DohertyEnergy

ENERGY & SUSTAINABILITY STATEMENT

(To Accompany Planning Application)

Site

LAND AT EAST STREET, RUSPER, HORSHAM
RH12 4RE

Proposal

DEVELOPMENT OF SITE TO CREATE EIGHTEEN DWELLINGS

Client

DEVINE HOMES PLC

18th FEBRUARY 2025
Ref. E1485-ESS-00

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1.0 INTRODUCTION

a) Doherty Energy Limited have been instructed by Devine Homes Plc to prepare an Energy and Sustainability Statement to support the submission of the planning application for the development on Land at East Street, Rusper, Horsham, RH12 4RE. 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 development of the site to create eighteen dwellings. The dwellings shall be a mixture of two, three and four bedroom houses in the form of detached and semi-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 dwellings.

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

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.

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.

2.0 POLICY CONTEXT

a) The Horsham District Planning Framework was adopted by Horsham District Council in November 2015. This sets out the planning strategy to deliver the social, economic and environmental needs for the district until 2031. It identifies six priority themes for the Council, which are:

- Economic Development: Plan for a successful local economy with high levels of employment
- Efficiency and Taxation: Delivering excellent value and high performance
- Arts, Heritage and Leisure: Build an arts, leisure and culture reputation that also supports our economy
- Living, Working Communities: Working together to support the life of local communities
- Environment: A better environment for today and tomorrow
- Safer and Healthier: Improving health and well being

b) Within the Framework there are a number of policies and this Energy and Sustainability Statement shall address the policies that are relevant to the energy and carbon emissions and water usage of the development.

c) Policy 35 – Climate change will support developments that make a clear contribution to mitigating and adapting to the impacts of climate change and meeting the districts reduction targets as set out in the Council's Acting Together on Climate Change Strategy, 2009.

d) The key mitigation measures identified by the policy are reducing energy use in construction; improving energy efficiency in new developments, including influencing the behaviour of occupants to reduce energy use and the use of decentralised, renewable and low carbon energy supply systems.

e) The policy requires developments to be designed so they can adapt to the impacts of climate change, reducing vulnerability, particularly in terms of flood risk ,water supply and changes in the districts landscape.

f) In Policy 36 – Appropriate Energy use, Horsham look for all development to contribute to clean, efficient energy and to follow the Energy Hierarchy as follows:

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

g) The energy hierarchy sets out a sequence for reducing carbon emissions, starting with reducing the need for energy by improving the design and fabric of a building, i.e. fabric first, then using energy more efficiently within the building and then using energy from renewable or low carbon technologies.

h) Sustainable design and construction is key to the National Planning Policy Framework, Regional and Local Policies. All development should seek a high standard of sustainable design and construction to radically reduce greenhouse gas emissions and to actively support energy efficiency improvements.

i) Policy 37 - Sustainable Construction sets requirements for developments to deliver sustainable design and incorporate the following measure, where appropriate according to the type of development and location:

- Maximise energy efficiency and integrate the use of decentralised, renewable and low carbon energy;
- Limit water use to 110 litres/person/day;
- Use design measures to minimise vulnerability to flooding and heatwave events;
- Be designed to encourage the use of natural lighting and ventilation;
- Be designed to encourage walking, cycling, cycle storage and accessibility to sustainable forms of transport;
- Minimise construction and demolition waste and utilise recycled and low-impact materials;

- Be flexible to allow future modification of use or layout, facilitating future adaptation, refurbishment and retrofitting;
- Incorporate measures which enhance the biodiversity value of development.

j) All new development will be required to provide satisfactory arrangements for the storage of refuse and recyclable materials as an integral part of design.

k) New homes should include the provision of high-speed broadband access and enable provision of future technologies where available

3.0 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. Further details can be found in the SuDs report.

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.

3.15 Transport

a) In order to promote the wider use of bicycles as transport, the proposed dwelling will have storage facilities for a number of bicycles. This will help reduce the need for short car journeys and the associated carbon dioxide emissions

b) To encourage the use of bicycles, the storage area shall have easy and direct access to the public right of way, so it wouldn't be necessary to take the bicycle through the house.

c) The storage shall be secure and weather tight to protect the bicycles.

d) Electric vehicles are proving to be an attractive option to the reduce running costs and lower emissions. The proposed dwelling shall be provided with electric vehicle charging point to allow for the charging of an electric vehicle.

e) The electric vehicle charging shall be capable of connecting to and using the electricity generated on site by the photovoltaic panels, thereby reducing the carbon emissions of the occupants transport. It is also possible to maximise the benefit of the photovoltaic system by the use of battery storage.

