be ring-fenced to implement project that deliver carbon reductions.

j) The Energy and Sustainability Statement follows the principles set out in the Energy Hierarchy and is broken down to provide the following details:

i) Estimated site-wide regulated carbon dioxide emissions and reductions (broken down for the domestic and non-domestic elements), expressed in tonnes per annum, after each stage of the energy hierarchy

ii) A clear commitment to regulated carbon dioxide emissions savings compared to a Part L 2013 of the Building Regulations compliant development through energy demand reduction measures alone

iii) Clear evidence that the risk of overheating has been mitigated through passive design
iv) Evidence of investigation into existing or planned district heating networks that the development could be connected to, including relevant correspondence with local heat network operators
v) Commitment to a site heat network served by a single energy centre linking all apartments and non-domestic building uses, if appropriate for the development
vi) Where applicable, investigations of the feasibility of installing CHP in the proposed development (if connection can’t be made to an area wide network) before considering renewables
vii) An initial feasibility test for renewable energy technologies and, where appropriate, commitment to further reduce carbon dioxide emissions through the use of onsite renewable energy generation

k) Developments are expected to achieve carbon reductions beyond Approved Document L from energy efficiency measures alone to reduce energy demand as far as possible. Residential development should achieve 10 per cent and non-residential development should achieve 15 per cent over Approved Document L.

l) 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 publication of the London Plan 2021.

m) Under The London Plan Policy SI 3 – Energy Infrastructure, the Mayor expects developments to investigate the use of heat networks, particularly for large scale developments. Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating systems. Where no heat network is not in existence yet, the development should be designed to allow for the cost effective connection at a later date. The heat network should achieve good practice design and specification standards.

n) Policy SI 4 – Managing Heat Risk, requires developments to minimise adverse impacts of the urban heat island through design, layout, orientation , materials and the incorporation of green infrastructure. Developments should demonstrate the potential for internal overheating and reliance on air conditioning systems can be minimised 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

o) The Policy SI 5 – Water Infrastructure, seeks to minimise the use of potable water supplies and promote improvements in the water supply infrastructure. Developments should minimise the use of mains potable water in line with the Optional Requirements of the Approved Document G of the Building Regulations by achieving water consumption of less than 105 litres per person per day, excluding an allowance of 5 litres for external water consumption.

4.0 SUSTAINABLE DESIGN AND CONSTRUCTION ASSESSMENT

a) The building fabric, the building services and the management of the building broadly determines its energy usage. The detailed design of a building is an iterative process, often requiring the involvement of different professional disciplines to establish the fundamental objectives of the design. An overall design philosophy in this respect has been established at an early stage.

b) As a result of central Government objectives, followed through at local level the general design philosophy for this site has a strong emphasis on sustainable design. This is not only in terms of the location and suitability of the site but also in relation to the way in which the building is constructed and will be used by its future occupants.

c) The first step in developing an integrated design is to establish the function of the buildings envelope and how it interacts with the usage patterns of the building and the technology used to condition the individual spaces.

d) Good fabric design can minimize the need for services. Where appropriate, designs should avoid simply excluding the environment, but should respond to factors like weather and occupancy and make good use of natural light, ventilation, solar gains and shading, where they are beneficial.

e) This section of the report will look at the ways in which energy is used within the proposed building and how the design can encourage efficient levels of energy consumption.

3.1 Management

a) Although improvements can be made to the fabric and services of a building, often the biggest impact on the day-to-day energy consumption is influenced by the way in which the building is managed. It is common to find well-designed buildings operating badly due to poor management. Conversely, poorly designed buildings can be optimised to their maximum efficiency through good management practices.

b) It is recommended that due consideration is given to the management strategy of the building. It is understood that the dwelling will be within private ownership. However, there is still an opportunity to provide for the most efficient management system and to encourage the future occupants to manage their homes efficiently.

c) This may include the use of movement sensor switched lighting systems, the installation of energy efficient electrical appliances, efficient lighting and fittings that do not permit the use of non-efficient lamps, tightly controlled heating and ventilation specific to the location within the dwelling, installation of efficient hot water systems and the provision of recycling facilities.

d) The EU energy efficiency labelling scheme rates products from A (the most efficient) to G (the least efficient). For refrigeration, the scale now extends to A++. The occupants of the dwelling shall be provided with information on the EU Energy Efficiency Labelling Scheme so that they are informed of the benefits of the scheme.

3.2 Ventilation

a) Natural ventilation is the most energy efficient form of ventilating any space. The proposed use and traditional architectural design of this building enables it to make best use of natural ventilation via openable windows.

b) Horizontal pivoted windows produce the most effective ventilation because of their inherent characteristic to develop large openings, where air will tend to enter at the lower level and exit via the top. They are easily adjustable to provide control and reduce the amount of energy required to run and maintain artificial ventilation systems. Normal casement windows can provide a degree of natural ventilation and with the layout of the dwelling; it is possible to obtain good cross ventilation.

c) Given the historical records for the British Isles, the weather permits a possible energy saving with the use of windows to provide cooling and ventilation. When the outside temperature ranges between 14 °C through to

24 °C, people are able to moderate the heat build-up in the space with the use of an openable window systems.

d) In addition to allowing direct and flexible control of heat through the use of openable windows they, also provide for the natural provision of fresh air to the occupants eliminating the need for artificially produced fresh air supply.

e) At other times of the year, mechanical ventilation with heat recovery can conserve energy in each dwelling by recovering heat from the warm moist extracted air and transferring it to the incoming fresh air. This works both ways so if the outside temperature is higher than inside the exchanger helps to maintain a comfortable internal environment. The mechanical ventilation with heat recovery system ensures high air quality whilst maintaining a balance between extraction and supply.

3.3 Heating System

a) The method of heating for the dwellings is not yet decided, however, it proposed method of heating for the dwelling will use of a highly efficient heat source, with weather compensation. It shall be appropriately designed to provide suitable conditions for the occupants and to offset the heat losses through the fabric of the dwelling.

b) The heating systems will be provided with time and temperature zone control to control the heating in the spaces.

c) Weather compensation will be used to help control the heating system. It uses an outdoor temperature sensor to adjust the system controls to compensate for changes in outdoor temperature automatically. As the weather gets colder the system works harder and produces more heat to the space. However, the weather warms up the system reduces the temperature of the heating system thereby reducing the energy consumption and carbon dioxide emissions.

d) If a central heating system was used, the heat would be have to be available for any occupant all the time, which would require a large buffer storage vessel and distribution around the building all the time. With the local heating systems, there are no storage or distribution losses.

e) Due to the high level of insulation standards required under the current building regulations and the associated heat gains of the building, the level of artificially produced heat required to the internal spaces is envisaged to be low.

3.4 Lighting (Natural / Artificial)

a) The proposed design makes best use of natural daylight to reduce the amount of electrical energy used to provide the minimum luminance for the required conditions. It is envisaged that all the habitable rooms within the dwelling are to be provided with natural light via windows. The number of windows proposed and the use of dimming controls on the lighting scheme where appropriate may assist in achieving the maximum reduction of electrical consumption.

b) The dwellings are orientated so that the large windows do not face south or are shaded, thus avoiding excessive solar gains during the summer.

c) When selecting luminaries, consideration should be given to their inherent local power consumption and luminance levels. This together with the use of energy saving lamps will reduce the consumption of energy through lighting to a minimum. It is suggested that a development of this kind could reduce the energy usage further by installing luminaries that only allow the use of energy saving lamps.

d) Any lighting in the external areas shall be fitted with automatic control systems, like passive infrared sensors, time switches or “dawn to dusk” day light sensors. These luminaires shall be fitted with low energy lamps.

3.5 Hot Water Systems

a) The hot water demand for the dwellings shall be generated using the efficient heating source and if necessary, a very well insulated hot water storage cylinder is to be provided.

b) The hot water system shall be designed to appropriate standards required by the current building regulations. This will ensure the minimum amount of heat loss from hot water pipe work by applying a high standard of thermal insulation and ensuring the correct circulation throughout the system.

c) Waste Water Heat Recovery Systems can be attached to the showers and are a proven and cost effective way to achieve energy savings and carbon emission reductions. They are either fitted around the waste pipe from a shower or bath, or in the shower tray itself, and recover heat from the drain water as it leaves the shower or bath. This recovered heat is used to preheat the cold water feed to the boiler and therefore reduces the amount of energy used by the boiler.

d) It is possible, with the ever-increasing demand on the limited supply of the natural resource of water, to suitably restrict the flow of water outlets. Flow restrictors can be installed on outlets where a reduced flow is acceptable, for example on showers and basins. This system allows for a uniform maximum flow to be provided regardless of natural water pressures throughout the dwelling.

3.6 Cold Water Systems

a) Cold water consumption can be kept to a minimum by the installation of a numbers of facilities.

b) Modern water efficient dual flush WC cisterns should be fitted as standard and as with the hot water system flow restrictors can be fitted to provide a uniform maximum flow rate throughout the dwelling.

c) Simple water butts can be provided in appropriate locations, allowing for the collection of rain water for the direct use on external landscaped areas. Water butts are the cheapest and easiest way of reducing the use of drinking water for this purpose. There are many products on the market ranging in price and size and some local authorities offer their own option at a subsidised price to the consumer.

d) It is not possible to estimate the total water saving from the installation and use of such a device as this is very much dependant on the landscaping design for the dwelling, the annual rain fall and the required usage of this water within the domestic setting. However, an average storage device can produce up to 5000 litres of usable rainwater per year.

3.7 Sustainable methods of construction

a) Sustainable methods of construction can range from the simplest of solutions, such as construction in locations with access to sustainable modes of transport to the more complex solutions including passive solar design and rainwater harvesting.

b) The following paragraphs will briefly discuss some of the additional options available for incorporation into the scheme at this early stage or later during the detailed design process.

3.8 Passive Solar Design

a) Passive solar gain can be experienced in both a positive and negative manner. South facing facades can often benefit from solar passive gain during the winter months but this is counteracted by the increased requirement for cooling during the summer.

b) In a scheme like that proposed, it is important to recognise where solar passive gains will be experienced and to design the scheme to enhance the effect during the winter and protect from it during the summer.

3.9 Building Envelope

a) All facades of the dwellings shall be designed to ensure that the minimum standards required by the Approved Document L of the Building Regulations are exceeded and that care shall be exercised to ensure flexibility and good shading systems are installed where necessary.

b) Any insulation that is used in this development shall have global warming potential of less than 5. This shall include not only the thermal insulation, but any acoustic insulation.

3.10 Enhanced Construction Details

a) The dwellings envelope shall be designed using the Enhanced Construction Details to limit recurring thermal bridging. This exceeds the requirement of the Building Regulations and helps lower the carbon emissions of the dwelling by reducing the heat losses by cold bridging.

3.11 Surface Water Drainage

a) Surface water drainage at the site will follow the Sustainable Drainage Systems (SuDS) management train.

b) The surface water will drain into the existing surface water system on site, with permeable surfacing acting as attenuation devices for slowing and holding the surface water run-off.

3.12 Rainwater Harvesting

a) The harvesting and recycling of rainwater can considerably reduce mains water consumption for toilets and other uses that do not need a sanitized water supply.

b) However, the plant space requirement for treatment and storage is often difficult to incorporate into a scheme. It also requires additional public health and water system risers to be installed to serve the facilities able to utilise such a water supply. If this system were to be considered then early design allowances would be required.

c) An alternative option would be to install a water butt system as discussed above, that allows the collection of rainwater from the roof to be used in the amenity space provided.

3.13 Sustainable Material Choices

a) A high percentage of carbon dioxide emissions are generated by unsustainable modes of transport. This is not only made up of the use of the private car but is substantially increased by the use of road as the popular way of transporting materials and goods needed during the construction purposes.

b) Many opportunities are now available to Architects wishing to make more sustainable choices when specifying building materials. The consideration can include where the materials come from, its' travel distance, mode of transport, and the nature in which the material resource is manufactured and managed.

c) Throughout the design process consideration will be given to not only the quality of materials to be specified, but also to the quantities. Additional consideration will be given to building material selection that maximises the life expectancy of the building by selecting materials build-ups from the Green Guide to Specification published by the Building Research Establishment (BRE).

d) The proposed development will be constructed of materials with a low environmental impact, achieving a Green Guide rating of between A+ and D for all five elements of construction, as follows:

- Roof.
- External walls.
- Internal walls.
- Upper and ground floors.
- Windows.

e) Consideration will also be given to the use of materials and products manufactured in the UK and Europe. Once a contractor is appointed, the opportunities for the use of local suppliers for their supply chain will also be explored.

f) All timber, including that used in the construction processes, will be required to be legally sourced. The definition of legally sourced timber follows the UK Government's definition of legally sourced timber, according to the CPET 2nd Edition report on UK Government timber procurement policy.

3.14 Recycling Facilities

a) In order to encourage the homeowners to recycle household waste, the dwelling can be provided with recycling bins, both within the dwelling and in the external waste storage area.

b) The recycling bins could be in the form of three internal in a dedicated non obstructive location in the kitchen. The bins shall be in a variety of sizes and a total capacity of 30 litres and no individual bins shall have a capacity of less than 7 litres.

c) External bins shall be provided for the Local Authority collection scheme. These shall be located in a dedicated location.

4.0 ENERGY ASSESSMENT

4.1 Introduction

a) This section of the Energy and Sustainability Statement shall make an appraisal of the carbon dioxide emissions of the proposed development, assess the implications of fabric and building services enhancements, the various methods of generating and using renewable energy at source, and to suggest the most appropriate means by which the development can contribute towards the aspiration of policy relating to reducing energy consumption and renewable energy provision.

b) In order to assess the impact of the improved building envelope and the fixed building services, the initial Standard Assessment Procedure (SAP) Assessments, version 10, have been carried out on the proposed dwellings as if they were constructed simply to comply with the requirements of the current Building Regulations. Further SAP calculations have been undertaken to demonstrate an improvement in the carbon emissions by incorporating better fabric constructions, better windows and doors, improved ventilation systems and efficient building services.

c) The energy assessment shall follow the principles set out in the London Plan, March 2021, Policy SI 2, which expects development proposals to make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

- Be Lean – use less energy
- Be Clean – supply energy efficiently
- Be Green – use renewable energy
- Be Seen – modify, monitor and report

4.2 Baseline Carbon Dioxide Emissions

a) In order to assess the carbon dioxide emissions of the development, the delivered energy demand needs to be estimated. At this stage in the design of the dwellings, the detailed construction drawings have not been prepared and therefore detailed carbon emission calculations cannot be undertaken to produce the carbon dioxide emissions.

b) However, the developments carbon dioxide emission estimates can be based on the current drawings and construction information known at this time and the initial stage SAP calculations.

c) Based on the current design and using construction information, the proposed dwellings comply with the current Building Regulations. The building services information is based on standard building services to meet the requirements of the Building Regulations.

d) Table 1 below summarises the results from the SAP Worksheets that can be found in Appendix A.