3.16 Home Office

a) In order to promote working from home, the dwelling shall be provided with the necessary space and services. This will further reduce the need for commuting to an office and reduce the carbon footprint of the occupants.

b) The suitable space for the home office shall have adequate space for an office, which will have good daylighting and natural ventilation. High speed broadband and adequate power points shall also be provided.

c) The good daylighting and natural ventilation will help the occupants use the spaces without the need for artificial lighting and mechanical ventilation for more of the year and reduce the emissions of the operation of the dwelling.

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 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 emerging local plan, 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

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 for a representative sample of the units.

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 BREL Compliance Reports that were prepared for a sample of the dwellings and the results are prorated for the development.

Dwelling	TER ($kg/m^2/yr$)	Area (m^2)	No. off	Emissions (kg/yr)
E1485-04	11.46	112.61	4	5,162.0
E1485-05	9.79	137.12	2	2,684.8
E1485-07	11.37	100.47	1	1,142.3
E1485-13	10.32	98.22	3	3,040.9
E1485-15	11.68	78.98	8	7,379.9
Baseline Carbon Dioxide Emissions (kg/yr)				**19,410**

Table 1 – Baseline Carbon Dioxide Emissions

4.3 Improved Baseline Carbon Dioxide Emissions – BE LEAN

a) Following the principles set out in the "Energy Hierarchy" which is implemented through 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 0.11-0.12 W/m^2K.

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 0.15-0.19 W/m^2K.

e) The party wall is fully filled with sealed edges, so the U Value is 0.0W/m^2K.

f) The roof areas offer excellent opportunity to enhance the insulation levels and for the purposes of these calculations, the U Value of 0.08 W/m^2K has been used.

g) 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^2K has been used, which uses double glazed planitherm glass, argon gas and warm edge spacer bars.

h) Composite entrance doors not only provide excellent noise and fire resistance, but are secure by design and have a U Value of 0.55 W/m^2K.

i) The air leakage rate for the dwelling can be improved. The maximum allowed under the current Building Regulations Approved Document L1:2021 is 8 $m^3/hr/m^2$ at 50 Pascal's. With carful detailing, this can be easily improved to 5 $m^3/hr/m^2$ at 50 Pascal's.

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

k) With regard to the heating, for the purposes of these calculations, to demonstrate the "fabric First" approach, the dwellings shall be heating using highly efficient gas fired condensing boilers, with time and temperature zone control. This provides excellent control for the dwelling occupants.

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) 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 (2021).

o) 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.

Dwelling	DER ($kg/m^2/yr$)	Area (m^2)	No. off	Emissions (kg/yr)
E1485-04	11.01	112.61	4	4,959.3
E1485-05	9.77	137.12	2	2,679.3
E1485-07	11.04	100.47	1	1,109.2
E1485-13	10.2	98.22	3	3,005.5
E1485-15	11.56	78.98	8	7,304.1
Baseline Carbon Dioxide Emissions (kg/yr)				**19,410**
Improved Carbon Dioxide Emissions (kg/yr)				**19,057**
Percentage Improvement over current Building Regulations				**1.8 %**

Table 2 – Actual Carbon Dioxide Emissions

p) As demonstrated in Table 2 above, the improvements in the thermal performance and fixed building services, a reduction of 1.8% 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) District heat networks supply heat to building or close cluster of buildings from a single or small number of generating plant to the distributed loads across an area. Where operating from locally generated heat, as opposed to waste or unwanted process heat for example, they are most suitable where there are numerous different heat loads (i.e. not purely residential) to provide a fairly consistent baseload demand and allow for maximisation of plant efficiency.

b) According to the West Sussex Sustainable Energy Study (2009), 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.

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) A this development is relatively small purely residential, i.e. under 300 dwellings and has is not sufficiently dense, it does not support the use of a site wide CHP system.

e) 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 Renewable Technologies Considered – BE GREEN

a) 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.