Dwelling	TER (kg/m²/yr)	Area (m²)	Part L 2021 CO_2 Emissions (kgCO_2/yr)
1	8.79	528	4,641.1
Baseline Carbon Dioxide Emissios (kg/yr)			**4,641**

Table 1 – Baseline Carbon Dioxide Emissions

4.3 Improved Baseline Carbon Dioxide Emissions – BE LEAN

a) Following the principles set out in the Mayor's "Energy Hierarchy" which is implemented through the London Plan and the Local Policy, the proposed design has been improved to use less energy and lower the carbon dioxide emissions - BE LEAN.

b) This has been achieved by improving the thermal performance of the various constructions, like the walls, roof, floors, windows, doors etc and improving the air tightness of the dwellings.

c) The floor U Values can be improved by incorporating insulation under the screed, or by using insulation blocks instead of concrete blocks between the beams. For the purposes of these calculations, the U Values of the current floor constructions have been calculated as 0.11 W/m^{2}K.

d) The wall U Values can be improved by improving the thermal performance of the insulation, either by increased thickness or lower thermal conductivity. In addition, insulated plasterboard will be used in place of standard plasterboard. For the purposes of these calculations, the U Values of the current wall constructions have been calculated as 0.13 W/m^{2}K.

e) The roof areas offer excellent opportunity to enhance the insulation levels and for the purposes of these calculations, the U Value of 0.14 W/m^{2}K has been used.

f) The thermal performance of the windows can be improved by adding coatings to the panes or adding an inert gas to the cavities. For the purposes of these calculations, a U Value for the windows of 1.2 W/m^{2}K has been used, which uses double glazed planitherm glass, argon gas and warm edge spacer bars.

g) A composite front door can be used instead of a timber door. Modern composite doors have good thermal, fire, acoustic and security properties. These types of door can have U Values as low as 0.55 W/m^{2}K.

h) The air leakage rate for the dwelling can be improved. The maximum allowed under the current Building Regulations Approved Document L1A:2013 is 10 $m^3/hr/m^2$ at 50 Pascal's. With carful detailing, this can be easily improved to 3 $m^3/hr/m^2$ at 50 Pascal's.

i) The use of Accredited Construction Details in the development means that the thermal bridging coefficient can be greatly improved thus a lower γ Value can be used.

j) With regard to the heating, local highly efficient gas fired condensing boilers have been used. These provided excellent control for the dwelling occupants and avoid heat distribution losses by installing a central system.

k) More efficient controls can be installed to control the heating, which can include weather compensation on the boiler control and the use of programmers, thermostats and thermostatic radiator valves all improve the efficiency of the heating system.

l) Instead of simply installing 75% of the light fittings as low energy efficient light fittings, as required by the current Building Regulations, 100% of the light fitting could be low energy fittings.

m) The use of natural lighting has been considered and although its use is not measured in the SAP calculations, it can help lower the energy use and therefore carbon dioxide emissions. This is carefully assessed against any unwanted solar overheating. Whilst a degree of solar gain can be beneficial for the occupants and helps lower the carbon dioxide emissions, it must be controlled to minimise the risk of solar overheating. The calculations show that there is only a slight to medium risk of overheating.

n) Mechanical ventilation heat recovery systems work by removing the warm moist air from kitchens and bathrooms and passing it through a heat exchanger to recover waste heat. This waste heat can then be used to warm the fresh air that is brought into the living areas of the dwellings, therefore reducing the heating load.

o) The development shall be designed to ensure that the Dwelling Emission Rates are better than the Target Emission Rates and the Fabric Energy Efficiency is better than the Target Fabric Energy Efficiency. These are the requirements from Criterion 1 of the current Building Regulations Approved Document L (2013).

p) By incorporating items like those stated above, the SAP calculations have been updated to demonstrate the effect of these improvements and the results are listed in Table 2 below.

q) Full details can be found in the Full SAP Calculations Printout in Appendix A.

Dwelling	DER (kg/m2/yr)	Area (m2)	Part L 2021 CO_2 Emissions ($kgCO_2$/yr)
1	8.78	528	4,635
Baseline Carbon Dioxide Emissions (kg/yr)			**4,641**
Percentage Improvement Over Building Regulations			**0.1%**

Table 2 – Actual Carbon Dioxide Emissions

r) As demonstrated in Table 2 above, the improvements in the thermal performance and fixed building services, a reduction of 0.1% can be achieved in the carbon emissions of the development.

4.4 Supplying Energy Efficiently – BE CLEAN

a) Following the principles set out in the Energy Hierarchy, the next step is to reduce the carbon dioxide emissions by supplying energy efficiently - BE CLEAN.

4.5 District Heat Network

a) The London Heat Map is an online tool that can help identify opportunities for the use of decentralised energy networks and systems for use in projects.

b) Using the Heat Map, there appears to be no district heating systems available or even proposed in the area within the next five years, so it would not be feasible to install plant for future connection to such a network at this time.

c) Due to the small size of the development, a communal heating system would be relatively expensive to install and to operate and therefore is not be considered at this time. This is in line with the Greater London Authority's "Sustainable Design and Construction SPG" in published in April 2014.

d) In line with the Greater London Authority's "Sustainable Design and Construction SPG" in published in April 2014, it is considered that no potential heat networks available in the foreseeable future.

4.6 Combined Heat and Power

a) Combined Heat and Power typically generates electricity on site as a by-product of generating heat. It uses fuel efficient energy technology that, unlike traditional forms of power generation, uses the by-product of the heat generation required for the development. Normally during power generation, the heat is discharged or wasted to atmosphere.

b) A typical CHP plant can increase the overall efficiency of the fuel use to more than 75%, compared to the traditional power supplies of 40%, which uses inefficient power stations and takes into account transmission and distribution losses.

c) The use of this development is primarily residential and it will be built to exceed the current Building Regulations. The aim of these regulations is to minimise the base heating load and electrical loads. The site base heating and electrical loads is key to the sizing and operation of any CHP system.

d) Due to the high levels of insulation and energy efficiency measures that will be incorporated into this development, there is no year round heat load for the CHP plant and therefore, a CHP system would be considered not viable on this development. As such, if a CHP system were to be incorporated, it would not operate efficiently and therefore NOT BE CLEAN.

4.7 Communal Heating Heat Network

a) A communal heating system would require a plant space and a central distribution network. As this development is for only ten dwellings, a communal system would be uneconomical to install and would have relatively high running and management costs for the future occupants.

b) In addition, the development is for ten flats on a very tight site and in order to provide amenity space, there does not appear to be sufficient space for a communal plant room.

4.8 Renewable Technologies Considered – BE GREEN

a) Taking into account the requirements of planning policy set out by London Borough of Bromley and the London Plan, the final step in the "Energy Hierarchy" is to reduce the carbon dioxide emissions by the use of renewable technologies - BE GREEN.

b) A review of the potential renewable technologies has been undertaken to identify any potential low or zero carbon technologies which could be incorporated at a later date. The following renewable energy resources have been assessed for availability and appropriateness in relation to the site location, building occupancy and design.

- Combined Heat and Power
- Biomass Heating
- Biomass CHP
- Heat Pumps
- Solar Photovoltaics
- Domestic Solar Hot Water Systems
- Wind Power

c) A preliminary assessment has been carried out for each renewable energy technology and for those appearing viable a further detailed appraisal has been undertaken.

d) The preliminary study considered the site location and the type of building in the development and surroundings and produced a shortlist of renewable energy technologies that will be the subject of a further feasibility study.

e) Table 3 below provides a summary of the assessment.