4.8 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.
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 considered that the use of ASHP to offset the heat losses of the dwellings could be feasible, however, the location of the outdoor units needs to be assessed to ensure they do not cause a nuisance to the neighbouring properties.
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 south 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. There are areas of roof that could be used for the installation of solar thermal collectors. However, with the efficiencies of these systems and their relatively low reduction in carbon dioxide emissions, it is felt that other technologies could be used to provide a greater reduction in carbon dioxide emissions for the cost.

Solar Thermal Hot Water		Feasible – NO
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 location.
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 the residential areas of the scheme, these being the use of heat pumps and solar photovoltaics or a combination of these.

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) 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.

4.9 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, incorporated into the ventilation system 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.

e) 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.

f) 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.

g) Exhaust air heat pumps collects energy form the exhaust air of the property. The exhaust air is extracted from the kitchen and the bathrooms and brought to the heat pump via ductwork. The exhaust air heat pumps come with an integrated hot water cylinder.

h) 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.

i) There is not sufficient area around or under the building to provide adequate area for sufficient heat collectors for the development. Therefore, ground source heat pumps shall not be considered at this stage.

j) There are no suitable water sources on the development site. Therefore, water source heat pumps shall not be considered at this stage.

k) There appears to be a suitable location at the side of the dwelling for the external heat pump unit, that would allow for goo air flow and avoid disturbing the residents.

l) The heat pump will be connected to the low-temperature distribution system, e.g. radiators, convectors or underfloor heating and hot water cylinder.

m) 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.

n) 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.

o) The SAP Assessment has been adjusted to incorporate the use of the air source heat pump and the BREL documents are summarised in the Table 4 below. Full details of the SAP calculations can be found in the BREL Documents in Appendix A.

Dwelling	DER (kg/m2/yr)	Area (m2)	No. off	Part L 2021 CO_2 Emissions ($kgCO_2/yr$)
E1485-04	3.18	112.61	4	1,432.4
E1485-05	2.87	137.12	2	787.1
E1485-07	3.20	100.47	1	321.5
E1485-13	3.06	98.22	3	901.7
E1485-15	3.44	78.98	8	2,173.5
Baseline Carbon Dioxide Emissions (kg/yr)				**19,410**
Total Carbon Dioxide Emissions (kg/yr)				**5,616**
Total Reduction in Carbon Emissions over Building Regulations				**71.1%**

Table 4 – Heat Pump Carbon Dioxide Emissions

p) As can be seen in Table 4 above, the use of air source heat pumps to provide the heating and hot water for the dwellings, could reduce the carbon dioxide emissions by 71.1% below the requirements of Approved document L1:2021.

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

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

j) Space has been identified on the roofs of the dwellings that can be used for the installation of photovoltaic systems. It is proposed that 1.0kWp panels could be installed on each dwelling to generate on-site renewable electricity.

Development incorporating Energy Efficiency Measures	Total Carbon Dioxide Emissions ($kgCO_2/yr$)	Percentage Reduction (%)
No Renewables	19,057	-
Reduction by including 18-No. 1.0kWp PV systems	16,084	15.6%

Table 5 – Photovoltaic Carbon Dioxide Emissions

k) As can be seen from Table 5 above, the incorporation of a photovoltaic systems, with a total output of 1.0 kWp per dwelling on the roofs of the dwellings, the development could reduce the carbon dioxide emissions by a further 15.6% and when combined with the fabric energy efficiency measures from in Table 2 above, a potential total reduction of 17.1% could be achieved.

l) These panels could be connected to the individual electric supplies for the dwellings to be used in the dwelling. Battery storage could be incorporated to provide a supply for the electric vehicle charging. Any surplus electricity can be exported to the National Grid.

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

4.11 Annual Carbon Dioxide Emission Reduction

a) Based on the initial SAP calculations for the dwellings, it has been calculated that the baseline carbon dioxide emissions figure for the development is 19,410 kgCO_2/year.

b) In accordance with the Planning Policies set out by Horsham District Council, this report has demonstrated an improvement in carbon dioxide emissions by fabric and energy efficiencies and the use of low or zero carbon technologies.

c) These reductions in carbon dioxide emissions are over and above the requirements of the Building Regulations Approved Document L.

d) A number of options have been considered and the potential carbon dioxide reductions calculated using the SAP calculations. 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	19,410	-
Development incorporating Energy Efficiency Measures	19,057	1.8%
Further Reduction in Carbon Dioxide Emissions by incorporating a Renewable Technology		
ASHP	5,616	71.1%
PV (18-No. 1.0 kWp systems)	16,084	17.1%
Total Percentage Improvement incorporating the Fabric and Energy Efficiencies and ASHP systems – Preferred Option		**71.1 %**

Table 6 – Summary of Reduction in Carbon Dioxide Emissions

e) It has been demonstrated that it is possible to achieve a 71.1% reduction in carbon dioxide emissions over and above the current Building Regulations by improving the energy efficiency of the development and its building services efficiencies and the incorporation of renewable technologies in the form of air source heat pump systems. This could be further improved during detailed design.

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 visual impact in the area and the turbulence caused by the surrounding buildings and trees etc.

i) Solar hot water has been considered but due to the low carbon reduction compared to other systems, it is not being considered further at this stage.

j) There is not enough space for ground source heat pumps.

k) The photovoltaic systems could provide a reduction of 17.1%. These may be considered further during details design.

l) At this stage of the development, the use of air source heat pumps provides the best reduction in carbon emissions and is the preferred option.

m) 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.

n) For the purpose of planning and based on the figures provided by initial SAP 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 incorporation of solar photovoltaic systems, a reduction in excess of 71.1% of the developments carbon dioxide emissions could be achieved.

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". The cooling hierarchy 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:

   a) minimise internal heat generation through energy efficient design
   b) reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls
   c) manage the heat within the building through exposed internal thermal mass and high ceilings
   d) passive ventilation
   e) mechanical ventilation
   f) 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

a) The Horsham District Council recognises that region of 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. The region is relatively resilient to drought and it takes two consecutive drier than normal winters to create water supply issues.

b) The Local Plan requires all new dwellings should limit domestic water consumption to 110 litres per person per day (l/p/d), including a maximum external water allowance of 5 litres. However, water neutrality should also be addressed.

c) 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.

d) 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.

e) Dual flush toilets can be installed to reduce the water consumption of the dwelling. A full flush capacity of 4 litres and a part flush capacity of 2 litres has been selected.

f) Flow restrictors shall be installed to limit the flow rates of the taps to 2.7 litres / minute. Flow restrictors shall also be installed in the kitchen taps and the showers to restrict their flow to 4 litres / minute. The showers shall be restricted to 6 litres / minute.

g) Baths, with a capacity of 130 litres to overflow, are being provided.

h) The washing machine shall have a water consumption of 643 litres / kg of dry load. The dishwasher shall have a water consumption of 0.99 litres / place setting.

i) No water softeners are being installed.

j) Using the Building Regulations Approved Document G Calculator, the water consumption has been calculated for the dwellings as 84.45 litres/person/day. This complies with the requirements of Policy 37 of the Horsham District Planning Framework.

k) Further details regarding the water efficiency calculations and the developments water neutrality can be found in the Water Neutrality Strategy document submitted with this Application.

7.0 CONCLUSION

a) The Horsham District Council requires new residential developments to minimise carbon emissions and exhibit the highest standards of sustainable design and construction.

b) The Application is for the development of the site to create eighteen dwellings. The dwellings shall be a mixture of two, three and four bedroom houses.

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 1.8% in the carbon dioxide emissions through fabric and services efficiencies, a further 69.3% by the incorporation of low or zero carbon on-site renewable heating systems. This results in a total of 71.1%. It is envisaged during detailed construction design, these figures can be improved.

d) 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.

e) 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.

f) The water usage has been assessed and although the actual water fittings have not been selected yet, the calculations show that the average water consumption of the development is 84.85 litres/person/day. This demonstrates the dwellings will be below the 110 litres/person/day requirement of the planning policy, thus minimising the impact of the development on the local water resources.

g) This Energy and Sustainability Statement demonstrates that the proposed development strives to meet the aspirations of reducing 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 Horsham District Council.