4.9 Renewables Toolkit Assessment

Energy System	Description	Comment
Combined Heat and Power (CHP)	Combined Heat and Power systems use the waste heat from an engine to provide heating and hot water, while the engine drives an electricity generator. These systems uses gas or oil as the main fuel and therefore can not truly be considered as renewable technology however, it is recognised that they have a significant reduced impact on the environment compared to conventional fossil fueled systems.	As CHP systems produce roughly twice as much heat as they generate electricity, they are usually sized according to the base load heat demand of a building, to minimise heat that is wasted during part-load operations. Therefore, to be viable economically they require a large and constant demand for heat, which make their use in new energy efficient housing, with high insulation, not really suitable. The efficiency of small scale CHP is relatively low and is unlikely to result in CO_2 emission savings. Economic viability relies on 4000 hours running time, which is unlikely to be achieved in this scheme. As policy requires a reduction in carbon dioxide emissions via true renewable sources this would not assist in achieving the policy objectives.
Combined Heat and Power		**Feasible – NO**
Biomass Heating	Solid, liquid or gaseous fuels derived from plant material can provide boiler heat for space and water heating. Biomass can be burnt directly to provide heat in buildings. Wood from forests, urban tree pruning, farmed coppices or farm and factory waste, is the most common fuel and is used commercially in the form of wood chips or pellets, although traditional logs are also used. Other forms of Biomass can be used, e.g. bio-diesel.	Wood pellet or wood chip fired or dual bio-diesel/gas-fired boilers could be considered. As this development consists of a new building, it offers the opportunity to accommodate such a system. The flues would have to be discharged to atmosphere above roof level and concerns raised by Environmental Health regarding the pollutants and particles, which would have to be addressed. Care need to be taken with the design of the flue to ensure particle discharge is not a concern to residents. The fuel storage silo/tank would have to be located external to the building, which is not available on this site. A suitable local fuel supplier is required to supply the site.
Biomass Heating		**Feasible – NO**

Energy System	Description	Comment
Biomass CHP	CHP as above, but with biomass as the fuel.	Whilst the Biomass CHP system may overcome the issue of the reduction in carbon dioxide emissions via true renewable sources, however, the lack of a year round base load is still a problem and therefore Biomass CHP is not feasible for this development.
Biomass CHP		**Feasible - NO**
Ground/Air Source Heat Pumps (GSHP / ASHP) - heating	The ground collector can be installed, either as a loop of pipe, in the piles or using a borehole and a compressor offer efficient heating of a space in winter, as the temperature of the ground (below approx 2m) remains almost constant all year. For air source, the external condensing unit can be located adjacent to the dwelling in a discreet location.	Ground and air source heat pumps are most efficient when supplying heat continuously and in areas where a mains gas supply is not available. In dwellings, GSHP and ASHP are capable of supplying the majority of the total space heating and pre heat for the hot water demand. This site does not appear to have external areas of sufficient size for the installation of ground loops for the collection of heat. It is possible that the use of ASHP to offset the heat losses and to provide the hot water for these dwellings would be feasible for this development.
Ground/Air Source Heat Pumps		**Feasible – YES**
Solar Photovoltaics (PV)	Building Integrated Photovoltaics (BIPV) or Roof mounted collectors provide noiseless, low maintenance, carbon free electricity.	There appears to be areas of roof that could be utilitised to install PV panels onto the scheme. These could be integrated into the roof finishes or mounted on frames on the roof and orientated towards the southwest for optimal performance. Careful consideration must be given to the chosen roof finish to ensure compatibility.
Solar PhotoVoltaics		**Feasible – YES**
Solar Thermal Hot Water	Solar collectors for low temperature hot water systems require direct isolation, so the chosen location, orientation and tilt are critical.	This solution could be utilised to generate hot water using the energy from the sun. The area of roof could be used for the installation of solar thermal collectors. These could be mounted on frames and orientated south for optimal performance. These would have to be installed at a pitch of 30-40 degrees and ideally as close to the dwelling served as possible.
Solar Thermal Hot Water		**Feasible – YES**

Energy System	Description	Comment
Wind Power	Most small (1-25kW) wind turbines can be mounted on buildings, but larger machines require foundations at ground level and suitable site location	It could be viable to install some form of wind turbines on this site, however due to surrounding buildings and the visual impact it is not considered to be the most sensitive system of providing energy via renewable resources in this built up location. There are also concerns that the wind across the site would be turbulent because of the surrounding buildings.
Wind Power		**Feasible – NO**

Table 3 – Renewable Technology Feasibility Assessment

a) From the above it has been established that there are two potential ways of providing energy via renewable sources appropriate for inclusion in this scheme, these being the use of solar photovoltaics and domestic solar hot water or a combination thereof.

b) CHP and Micro CHP are considered not feasible as the economic viability relies on at least 4,000 hours runtime which is unlikely to be achieved in this development.

c) Biomass systems have been considered unfeasible for this site due to particle discharge in a built up area, fuel handling and storage on a site with limited open space, required plant areas and the on going maintenance of the system.

d) Ground source heat pumps have been considered not feasible for this development as there is insufficient ground area for the installation of ground loops.

e) Air source heat pumps require an outdoor unit with space to allow for good air flow. Due to the layout of the building and amenity spaces, a space has been identified for the installation of the outdoor unit that would not result in loss of amenity space or create a nuisance to the occupiers of the space.

f) There are some concerns of the noise emissions from the outdoor units being so close to bedrooms.

g) Wind has been considered not viable for this site as there are a lot of the buildings and trees in the surrounding area which are likely to cause disruption to air flows.

4.10 Heat Pumps

a) Heat pumps are used to extract the heat from the ground, air or water and transfer it to a heating distribution system, such as under floor heating or radiators using an electric pump. They are usually efficient enough to provide for all space heating requirements and a pre-heat for the domestic hot water systems.

b) The system would comprise of a heat exchanger either buried in the ground, or mounted on the exterior of the building, or located within a water course, and a heat pump. These would be connected to a traditional heating distribution system, like radiators, underfloor heating, fan coil units etc.

c) The system uses the latent solar energy stored in the ground or water, or the latent temperature of the air around or within the building. The heat pump upgrades the heat energy to provide the heating for the building. The heat pump operates on the same principles as a refrigeration cycle, like a domestic fridge, except the heat is retained and the cold rejected.

d) Ground source heat pumps are generally the most efficient however can be expensive to install as the heat exchanger needs to be buried under the ground. Their efficiency and practicality can also be affected by the ground conditions of the site. Water source heat pumps are only suitable where there is a water source available and when appropriate consents have been obtained to utilize this source. Air source heat pumps are generally more flexible as the heat pump and exchanger unit is usually mounted external to the building or within a garage or storage space.

e) There does not appear to be sufficient space around or under the building to provide adequate area for sufficient heat collectors for the development. Therefore, it is not considered suitable for a ground source heat pump at this stage.

f) With regard to emissions, heat pump installations are pollution free. There are no local emissions and, although there will be carbon dioxide emissions associated with their electricity use, these are much less than other forms of electric heating and can be lower than those associated with conventional gas or oil fired boilers.

g) It is proposed to use an air source heat pump to provide the heating and hot water for this development. The heat pump will be connected to the low-temperature distribution system, e.g. radiators, convectors or underfloor heating and hot water cylinder.

h) Many of the safety considerations appropriate to any refrigeration or air conditioning systems apply to the use of heat pumps since the working fluid is often a controlled substance that needs to be handled by trained personnel. However, once the system is commissioned, accidental release of refrigerant is unlikely.

i) In general terms heat pumps of all kinds are expected to operate an average output efficiency of 3:1, this means that for every 1 unit of energy used to run the system it will produce 3 units of energy as a result.

j) The SAP Assessments have been adjusted to incorporate the use of the air source heat pump and the SAP worksheets are summarised in Table 4 below.

Dwelling	Floor Area (m2)	Heating (kg/yr)	Water Heating (kg/yr)	Pumps & Fans (kg/yr)	Electricity for Lighting (kg/yr)	Total Emissions (kg/yr)	Dwelling CO2 Emission Rate
E1260-01	528	1,289.97	228.18	278.94	111.52	2,212.32	4.19

Dwelling	DER (kg/m^2/yr)	Area (m^2)	No. off	Emissions (kg/yr)
E1260-01	4.19	528	1	2,212.3

Baseline Carbon Dioxide Emissions (kg/yr)	**4,641**
Improved Carbon Dioxide Emissions (kg/yr)	**2,212**
Percentage Improvement over current Building Regulations	**52.3 %**

Table 4 – Air Source Heat Pump Carbon Dioxide Emissions

k) By using fabric and energy efficiency figures from section 4.3 above and using an air source heat pump to meet the heating and hot water demands for the dwelling, the carbon dioxide emissions can be reduced by 52.3% when compared with the Approved Document L1:2021 baseline carbon dioxide emissions.

4.11 Solar Photovoltaics

a) Photovoltaics (PV) is a technology that allows the production of electricity directly from sunlight. The term originates from “Photo” referring to light and “voltaic” referring to voltage. This type of technology has been developed for incorporation within building design to produce electricity for either direct consumption or re-sale to the National Grid.

b) PV panels come in modular panels which can be fitted on the top of roofs or incorporated in the finishes like slates or shingles to form integral part of the roof covering. PV cells can be incorporated into glass for atria walls and roofs or used in the cladding or rain screen on a building wall.

c) When planning to install PV panels, it is important to consider the inherent cost of installation in comparison to possible alternatives. The aesthetic impact of the PV panels also requires careful consideration.

d) Roof mounted PV panels should ideally face south-east to south-west at an elevation of about 30-40°. However, in the UK even if installed flat on a roof, they receive 90% of the energy of an optimum system.

e) PV installations are expressed in terms of the electrical output of the system, i.e. kilowatt peak (kWp). The Department of Trade and Industry estimate that an installation of 1kWp, could produce approximately 700-850 kWh/yr, which would require an area of between 8-20m^2, depending on the efficiencies and type of PV panel used.

f) It is also estimated that a gas heated, well insulated typical dwelling would use approximately 1,500kWh/year electricity for the lights and appliances, therefore the 1kWp system could save approximately 45% of a single dwellings electrical energy requirements.

g) Although often not unattractive, and possible to integrate into the building or roof cladding, PV systems are still considered likely to have visual implications, therefore careful sighting of the panels is required.

h) As this installation will be contained on the roof of the proposed dwellings, it involves no additional land use.

i) With regard to noise and vibration, a PV system is completely silent in operation.

j) Care must be taken with the design and installation of PV systems as they need to meet standards for electrical safety.

k) Space has been identified on the side roof of the dwelling that can be used for the installation of photovoltaic systems. The Table below shows the reduction achieved if a photovoltaic system with an output of 1.875 kWp is installed on the roof.

Development incorporating Energy Efficiency Measures	Total Carbon Dioxide Emissions ($kgCO_2/yr$)	Percentage Reduction (%)
No Renewables (gas heating)	4,635	-
Reduction by including 1.875 kWp PV system	194.7	4.2%
No Renewables (ashp heating)	2,212	-
Reduction by including 1.875 kWp PV system	194.7	8.8%
Final Carbon Dioxide emissions ASHP + PV	2,017 $kgCO_2/yr$	
Total Reduction over baseline emissions	56.5%	

Table 5 – Photovoltaic Carbon Dioxide Emissions

l) As can be seen from Table 5 above, the incorporation of photovoltaic systems, with a total output of 1.875 kWp, on the southwest roof of the dwelling, the development could reduce the carbon dioxide emissions by a further 4.2% by themselves, but if combined with the air source heat pump, a total reduction of 56.5% could be achieved.

m) From the above calculations, based on 375 watt panels, orientated towards the southwest and mounted on the roof finishes at a 40 degree pitch, it is calculated that 5-No. panels are required on the roof. This would require an area of approximately 10-15m^2.

n) It is estimated that this size of system could generate 1,414 kWh of electricity in a year.

o) These panels could be connected to the electric supply for the dwelling to be used in the dwelling or used to charge batteries for use at a later time. Any surplus electricity can be exported to the National Grid.

p) Further detailed calculations for the carbon dioxide emissions and the final system size and layout shall be carried out during detailed design.

4.12 Domestic Solar Hot Water System

a) This system uses the energy from the sun to heat water, most commonly to provide the hot water demands of the development. The system uses heat collectors, generally mounted on the roof, in which a fluid is heated by the sun. This fluid is used to heat up water that is stored in either a separate cylinder or a twin coil hot water cylinder inside the dwelling. The system works very successfully in the UK, as it can operate in diffused light conditions.

b) As with PV panels, the collectors should be mounted facing in a southerly direction, from south-east through to south-west and at an elevation of 10 to 60°. The panels can be installed on the roof, either on the slope of the roof, on a frame, or they can be integrated into the roof finishes.

c) This system would be best suited on sites where the solar thermal collectors can be located close to the hot water storage vessel within the dwelling and therefore any losses can be minimised.

d) Approximately 2-4m^2 of solar thermal collectors could provide the hot water requirements of a typical dwelling. These could be used to feed twin coil hot water cylinders positioned within the dwellings, allowing the water to be heated by the sun when possible whilst retaining the back up of the main heating system when required.

e) This system would be relatively easy to install. However, the visual impact needs to be given consideration.

f) Although often not unattractive, and possible to integrate into the building or roof cladding system domestic solar thermal collectors are still considered likely to have visual implications, therefore careful sighting of the panels is required.

g) As this installation will be contained on the roof of the proposed development, it involves no additional land use.

h) With regard to noise and vibration, a domestic solar hot water system is completely silent in operation.

i) Space has been identified on the roof of the dwelling that can be used for the installation of 2m^2 evacuated tube systems, mounted on the roofs at a 30 degree pitch and orientated in a southerly direct.

j) However, it is unlikely that these will provide the required reduction in carbon dioxide emissions. Therefore, at this stage, the use of domestic solar hot water will not be considered further.

4.13 Annual Carbon Dioxide Emission Reduction

a) From the above, it can be seen that the use of air source heat pump for the heating and hot water demands of the dwelling, together with the fabric and energy efficiency measures, could be used to achieve in excess of the 35% reduction in carbon dioxide emissions as required by Planning Policy.

b) Based on the initial SAP calculations for the dwelling, it has been calculated that the baseline carbon dioxide emissions figure for the development, based on electric heating, is 4,641 $kgCO_2$/year.

c) In accordance with the Planning Policies set out by London Borough of Hillingdon and the London Plan, this report has demonstrated a 35% improvement in carbon dioxide emissions by fabric and energy efficiencies and the use of low or zero carbon technologies.

d) A number of options have been considered and the potential carbon dioxide reductions calculated using the SAP 10 calculations and a summary of the results is provided in Table 6 below.