Appendix A – BREL Compliance Reports

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Tue 18 Feb 2025 16:10:54

Project Information			
Assessed By	Jason Doherty	Building Type	House, Detached
OCDEA Registration	EES/022645	Assessment Date	2025-02-18

Dwelling Details			
Assessment Type	As designed	Total Floor Area	113 m^2
Site Reference	E1485-04	Plot Reference	3B-HP
Address	Plot 4 East Street, Rusper, Horsham, RH12 4RE		

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	*11.46 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.18 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*59.96 kWh_{PE}/m^2*	
Dwelling primary energy	33.22 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*44.9 kWh/m^2*	
Dwelling fabric energy efficiency	38.1 kWh/m^2	OK

2a Fabric U-values

Element	*Maximum permitted average U-Value [W/m^2K]*	Dwelling average U-Value [W/m^2K]	Element with highest individual U-Value	
External walls	*0.26*	0.17	Walls (1) (0.19)	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	Heatloss Floor 1 (0.12)	OK
Roofs	*0.16*	0.08	Roof (1) (0.08)	OK
Windows, doors, and roof windows	*1.6*	1.19	S-br (1.2)	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 [m^2]	U-Value [W/m^2K]
Exposed wall: Walls (1)	62.94275	0.19
Exposed wall: Walls (2)	83.127	0.15
Ground floor: Heatloss Floor 1, Heatloss Floor 1	56.81	0.12
Exposed roof: Roof (1)	1.01	0.08 **(!)**
Exposed roof: Roof (2)	55.8	0.08 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))

Name	Area [m^2]	Orientation	Frame factor	U-Value [W/m^2K]
D-S, Door	2.142	South	N/A	1 **(!)**
S-br, Window	2.43	South	0.7	1.2
S-br, Window	1.89	South	0.7	1.2
S-br, Window	0.6075	South	0.7	1.2
S-tl, Window	1.902	South	0.7	1.2
S-tl, Window	1.902	South	0.7	1.2
S-tl, Window	0.483	South	0.7	1.2
E, Window	2.43	East	0.7	1.2
N-br, Window	2.43	North	0.7	1.2
N-br, Window	0.71925	North	0.7	1.2
N-br, Window	4.9875	North	0.7	1.2
N-br, Window	0.6075	North	0.7	1.2

Name	Area [m²]	Orientation	Frame factor	U-Value [W/m²K]
N-tl, Window	1.902	North	0.7	1.2
N-tl, Window	0.822	North	0.7	1.2
N-tl, Window	1.362	North	0.7	1.2
W-br, Window	4.2735	West	0.7	1.2
E-tl, Window	1.08	East	0.7	1.2

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

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

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.002 **(!)**	e6-01
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.033 **(!)**	e16-01
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.045	e10-01
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.033 **(!)**	e12-01
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.092	e17-01
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.062	IG
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 **(!)**	e3-01
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 **(!)**	e4-01
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.047	e5-03

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

Maximum permitted air permeability at 50Pa	*8 m³/hm²*	
Dwelling air permeability at 50Pa	5 m³/hm², Design value	OK
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Heat pump with radiators or underfloor heating **-** Electricity

Efficiency	333.8%
Emitter type	Both radiators and underfloor
Flow temperature	35°C
System type	Heat Pump
Manufacturer	Daikin Europe NV
Model	EDLA04EV3 PPC
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: Cylinder

Capacity	180 litres
Declared heat loss	1.89 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 by arrangement of plumbing and electrical services		
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	360 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	*N/A*	
Specific fan power	N/A	**N/A**
Minimum permitted heat recovery efficiency	*N/A*	
Heat recovery efficiency	N/A	**N/A**
Manufacturer/Model		
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	

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Tue 18 Feb 2025 16:11:44

Project Information			
Assessed By	Jason Doherty	Building Type	House, Detached
OCDEA Registration	EES/022645	Assessment Date	2025-02-18

Dwelling Details			
Assessment Type	As designed	Total Floor Area	137 m^2
Site Reference	E1485-05	Plot Reference	4B-HP
Address	Plot 5 East Street, Rusper, Horsham, RH12 4RE		

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	*9.79 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	2.87 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*51.24 kWh_{PE}/m^2*	
Dwelling primary energy	29.96 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*41.4 kWh/m^2*	
Dwelling fabric energy efficiency	35.4 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*	0.18	Walls (3) (0.25)	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	Heatloss Floor 1 (0.12)	OK
Roofs	*0.16*	0.08	Roof (3) (0.16)	OK
Windows, doors, and roof windows	*1.6*	1.19	N-br (1.2)	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)	111.01225	0.19
Exposed wall: Walls (2)	42.96825	0.15
Exposed wall: Walls (3)	4.66	0.25
Ground floor: Heatloss Floor 1, Heatloss Floor 1	71.3	0.12
Exposed roof: Roof (1)	5.48	0.08 **(!)**
Exposed roof: Roof (2)	63.49	0.08 **(!)**
Exposed roof: Roof (3)	3.29	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-N, Door	2.142	North	N/A	1 **(!)**
N-br, Window	2.1465	North	0.7	1.2
N-br, Window	1.6875	North	0.7	1.2
N-br, Window	1.1375	North	0.7	1.2
N-br, Window	1.6875	North	0.7	1.2
N-tl, Window	1.5625	North	0.7	1.2
NE, Window	0.567	North East	0.7	1.2
NW, Window	0.567	North West	0.7	1.2
W, Window	4.284	West	0.7	1.2
S-br, Window	1.902	South	0.7	1.2

Name	Area [m^2]	Orientation	Frame factor	U-Value [W/m^{2}K]
S-br, Window	1.75	South	0.7	1.2
S-br, Window	1.62	South	0.7	1.2
S-br, Window	4.9875	South	0.7	1.2
S-tl, Window	1.92	South	0.7	1.2
E-br, Window	0.71925	East	0.7	1.2
E-tl, Window	0.71925	East	0.7	1.2

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

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

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.062	IG
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 **(!)**	e3-01
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 **(!)**	e4-01
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.047	e5-03
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.002 **(!)**	e6-01
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.033 **(!)**	e16-01
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.045	e10-01
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.013 **(!)**	e11-01
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.033 **(!)**	e12-01
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.028 **(!)**	e13-01
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.092	e17-01

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	5 m^3/hm^2, Design value	OK
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Heat pump with radiators or underfloor heating - Electricity

Efficiency	337.2%
Emitter type	Both radiators and underfloor
Flow temperature	35°C
System type	Heat Pump
Manufacturer	Daikin Europe NV
Model	EDLA04EV3 PPC
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: Cylinder

Capacity	180 litres
Declared heat loss	1.89 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 by arrangement of plumbing and electrical services		
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	360 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	*N/A*	
Specific fan power	N/A	**N/A**
Minimum permitted heat recovery efficiency	*N/A*	
Heat recovery efficiency	N/A	**N/A**
Manufacturer/Model		
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: Name:	Assessor ID: Date:
b. Client Declaration	
N/A	

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Tue 18 Feb 2025 16:12:21

Project Information			
Assessed By	Jason Doherty	Building Type	House, Detached
OCDEA Registration	EES/022645	Assessment Date	2025-02-18

Dwelling Details			
Assessment Type	As designed	Total Floor Area	100 m^2
Site Reference	E1485-07	Plot Reference	3B-HP
Address	Plot 7 East Street, Rusper, Horsham, RH12 4RE		

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	*11.34 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.2 $kgCO_2/m^2$	**OK**
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*59.21 kWh_{PE}/m^2*	
Dwelling primary energy	33.46 kWh_{PE}/m^2	**OK**
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*41.9 kWh/m^2*	
Dwelling fabric energy efficiency	34.8 kWh/m^2	**OK**

2a Fabric U-values

Element	*Maximum permitted average U-Value [W/m^2K]*	Dwelling average U-Value [W/m^2K]	Element with highest individual U-Value	
External walls	*0.26*	0.17	Walls (1) (0.19)	**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	Heatloss Floor 1 (0.12)	**OK**
Roofs	*0.16*	0.08	Roof (1) (0.08)	**OK**
Windows, doors, and roof windows	*1.6*	1.18	S-br (1.2)	**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 [m^2]	U-Value [W/m^2K]
Exposed wall: Walls (1)	56.757	0.19
Exposed wall: Walls (2)	71.847	0.15
Ground floor: Heatloss Floor 1, Heatloss Floor 1	50.75	0.12
Exposed roof: Roof (1)	1.03	0.08 **(!)**
Exposed roof: Roof (2)	49.72	0.08 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))