	Total Carbon Dioxide Emissions ($kgCO_2$/yr)	Reduction in Carbon Dioxide Emissions (%)
Building Regulations Compliant Development	4,641	-
Development incorporating Energy Efficiency Measures	4,635	0.1%
Further Reduction in Carbon Dioxide Emissions by incorporating a Renewable Technology		
ASHP	2,212	52.3%
PV (1.875kWp ASHP)	2,017	56.5%

Table 6 – Summary of Reduction in Carbon Dioxide Emissions

e) It has been demonstrated that it is possible to achieve a total 52.3% reduction in carbon dioxide emissions over and above the 2021 Building Regulations by improving the energy efficiency of the development and its building services efficiencies and including low or zero carbon heating technologies.

f) CHP and Biomass CHP have been analysed but are considered not feasible for this development as the heating and electrical load profiles would not provide a good clean efficient system for the development.

g) Biomass heating has been analysed but is considered not feasible for this development due to particle discharge in the built up area, space requirements and the cost and the reliability of a biomass fuel source.

h) Wind power is considered not feasible for this development due to the turbulence caused by the surrounding buildings and trees etc.

i) Solar hot water could be considered further however, the reduction in carbon emissions would not meet the required reduction.

j) By installing a Photovoltaic systems with a total output of 1.875 kWp, a total further reduction of 8.8% could be made in the developments carbon emissions.

k) Detailed calculations of the total carbon dioxide emissions compared to the estimated carbon dioxide reduction for the development can be undertaken once the detailed design has progressed to construction drawing stage.

l) For the purpose of planning and based on the figures provided by initial SAP 10 calculations, this report has demonstrated that it is feasible, with the improvement of the building fabric, the introduction of energy efficient controls and systems and the installation of low or zero carbon technologies, a reduction in excess of 35% of the developments carbon dioxide emissions could be achieved. The shortfall to achieve zero carbon can be made via a payment to the Borough’s Carbon Offset Fund. This complies with the requirements of the planning policies set out by London Borough of Hillingdon and in the London Plan.

4.14 Monitor Energy Performance – BE SEEN

a) The final part of the Energy Hierarchy is to provide monitoring of the energy performance to ensure the proposed measures are working as intended.

b) In order to truly achieve net zero-carbon buildings, it is essential to have a better understanding of the buildings actual operational energy performance and work towards bridging the 'performance gap' between design theory and actual energy use.

c) It is for this reason that the London Plan 2021 Policy SI 2 sets out the 'be seen' requirement for all major development proposals to monitor and report on the actual operational energy performance for at least five years post construction. The 'be seen' policy will help to gain an understanding of the performance gap and identify ways of closing it while ensuring compliance with London's net zero-carbon target.

d) The GLA have published guidance to explain how to comply with this policy as well as a reporting template which ca be used if the permission is granted and the development is implemented.

4.15 Energy Hierarchy Carbon Dioxide Emissions Summary

a) The concept of applying the energy hierarchy in relation to Approved Document L of the Building Regulations 2021, the Energy Planning, Greater London Authority Guidance on Preparing Energy Assessments (March 2021) document provides further guidance on how the carbon dioxide emission figures can be presented.

b) The regulated carbon dioxide emissions reduction target for the development would be to achieve zero carbon as assessed under the Approved Document L 2021 of the Building Regulations.

c) These figures are based on the current design information and are subject to change when the detailed construction information is produced.

d) Table 7 provides Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings.

		Tonnes CO_2/yr
Baseline: Part L 2021 of the Building Regulations Compliant Development	a	4.6
After energy demand reduction	b	4.6
After heat network / CHP	c	4.6
After renewable energy	d	2.2

Table 7 – Carbon Dioxide Emissions after each stage of the Energy Hierarchy

e) Table 8 provides Regulated carbon dioxide savings from each stage of the Energy Hierarchy for domestic buildings

		Tonnes CO_2/yr		%
Savings from energy demand reduction	a-b	0.0	(a-b)/a*100	0.1%
Savings from heat network / CHP	b-c	0.0	(b-c)/a*100	0.0%
Savings from renewable energy	c-d	2.4	(c-d)/a*100	52.2%
Cumulative on site savings	**a-d=e**	**2.4**	**(a-d)/a*100**	**52.3%**
Annual Savings from off-set payment	a-e=f	2.2		
Cumulative savings for off-set payment	f*30=g	66.3		

Table 8 – Regulated carbon dioxide savings from each stage of the Energy Hierarchy

f) In Table 8 above, the cumulative savings for off-set payment has been calculated as 66.3 Tonnes of Carbon Dioxide over the next 30 years. The Greater London Authority has published the carbon offsetting figure of £95 / Tonnes Carbon Dioxide. This would equate to the sum of £6,303.

g) The calculations contained within this Energy Statement are based on the current design information and are subject to change when the detailed design is undertaken and the construction information is produced.

4.16 GLA Carbon Emission Reporting Spreadsheet 2022

a) As Approved Document L 2021 of national Building Regulations has been revised and came into force on 15 June 2022, the Greater London Authority (GLA) have revised their Energy Assessment Guidance and Carbon Emissions Reporting Spreadsheet accordingly.

b) The Energy Assessment Guidance 2020 provides information for planning applicants on how to comply with the London Plan climate mitigation policies. The Carbon Emissions Reporting Spreadsheet supports the guidance, and will be completed and submitted this along with this Energy Statement.

c) The GLA Summary tables can be found in Appendix C. The figure in these tables are taken from the GLA Carbon Emissions Reporting Spreadsheet V1.2-beta.

5.0 OVERHEATING

a) It is important to consider the internal comfort conditions for the occupants of the dwelling. At design stage, this can be met through the use of the "cooling hierarchy", as set out in the London Plan. The cooling hierarchy, in Policy 5.9, seeks to reduce any potential overheating and also the need to cool a building through active cooling measures. Air conditioning systems are a very resource intensive form of active cooling, increasing carbon dioxide emissions, and also emitting large amounts of heat into the surrounding area. By incorporating the cooling hierarchy into the design process buildings will be better equipped to manage their cooling needs and to adapt to the changing climate they will experience over their lifetime.

b) The development shall reduce the potential for overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy:

   e) minimise internal heat generation through energy efficient design
   f) reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls
   g) manage the heat within the building through exposed internal thermal mass and high ceilings
   h) passive ventilation
   i) mechanical ventilation
   j) active cooling systems (ensuring they are the lowest carbon options).

c) During the initial design, the initial SAP Assessment was carried out for the dwelling to help assess the energy demand and carbon emissions of the development. The SAP Assessment includes an overheating assessment in line with the requirements of the Building Regulations.

d) Based on this SAP Assessment, the dwellings have a slight to medium risk of solar overheating. This is acceptable under the requirements of the Building Regulations.

e) The internal heat generation has been minimised through energy efficient design. All of the luminaires shall be low energy which will also remove an internal heat generating load.

f) The heat entering the building in summer is reduced through the optimisation of glazing area, the use of shading via building form and other protruding edges, together with the inclusion of very high performance façade materials and improved air tightness. The use of a solar control glazing, which has a coating applied to lower the G Value of the glass, can be applied. This acts in the same way that the low e coating lowers the U Value which helps reduce heat losses through the windows.

g) The dwellings could have a mechanical ventilation system installed, which provides filtered fresh air to the dwelling. This is tempered by the crossover heat exchanger, which recovers waste heat from the extract air from the dwelling. The ventilation systems shall be controlled locally by the occupants.

h) Low energy lamps shall be used in the luminaires to reduce heat gain. These lamps do not emit heat like traditional GLS lamps.

i) It is also possible to include passive ventilation within the cores and staircase by utilising the smoke vents. The smoke vents are linked to thermostats and can be opened if the temperature exceeds an upper limit, thus providing passive and natural ventilation to these areas to remove any potential heat build-up.

j) If required, during the detailed design phase of this project, dynamic thermal modelling, using IES software to produce an SBEM model, in accordance with CIBSE Guide A, TM52 and TM49, can be used to ensure that the finding of the initial overheating assessment are still valid and provide a more detailed assessment and prediction of the overheating risk for the development.