Name	Area [m^2]	Orientation	Frame factor	U-Value [W/m^2K]
D-S, Door	2.142	South	N/A	1 **(!)**
S-br, Window	2.13975	South	0.7	1.2
S-br, Window	2.13975	South	0.7	1.2
S-br, Window	0.6075	South	0.7	1.2
S-br, Window	0.483	South	0.7	1.2
S-tl, Window	1.632	South	0.7	1.2
S-tl, Window	1.632	South	0.7	1.2
S-tl, Window	0.483	South	0.7	1.2
E, Window	2.43	East	0.7	1.2
E, Window	1.6875	East	0.7	1.2
N-tl, Window	0.822	North	0.7	1.2
W-br, Window	4.2735	West	0.7	1.2

Name	Area [m²]	Orientation	Frame factor	U-Value [W/m²K]
W-br, Window	1.3125	West	0.7	1.2
W-tl, Window	1.092	West	0.7	1.2
W-tl, Window	1.092	West	0.7	1.2
N-br, Window	0.6075	North	0.7	1.2

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.002 **(!)**	e6-01
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.033 **(!)**	e16-01
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.045	e10-01
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.033 **(!)**	e12-01
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.092	e17-01
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.062	IG
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 **(!)**	e3-01
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 **(!)**	e4-01
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.047	e5-01

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m³/hm²*	
Dwelling air permeability at 50Pa	5 m³/hm², Design value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating **-** Electricity	
Efficiency	329.1%
Emitter type	Both radiators and underfloor
Flow temperature	35°C
System type	Heat Pump
Manufacturer	Daikin Europe NV
Model	EDLA04EV3 PPC
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	180 litres
Declared heat loss	1.89 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 by arrangement of plumbing and electrical services		
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	360 lm/W	**OK**
External lights control	N/A	

8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	*N/A*	
Specific fan power	N/A	**N/A**
Minimum permitted heat recovery efficiency	*N/A*	
Heat recovery efficiency	N/A	**N/A**
Manufacturer/Model		
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	

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Tue 18 Feb 2025 16:12:44

Project Information			
Assessed By	Jason Doherty	Building Type	House, Semi-detached
OCDEA Registration	EES/022645	Assessment Date	2025-02-18

Dwelling Details			
Assessment Type	As designed	Total Floor Area	98 m^2
Site Reference	E1485-13	Plot Reference	3B-HP
Address	Plot 13 East Street, Rusper, Horsham, RH12 4RE		

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	*10.32 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.06 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*53.74 kWh_{PE}/m^2*	
Dwelling primary energy	32.13 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*36.7 kWh/m^2*	
Dwelling fabric energy efficiency	31.9 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*	0.19	Walls (1) (0.19)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	N/A
Curtain walls	*1.6*	0	N/A	N/A
Floors	*0.18*	0.12	Heatloss Floor 1 (0.12)	OK
Roofs	*0.16*	0.08	Roof (1) (0.08)	OK
Windows, doors, and roof windows	*1.6*	1.18	S-br (1.2)	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)	82.327	0.19
Party wall: Party Wall (1)	42.64	0 **(!)**
Ground floor: Heatloss Floor 1, Heatloss Floor 1	49.11	0.12
Exposed roof: Roof (1)	49.11	0.08 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))

Name	Area [m²]	Orientation	Frame factor	U-Value [W/m²K]
D-S, Door	2.142	South	N/A	1 **(!)**
S-br, Window	2.13975	South	0.7	1.2
S-br, Window	2.13975	South	0.7	1.2
S-br, Window	0.483	South	0.7	1.2
S-br, Window	0.483	South	0.7	1.2
S-br, Window	1.362	South	0.7	1.2
S-br, Window	1.362	South	0.7	1.2
E, Window	1.6875	East	0.7	1.2
E, Window	1.6875	East	0.7	1.2
E, Window	1.5	East	0.7	1.2
E, Window	1.5	East	0.7	1.2
W-br, Window	3.78	West	0.7	1.2
W-br, Window	1.3125	West	0.7	1.2