6.0 WATER CALCULATIONS

k) The Greater London Authority and the London Borough of Bromley recognises that London and the South East is classified as 'seriously' water stressed, meaning that more water is taken from the environment than the environment can sustain in the long term. London is relatively resilient to drought and it takes two consecutive drier than normal winters to create water supply issues.

l) The Local Plan requires all new dwellings should limit domestic water consumption to 105 litres per person per day (l/p/d), with an additional maximum external water allowance of 5 litres.

m) Low water usage fitting, or flow restrictors can be fitted in the dwelling. Efficient white goods that are not only energy efficient but also water efficient can also be installed.

n) At this stage in the design, the final selection of the water fittings and appliance has not been made, but this calculations shows the design intent for these fittings and appliances.

o) Dual flush toilets can be installed to reduce the water consumption of the dwelling. A full flush capacity of 4.5 litres and a part flush capacity of 3 litres has been selected.

p) Flow restrictors shall be installed to limit the flow rates of the taps to 3 litres / minute. Flow restrictors shall also be installed in the kitchen taps and the utility room to restrict their flow to 8 litres / minute. The showers shall be restricted to 8 litres / minute.

q) The bath shall have a maximum capacity to overflow of 165 litres.

r) No Appliances have been selected at this time, so the default Best Practise values have been used. The washing machine shall have a water consumption of 8.17 litres / kg of dry load. The dishwasher shall have a water consumption of 1.25 litres / place setting.

s) No water softeners are being installed.

t) Using the Building Regulations Approved Document G Calculator, the water consumption has been calculated as 109.24 litres / person / day. This includes the 5 litre per day external water allowance.

u) The calculated water consumption for the dwelling complies with the requirements of the Local Plan and the Building Regulations Approved Document G.

v) Details of the calculations can be found in Appendix B.

7.0 CONCLUSION

a) The London Borough of Hillingdon and the London Plan 2021 Policy SI 2 requires new residential developments to minimise and exhibit the highest standards of sustainable design and construction. The reduction in carbon dioxide emissions target has been set as zero carbon. The development should achieve a minimum of 35% over the Target Emission Rate, as defined by the Building Regulations 2021, with carbon off setting used to provide zero carbon homes.

b) This development is for the erection of a new residential unit at 29 The Avenue, Ickenham, Hillingdon, UB10 8NR.

c) It is proposed that in order to meet the requirements of policy this development will adopt a high standard of design with regard to energy efficiency principles. It has been estimated that the proposed development will achieve a reduction of at least 0.1% in the carbon dioxide emissions through fabric and services efficiencies. A further 52.2% reduction through the use on-site low or zero carbon heating technology. This results in a total of 52.3%. It is envisaged during detailed construction design, these figures can be improved.

d) A further reduction in carbon emissions of 8.8% has been identified by installing solar photovoltaic system on the side elevation. However, at this stage of the development, it is not proposed to include this system. However, it may be included during detailed design.

h) A potential carbon off-set of 2.2 Tonnes, equating to 66.3 Tonnes over 30 years has been identified. Based on the Greater London Authority published carbon offsetting figure of £95 / Tonnes Carbon Dioxide, this would equate to the sum of £6,303.

e) At planning stage it is not possible to produce the final reports on the energy demand, carbon dioxide emissions, based on the initial construction information. It is envisaged that during detailed design, the reduction in carbon dioxide emissions can be improved.

f) This report has assessed the risk of overheating and the development has been identified as having slight to medium risk, which can be reduced by incorporating low G value glazing, internal shading by light coloured curtains or cross ventilation by opening the windows fifty percent of the time.

g) The water usage has been assessed and although the actual water fittings have not been selected yet, the calculations show that it is possible for this development to achieve the requirements of the planning policy, thus minimising the impact of the development on the local water resources.

h) This Energy and Sustainability Statement demonstrates that the proposed development exceed the minimum requirement of a 35% reduction on carbon emissions as set out by planning policy. This is achieved by incorporating fabric and energy efficiency measures and utilitsing low and zero carbon technologies like air source heat pumps. It has also been demonstrated that the development complies with the requirements of planning policy with regard to water consumption and overheating. It is for these reasons it is considered that this application should be viewed favorably by the London Borough of Hillingdon.

Appendix A – Full SAP Calculations Printout

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Elmhurst Sap 10 SAP 10 program, 1.0

Date: Thu 22 Sep 2022 12:33:22

Project Information			
Assessed By	Jason Doherty	Building Type	House, Detached
OCDEA Registration	EES/022645	Assessment Date	2022-09-22

Dwelling Details			
Assessment Type	As designed	Total Floor Area	528 m^2
Site Reference	E1260	Plot Reference	E1260-01
Address	29 The Avenue, Hillingdon, UB10 8NR		

Client Details	
Name	Client
Company	Company
Address	Address, Town, AA11 1AA

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*8.79 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	4.19 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*47.35 kWh_{PE}/m^2*	
Dwelling primary energy	43.59 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*46.9 kWh/m^2*	
Dwelling fabric energy efficiency	44.7 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m²K]***	**Dwelling average U-Value [W/m²K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (3) (0.18)	OK
Party walls	*0.2*	N/A	N/A	**N/A**
Curtain walls	*1.6*	N/A	N/A	**N/A**
Floors	*0.18*	0.12	1st floor (0.19)	OK
Roofs	*0.16*	0.14	Roof (4) (0.16)	OK
Windows, doors, and roof windows	*1.6*	1.2	R-NE (1.3)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m²]**	**U-Value [W/m²K]**
Exposed wall: Walls (1)	266.60175	0.13 **(!)**
Sheltered wall: Walls (2)	34.55	0.12 **(!)**
Exposed wall: Walls (3)	4.7	0.18
Ground floor: Heatloss Floor 1, Heatloss Floor 1	217.72	0.11
Upper floor: 1st floor, 1st floor	49.86	0.19
Exposed roof: Roof (1)	54.96	0.14
Exposed roof: Roof (2)	216.29	0.14
Exposed roof: Roof (3)	41.65	0.14
Exposed roof: Roof (4)	6.8	0.16

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m²]**	**Orientation**	**Frame factor**	**U-Value [W/m²K]**
D-NW, Door	2.31	North West	N/A	0.55 **(!)**
NW, Window	1.155	North West	N/A	1.2
NW, Window	1.155	North West	N/A	1.2
NW, Window	1.68	North West	N/A	1.2
NW, Window	1.68	North West	N/A	1.2
NW, Window	2.76	North West	N/A	1.2
NW, Window	1.44	North West	N/A	1.2
NW, Window	1.44	North West	N/A	1.2

Name	Area [m^2]	Orientation	Frame factor	U-Value [W/m^2K]
NW, Window	1.44	North West	N/A	1.2
NE, Window	0.975	North East	N/A	1.2
NE, Window	1.2	North East	N/A	1.2
NE, Window	1.764	North East	N/A	1.2
NE, Window	1.44	North East	N/A	1.2
NE, Window	1.44	North East	N/A	1.2
R-NE, Rooflight	0.975	North East	0.7	1.3
R-NE, Rooflight	0.975	North East	0.7	1.3
R-NE, Rooflight	0.975	North East	0.7	1.3
R-H, Rooflight	6	North	0.7	1.3
SE, Window	2.97	South East	N/A	1.2
SE, Window	12.453	South East	N/A	1.2
SE, Window	8.61	South East	N/A	1.2
SE, Window	6.3	South East	N/A	1.2
SE, Window	6.3	South East	N/A	1.2
SE, Window	3	South East	N/A	1.2
SE, Window	0.85625	South East	N/A	1.2
SE-dr, Window	1.875	South East	N/A	1.2
SE-dr, Window	1.875	South East	N/A	1.2
SW, Window	1.68	South West	N/A	1.2
SW, Window	1.68	South West	N/A	1.2
SW, Window	1.44	South West	N/A	1.2
SW, Window	1.44	South West	N/A	1.2
SW, Window	1.44	South West	N/A	1.2
R-SW, Rooflight	0.975	South West	0.7	1.3
R-SW, Rooflight	0.975	South West	0.7	1.3
R-SW, Rooflight	0.975	South West	0.7	1.3