Name	Area [m^2]	Orientation	Frame factor	U-Value [W/m^{2}K]
W-br, Window	1.092	West	0.7	1.2
W-br, Window	1.092	West	0.7	1.2

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.002 **(!)**	e6-01
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.033 **(!)**	e16-01
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.045	e10-01
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.033 **(!)**	e12-01
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.062	IG
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 **(!)**	e3-01
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 **(!)**	e4-01
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.047	e5-03
External wall	E18: Party wall between dwellings	SAP table default	0.24	
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.048	p1-01
Party wall	P2: Intermediate floor within a dwelling	SAP table default	0 **(!)**	
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.033 **(!)**	p4-01

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	5 m^3/hm^2, Design value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	328.9%
Emitter type	Both radiators and underfloor
Flow temperature	35°C
System type	Heat Pump
Manufacturer	Daikin Europe NV
Model	EDLA04EV3 PPC
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	180 litres
Declared heat loss	1.89 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 by arrangement of plumbing and electrical services		
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	360 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	*N/A*	
Specific fan power	N/A	**N/A**
Minimum permitted heat recovery efficiency	*N/A*	
Heat recovery efficiency	N/A	**N/A**
Manufacturer/Model		
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	

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Tue 18 Feb 2025 16:13:06

Project Information			
Assessed By	Jason Doherty	Building Type	House, Semi-detached
OCDEA Registration	EES/022645	Assessment Date	2025-02-18

Dwelling Details			
Assessment Type	As designed	Total Floor Area	79 m^2
Site Reference	E1485-15	Plot Reference	3B-HP
Address	Plot 15 East Street, Rusper, Horsham, RH12 4RE		

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	*11.68 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.44 $kgCO_2/m^2$	**OK**
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*61.1 kWh_{PE}/m^2*	
Dwelling primary energy	36.16 kWh_{PE}/m^2	**OK**
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*37.1 kWh/m^2*	
Dwelling fabric energy efficiency	33.5 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*	0.18	Walls (1) (0.19)	**OK**
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.12	Heatloss Floor 1 (0.12)	**OK**
Roofs	*0.16*	0.08	Roof (1) (0.08)	**OK**
Windows, doors, and roof windows	*1.6*	1.17	W-br (1.2)	**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)	64.30125	0.19
Exposed wall: Walls (2)	15.058	0.15
Party wall: Party Wall (1)	44.44	0 **(!)**
Ground floor: Heatloss Floor 1, Heatloss Floor 1	39.49	0.12
Exposed roof: Roof (1)	39.49	0.08 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m²]**	**Orientation**	**Frame factor**	**U-Value [W/m²K]**
D-W, Door	2.142	West	N/A	1 **(!)**
W-br, Window	1.3125	West	0.7	1.2
W-br, Window	0.483	West	0.7	1.2
E, Window	3.78	East	0.7	1.2
E, Window	1.902	East	0.7	1.2
S-br, Window	0.71925	South	0.7	1.2
W-tl, Window	1.902	West	0.7	1.2

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.002 **(!)**	e6-01
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.033 **(!)**	e16-01
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.045	e10-01
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.033 **(!)**	e12-01
External wall	E18: Party wall between dwellings	SAP table default	0.24	
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.062	IG
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 **(!)**	e3-01
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 **(!)**	e4-01
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.047	e5-03
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.048	p1-01
Party wall	P2: Intermediate floor within a dwelling	SAP table default	0 **(!)**	
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.033 **(!)**	p4-01

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	5 m^3/hm^2, Design value	**OK**
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Heat pump with radiators or underfloor heating **-** Electricity	
Efficiency	339.6%
Emitter type	Both radiators and underfloor
Flow temperature	35°C
System type	Heat Pump
Manufacturer	Daikin Europe NV
Model	EDLA04EV3 PPC
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: Cylinder	
Capacity	180 litres
Declared heat loss	1.89 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 by arrangement of plumbing and electrical services	
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	360 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	*N/A*	
Specific fan power	N/A	**N/A**
Minimum permitted heat recovery efficiency	*N/A*	
Heat recovery efficiency	N/A	**N/A**
Manufacturer/Model		
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: Name:	Assessor ID: Date:
b. Client Declaration	
N/A	