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))

Building part **1 - Main Dwelling**: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.05	
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.03 **(!)**	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.05	
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.01 **(!)**	
External wall	E3: Sill	Calculated by person with suitable expertise	0.03 **(!)**	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.03 **(!)**	
External wall	E21: Exposed floor (inverted)	Calculated by person with suitable expertise	0.32	
External wall	E14: Flat roof	Calculated by person with suitable expertise	0.08	
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.04	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	3 m^3/hm^2, Design value **(!)**	**OK**
Air permeability test certificate reference		

4 Space heating		
Main heating system 1: Heat pump with warm air distribution - Electricity		
Efficiency	170.0%	
Emitter type		
Flow temperature		
System type	Air source heat pump	
Manufacturer		
Model		
Commissioning		
Secondary heating system: Closed room heater		
Fuel	Wood logs	
Efficiency	65.0%	
Commissioning		

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	250 litres
Declared heat loss	1.35 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Time and temperature zone control	
Function	
Ecodesign class	
Manufacturer	
Model	
Water heating - type: Cylinder thermostat and HW separately timed	
Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	90 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	1.07 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	80%	OK
Manufacturer/Model	Sentinel Kinetic 200ZP	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence
N/A

12 Declarations

a. Assessor Declaration

This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.	

Signed:	Assessor ID:
Name:	Date:

b. Client Declaration

N/A

Appendix B – Water Calculations

Water Efficiency Calculator for New Dwellings (V1f - Aug 2010)

Project Details

Adress/Reference	29 The Avenue	Case Reference	E1260
Number of Bedrooms	5	Occupancy for Calculation Purposes	6

Appliance/Useage Details

Taps (Excluding Kitchen Taps)

Tap Fitting Type	Flow Rate Litres/Min	Quantity (No.)	Total per Fitting type
Mixer Taps	3.00	6	18.00
Utility	8.00	1	8.00
			0.00
			0.00
			0.00
			0.00
Total No. of Fittings (No.)		7	
Total Flow (l/s)			26.00
Maximum Flow (l/s)			8.00
Average Flow (l/s)			3.71
Weighted Average Flow (l/s)			5.60
Flow for Calculation (l/s)			**5.60**

Showers

Shower fitting Type	Flow Rate Litres/Min	Quantity (No.)	Total per Fitting type
Thermostatic Shower	8.00	5	40.00
			0.00
			0.00
			0.00
			0.00
			0.00
Total No. of Fittings (No.)		5	
Total Flow (l/s)			40.00
Maximum Flow (l/s)			8.00
Average Flow (l/s)			8.00
Weighted Average Flow (l/s)			5.60
Flow for Calculation (l/s)			**8.00**

Baths

Bath Type	Capacity to Overflow	Quantity (No.)	Total per Fitting type
Bath	165.00	5	825.00
			0.00
			0.00
			0.00
Total No. of Fittings (No.)		5	
Total Capacity (l)			825.00
Maximum Capacity (l)			165.00
Average Capacity (l)			165.00
Weighted Average Capacity (l)			115.50
Capacity for Calculation (l)			**165.00**

WCs

WC Type	Full Flush Volume	Part Flush Volume	Quantity (No)
Dual WC	4.50	3.00	6
Total number of fittings			**6**
Average effective flushing volume			**3.50**

Dishwashers

Dishwasher Type	L per Place Setting	Quantity (No.)	Total per Fitting type
			0.00
			0.00
Total No. of Fittings (No.)		0	
Total Consumption (l)			1.25
Maximum Consumption (l)			1.25
Average Consumption (l/s)			1.25
Weighted Average Consumption (l)			0.88
Consumption for Calculation (l/s)			**1.25**

Washing Machines

Washing Machine Type	L per Kg Dry Load	Quantity (No.)	Total per Fitting type
			0.00
			0.00
Total No. of Fittings (No.)		0	
Total Consumption (l)			8.17
Maximum Consumption (l)			8.17
Average Consumption (l/s)			8.17
Weighted Average Consumption (l)			5.72
Consumption for Calculation (l/s)			**8.17**

Kitchen Taps

Tap Fitting Type	Flow Rate Litres/Min	Quantity (No.)	Total per Fitting type
Kitchen Tap	8.00	1	8.00
			0.00
			0.00
Total No. of Fittings (No.)		1	
Total Flow (l/s)			8.00
Maximum Flow (l/s)			8.00
Average Flow (l/s)			8.00
Weighted Average Flow (l/s)			5.60
Flow for Calculation (l/s)			**8.00**

Other Fittings

Waste Disposal Y/N	N
Water softner	
Consumption beyond 4% l/p/d	

Use of grey water and harvested rainwater

Total Grey water from WHB taps (l)	0
Total Availble Grey Water Supply (l)	318.66
Possible Demand (l)	195.76
Grey/Rain Installed Capacity (l)	0.00
Figure for Calculation lit/person/day	0.00

Water Use Assessment

Installation Type	Unit	Capacity/ Flow Rate	Use Factor	Fixed use (l/p/day)	Total Use (l/p/day)	
WC Single Flush	Volume (l)	0.00	4.42	0.00	0.00	
WC Dual Flush	Full Flush (l)	0.00	1.46	0.00	0.00	
	Pt Flush (l)	0.00	2.96	0.00	0.00	
WC's (Multiple)	Volume (l)	3.50	4.42	0.00	15.47	
Taps Exc. Kitchen	Flow Rate	5.60	1.58	1.58	10.43	
Bath (shower present)	(l/s)	165.00	0.11	0.00	18.15	
Shower (bath present)	(l/s)	8.00	4.37	0.00	34.96	
Bath Only	(l)	0.00	0.50	0.00	0.00	
Shower Only	(l/s)	0.00	5.60	0.00	0.00	
Kitchen Taps	(l/s)	8.00	0.44	10.36	13.88	
Washing Machines	(l/kgdry)	8.17	2.10	0.00	17.16	<< Note - these may be default values.
Dishwashers	(l/place)	1.25	3.60	0.00	4.50	<< You can change them by entering
Waste Disposal	(l/s)	0.00	3.08	0.00	0.00	___the actual applicances in the
Water Softner	(l/s)	0.00	1.00	0.00	0.00	___appropriate sections above
Total Calculated Water Use (l/p/day)					**114.54**	
Grey/RainWater Reused (l)					0.00	
Normalisation Factor	(Factor)				0.91	
Total Consumption CSH (l/p/day)					**104.24**	
External Water Use Allowance (l)					5.00	
Total Comsumption Part G (l/p/day)					**109.24**	

Assesment Result	**PASS**

Appendix C – GLA Carbon Emission Reporting Tables

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

	Carbon Dioxide Emissions for residential buildings (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2021 of the Building Regulations Compliant Development	2.3	
After energy demand reduction (be lean)	2.6	
After heat network connection (be clean)	2.6	
After renewable energy (be green)	2.0	

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

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	**(%)**
Be lean: savings from energy demand reduction	-0.3	-15%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.6	26%
Cumulative on site savings	**0.2**	**11%**
Annual savings from off-set payment	2.0	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**61**	-
Cash in-lieu contribution (£)	**5,757**	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab