Sustainability & Energy Statement

29-31 High Street, Hampton Wick

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Executive Summary

This Sustainability and Energy Statement considers the sustainability issues relating to the proposed redevelopment of 29-31 High Street, Hampton Wick to provide commercial accommodation and eight, 1, 2 & 3-bedroom apartments.

The Statement sets out the commitments of the applicant to the site and the targets that will be applied to the development.

The site is located in a sustainable location close to existing facilities and infrastructure and will provide business space and homes to meet local need.

Throughout the design process, the applicant and design team members have given careful consideration to the sustainability issues relating to the site, and how these can be enhanced in a marketable and feasible manner. As a result, this Statement demonstrates that the development meets relevant sustainability criteria and in a number of areas exceeds them.

The fabric standards of the buildings exceed the requirements of the Building Regulations.

The methodology used has been based upon the emerging policy in the new London Plan (and provided in 'Energy Assessment Guidance' published by the Mayor of London in October 2018) and uses the carbon factors for gas and electricity proposed for SAP 10.

In order to demonstrate the energy efficiency of the buildings a set of SAP and SBEM calculations have been prepared for the apartments and commercial accommodation respectively for the 'Be Lean' scenario based on the use of gas boilers to each unit. This is not the proposed strategy but purely demonstrates the reduction from the 'Be Lean' condition.

The Regulations Compliance Reports for this option are attached as Appendix 1 and the 'Be Lean' GLA spreadsheet based on the SAP 10 carbon factors is attached as Appendix 2.

It is proposed to install Vaillant aroTHERM air source heat pumps into each of the apartments. These units will provide space heating and hot water to the apartments.

In addition, it is proposed to install air source heat pumps into the three commercial units. The heat pumps will provide space heating and cooling (if required).

The 'Be Clean' SAP 10 spreadsheet is attached as Appendix 4, which uses the energy demand calculations from the SAP calculations (attached as Appendix 3) to calculate the total site emissions.

The location of the outdoor units will be determined at the detailed working drawing design stage but it is anticipated that the outdoor units for each of the apartments could be accommodated within the amenity space provided for each unit.

The reductions in emissions can be summarised as follows:

	Total Emissions	% Reduction
	T CO_2 per year	
Be Lean		
Baseline (Building Regulations TER) – based on gas	13.123	
Be Lean - after energy efficiency (DER) – based on gas	11.574	
Reduction	1.549	**11.80%**
Be Clean		
Baseline (Building Regulations TER) – based on electricity	12.424	
Emissions – after ASHPs to all accommodation	7.434	
Reduction	4.990	**40.17%**

The residual emissions are 7.434 tonnes and therefore, using the carbon offset charge the payment should be **£13,381 (**7.434 x £1,800).

The London Borough of Richmond upon Thames Sustainable Construction Checklist is attached as Appendix 5.

1.0 Introduction

This report has been commissioned by Mr. and Mrs. Frost and provides a Sustainability and Energy Statement for the redevelopment of the site at 29-31 High Street, Hampton Wick to provide 534 m^2 (net GIA) of Class E commercial accommodation and eight, 1, 2 and 3-bedroom apartments.

The report describes the methodology used in assessing the development and the initiatives proposed.

The objective is to reduce the energy demand to an economic minimum by making investments in the parts of the buildings that has the greatest impact on energy demand and are the most difficult and costly to change in the future, namely the building fabric.

Once cost-effective structures have been designed, low-carbon and renewable technologies have been considered for installation to provide heat and/or electricity.

The following hierarchy has been followed:

- Lean reduce demand and consumption
- Clean increase energy efficiency
- Green provide low carbon renewable energy sources

The report has been prepared by Ivan Ball of Bluesky Unlimited who are sustainability consultants.

2.0 Planning Policy Context

National Policy

The UK Government published its sustainable development strategy in 1999 entitled "A better quality of life: A strategy for sustainable development in the UK". This sets out four main objectives for sustainable development in the UK:

- Social progress that recognises the needs of everyone.
- Effective protection of the environment.
- Prudent use of natural resources.
- Maintenance of high stable levels of economic growth and employment.

Sustainable Communities: Building for the Future, known colloquially as the Communities Plan was published in 2003. The Plan sets out a long-term programme of action for delivering sustainable communities in both urban and rural areas. It aims to tackle housing supply issues in parts of the country, low demand in other parts and the quality of our public spaces. The Communities Plan describes sustainable communities as: Active, inclusive and safe, well run, environmentally sensitive, well designed and built, well connected, thriving, well served and fair for everyone.

The most relevant national planning policy guidance on sustainability is set out in:

- National Planning Policy Framework - 2019

Paragraph 148 states;

"The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure."

Regional and Local Policies

The Development Plan comprises the London Plan (2016) and the London Borough of Richmond Local Plan (2018).

London Plan, published March 2016 **–** the following policies are relevant to the application:

Policy 5.2 – Minimising carbon dioxide emissions *

A *Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:*

1 *Be lean: use less energy*

2 *Be clean: supply energy efficiently*

3 *Be green: use renewable energy*

B *The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emissions reduction in buildings. These targets are expressed as minimum improvements over the Target Emission Rate (TER) outlined in the national Building Regulations leading to zero carbon residential buildings from 2016 and zero carbon non-domestic buildings from 2019.*

Residential and Non-residential buildings:

Year	***Improvement on 2013 Building Regulations***
2013 – 2016	*35 per cent*

C *Major development proposals should include a detailed energy assessment to demonstrate how the targets for carbon dioxide emissions reduction outlined above are to be met within the framework of the energy hierarchy.*

D *As a minimum, energy assessments should include the following details:*

a *calculation of the energy demand and carbon dioxide emissions covered by the Building Regulations and, separately, the energy demand and carbon dioxide emissions from any other part of the development, including plant or equipment, that are not covered by the Building Regulations (see paragraph 5.22) at each stage of the energy hierarchy*

b *proposals to reduce carbon dioxide emissions through the energy efficient design of the site, buildings and services*

c *proposals to further reduce carbon dioxide emissions through the use of decentralised energy where feasible, such as district heating and cooling and combined heat and power (CHP)*

d *proposals to further reduce carbon dioxide emissions through the use of on-site renewable energy technologies.*

E *The carbon dioxide reduction targets should be met on-site. Where it is clearly demonstrated that the specific targets cannot be fully achieved on-site, any shortfall may be provided off-site or through a cash in lieu contribution to the relevant borough to be ring fenced to secure delivery of carbon dioxide savings elsewhere.*

Policy 5.3 – Sustainable design and construction

A *The highest standards of sustainable design and construction should be achieved in London to improve the environmental performance of new developments and to adapt to the effects of climate change over their lifetime.*

B *Development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.*

C *Major development proposals should meet the minimum standards outlined in the Mayor's supplementary planning guidance and this should be clearly demonstrated within a design and access statement. The standards include measures to achieve other policies in this Plan and the following sustainable design principles:*

- *a. minimising carbon dioxide emissions across the site, including the building and services (such as heating and cooling systems)*
- *b. avoiding internal overheating and contributing to the urban heat island effect*
- *c. efficient use of natural resources (including water), including making the most of natural systems both within and around buildings*
- *d. minimising pollution (including noise, air and urban runoff)*
- *e. minimising the generation of waste and maximising reuse or recycling*
- *f. avoiding impacts from natural hazards (including flooding)*
- *g. ensuring developments are comfortable and secure for users, including avoiding the creation of adverse local climatic conditions*
- *h. securing sustainable procurement of materials, using local supplies where feasible, and*
- *i. promoting and protecting biodiversity and green infrastructure.*

Policy 5.6 – Decentralised energy in development proposals

A *Development proposals should evaluate the feasibility of Combined Heat and Power (CHP) systems.*

B *Major development proposals should select energy systems in accordance with the following hierarchy:*

- *1 Connection to existing heating or cooling networks*
- *2 Site wide CHP network*
- *3 Communal heating and cooling.*

C *Potential opportunities to meet the first priority in this hierarchy are outlined in the London Heat Map tool. Where future network opportunities are identified, proposals should be designed to connect to these networks.*

Policy 5.7 – Renewable Energy

B *Within the framework of the energy hierarchy (Policy 5.2), major development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible.*

Policy 5.15 – Water Use and Supplies

B Development should minimise the use of mains water by:

a incorporating water saving measures and equipment

b designing residential development so that mains water consumption would meet a target of 105 litres or less per head per day

Sustainable Design and Construction SPG – April 2014

The SPG provides Guidance on how schemes should comply with the London Plan and this Sustainability Statement has been prepared in accordance with the Guidance provided.

London Borough of Richmond

The London Borough of Richmond adopted its Local Plan on the 3rd July 2018 and this supersedes the Core Strategy (2009) and the Development Management Plan (2011).

The following policy is of particular relevance to the topic area of this Statement and has been edited for clarity and relevance to the application in question.

Local Plan (2018)

Policy LP 22 - Sustainable Design and Construction

A. Developments will be required to achieve the highest standards of sustainable design and construction to mitigate the likely effects of climate change. Applicants will be required to complete the following:

1. *Development of 1 dwelling unit or more, or 100sqm or more of non-residential floor space (including extensions) will be required to complete the Sustainable Construction Checklist SPD. A completed Checklist has to be submitted as part of the planning application.*
2. *Development that results in a new residential dwelling, including conversions, change of use, and extensions that result in a new dwelling unit, will be required to incorporate water conservation measures to achieve maximum water consumption of 110 litres per person per day for homes (including an allowance of 5 litres or less per person per day for external water consumption).*
3. *New non-residential buildings over 100sqm will be required to meet BREEAM 'Excellent' standard.*

Reducing Carbon Dioxide Emissions

B. Developers are required to incorporate measures to improve energy conservation and efficiency as well as contributions to renewable and low carbon energy generation. Proposed developments are required to meet the following minimum reductions in carbon dioxide emissions:

1. *All new major residential developments (10 units or more) should achieve zero carbon standards in line with London Plan policy.*

2. *All other new residential buildings should achieve a 35% reduction.*
3. *All non-residential buildings over 100sqm should achieve a 35% reduction. From 2019 all major non-residential buildings should achieve zero carbon standards in line with London Plan policy.*

Targets are expressed as a percentage improvement over the target emission rate (TER) based on Part L of the 2013 Building Regulations.

C. This should be achieved by following the Energy Hierarchy:

1. *Be lean: use less energy*
2. *Be clean: supply energy efficiently*
3. *Be green: use renewable energy*

Decentralised Energy Networks

D. The Council requires developments to contribute towards the Mayor of London target of 25% of heat and power to be generated through localised decentralised energy (DE) systems by 2025. The following will be required:

1. *All new development will be required to connect to existing DE networks where feasible. This also applies where a DE network is planned and expected to be operational within 5 years of the development being completed.*

Applicants are required to consider the installation of low, or preferably ultra-low, NOx boilers to reduce the amount of NOx emitted in the borough.

Local opportunities to contribute towards decentralised energy supply from renewable and low-carbon technologies will be encouraged where appropriate.

* The London Plan will be revised in 2021. In addition, Part L of the Buildings Regulations will be revised in 2022 and the carbon emissions factors will be revised significantly compared to the current Part L (2013).

Consequentially the Mayor of London published Energy Assessment Guidance in October 2018, which requires the use of the current SAP methodology (2013) to calculate energy demand but the carbon emissions factors proposed for Part L 2020 are to be applied to the energy demand.

Whilst primarily intended for referrable schemes the GLA have allowed the Boroughs to decide whether they apply the Guidance to all developments.

3.0 Assessment Methodology

The baseline carbon dioxide emissions from the buildings have been established using agreed building specifications and detailed planning drawings and SAP and SBEM calculations have been prepared for a representative range of the apartments and commercial accommodation, which provides an assessment of the total emissions from the site.

Emission Factors

The CO_2 emission factors, where applicable, used throughout this report have been taken from the emerging Building Regulation Approved Document L - 2021.

	kg CO_2/kWh
Mains gas	0.210
Grid supplied and displaced electricity	0.233

4.0 Proposal

The accommodation schedule in detail is;

Unit Type	Number	Area	Total Area
		m^2	m^2
Commercial Accommodation			
Class E (assumed (a, b, c) - retail)	1	211.0	211.0
Class E (assumed (g) - office)	1	233.0	233.0
Class E (assumed (g) – workshop)	1	90.0	90.0
Sub-Total			534.0
Residential Accommodation			
1-Bedroom apartment	1	49.6	49.6
1-Bedroom apartment	2	50.0	100.0
1-Bedroom apartment	1	50.1	50.1
1-Bedroom apartment	1	53.8	53.8
2-Bedroom apartment	1	61.0	61.0
2-Bedroom Maisonette apartment	1	85.7	85.7
3-Bedroom apartment	1	110.2	110.2
Sub-Total	8		510.4
Total			**1,044.4**

5.0 Energy Efficiency

5.1 Demand Reduction (Be Lean)

Design

The energy performance of a building is affected by its design, construction and use and whilst occupant behaviour is beyond the remit of this statement, better design and construction methods can significantly reduce the life cycle emissions of a building and assist the occupant to reduce consumption.

Sustainable design is not just about incorporating renewable technologies; buildings should be designed at the outset to provide suitable environmental conditions for the occupants whilst also consuming as little energy as practical. It is possible to exceed Building Regulations requirements (Part L - 2013) through demand reduction measures alone, which typically include a combination of passive design measures (e.g. building design and efficient building fabric) and active design measures (e.g. variable speed motors).

Passive Design Measures

The passive design measures proposed include;

Passive Solar Gain

Passive measures include allowing for natural ventilation and exposed thermal mass coupled with high levels of insulation, air tightness and the control of solar gain.

The proposal is in context with surrounding development but all apartments benefit from at least dual aspects.

There are no units with a solely northerly aspect and all apartments will benefit from access to direct sunlight at some point throughout the day..

Natural Daylighting

The orientation and the size of the windows have been optimised to maximise the amount of natural daylight and therefore reduce the demand for artificial lighting.

Efficient Building Fabric

Building Envelope

U-values of the building envelope must meet Building Regulations Part L standards and further improvements to U-values will reduce the apartments heating requirements.

The basement and ground floors will be insulated with 150mm 'Kingspan' PIR insulation or similar.

The finish proposed for the external walls includes render, timber cladding and tile hanging and therefore suits the use of either traditional load bearing cavity walls or a timber frame or other system build. Whichever construction is selected for the external walls the U-value set out in the table below could be achieved for either.

All windows and external doors will be double glazed with Low 'e' soft coat and argon filled.

It is proposed to set maximum limits for the elemental U-values as follows:

Element	Part L Limiting U-values	Proposed U-values	Proposed Improvement
	W/m²K	W/m²K	
Floor	**0.20**	**0.11**	**45%**
External Walls	**0.30**	**0.18**	**40%**
Sloping (warm) Roofs	**0.20**	**0.15**	**25%**
Flat Roofs	**0.20**	**0.15**	**25%**
Windows	**2.00**	**1.37**	**32%**
Entrance Doors		**1.60**	**-**

Air Leakage

Large amounts of heat are lost in winter through air leakage from a building (also referred to as infiltration or air permeability) often through poor sealing of joints and openings in the building

The Building Regulations set a minimum standard for air permeability of 10 m^3 of air per hour per m^2 of envelope area, at 50Pa.

It is proposed to achieve a 60% improvement over Building Regulations and the buildings will target a permeability of 4.0 $m^3/hr/m^2$.

Thermal Bridging

The significance of Thermal Bridging, as a potentially major source of fabric heat losses, is increasingly understood. Improving the U-values for the main building fabric without accurately addressing the Thermal Bridging is no longer an option and will not achieve the fabric energy efficiency and energy and CO_2 reduction targets set out in this strategy.

The buildings will use the Accredited Construction Details where applicable and bespoke details where ACDs do not exist.

The bridging losses have been based upon the use of the ACDs and calculated using SAP Appendix K Table 1.

Ventilation

As a result of increasing thermal efficiency and air tightness, Building Regulations Approved Document F was also revised in 2006 to address the possibility of overheating and poor air quality.

Active Design Measures will include;

Efficient Lighting and Controls

Throughout the scheme natural lighting will be optimised.

Approved Document L1A requires three in four light fittings (75%) to be dedicated low energy fittings. The homes will exceed this and all light fittings will be of a dedicated energy efficient type.

External lighting will be fitted with time controls and light sensors to ensure illumination is restricted to required times. External lighting will be limited to a maximum fitting output of 150w.

Space Heating and Hot Water

The baseline SAP modelling has been based upon the use of a combination boiler installed to each commercial unit and apartment but the assessment considers other options for providing space heating and hot water.

5.2 Establishing Energy Demand and Carbon Dioxide Emissions (Be Lean)

The GLA Energy Assessment Guidance of October 2018 requires the energy efficient of a building (Be Lean) to be expressed using a gas heating system as a baseline.

Residential Accommodation

A set of calculations have therefore been prepared on this basis, which are not necessarily the proposed final option but are used to test the 'Be Lean' reductions only.

SAP calculations have been prepared for a 1-Bedroom mid-floor apartment with a southwest and southeast aspect at 50.1 m^2 and for a 1-Bedroom top-floor apartment with orientations to southwest and northeast at 50.0 m^2.

Calculations have also been prepared for a 2-Bedroom top-floor apartment with a southwest, southeast and northeast aspect at 61.0 m^2 and the 2-Bedroom duplex apartment at 85.7 m^2.

The emissions from the 3-Bedroom mid-floor apartment of 110.2 m^2 are assumed to be similar to the 2-Bedroom duplex apartment.

Baseline

The Regulations Compliance Reports are attached as Appendix 1 but the energy demand for the modelled apartments can be summarised as follows;

1-Bedroom apartment – 50.1 m^2 Mid-floor	Energy Demand TER	Energy Demand DER
	kWh/yr	kWh/yr
Space heating	1,244	1,088
Water heating	1,942	1,627
Electricity for pumps, fans & lighting	307	307
Total	**3,493**	**3,022**

1-Bedroom apartment – 50.0 m^2 Top-floor	Energy Demand TER	Energy Demand DER
	kWh/yr	kWh/yr
Space heating	2,302	2,287
Water heating	1,913	1,583
Electricity for pumps, fans & lighting	307	307
Total	**4,522**	**4,177**

2-Bedroom apartment – 61.0 m² Top	Energy Demand TER	Energy Demand DER
	kWh/yr	kWh/yr
Space heating	2,494	2,396
Water heating	2,110	1,706
Electricity for pumps, fans & lighting	351	351
Total	**4,955**	**4,453**

2-Bedroom Duplex apartment – 85.7 m² Mid & Top	Energy Demand TER	Energy Demand DER
	kWh/yr	kWh/yr
Space heating	3,089	2,921
Water heating	2,438	1,905
Electricity for pumps, fans & lighting	453	453
Total	**5,980**	**5,279**

Commercial Accommodation

The baseline emissions for the commercial accommodation have been established by preparing a BRUKL calculation based on the use of a gas heating installation for Units 01, 03 & 04 and secondly for Unit 02.

The energy demand can be summarised as follows:

Units 01, 03 & 04	Notional Energy Demand	Actual Energy Demand
	kWh/m²	kWh/m²
Heating	27.41	15.76
Cooling	0.00	0.00
Auxiliary and Lighting	22.46	24.72
Hot Water	3.34	3.04
Totals	**53.22**	**43.52**

Unit 02	Notional Energy Demand	Actual Energy Demand
	kWh/m²	kWh/m²
Heating	25.42	16.47
Cooling	0.00	0.00
Auxiliary and Lighting	20.24	24.12
Hot Water	3.34	3.04
Totals	**48.99**	**43.63**

The energy demand figures calculated above have been inputted into the SAP 10 spreadsheet, which is attached as Appendix 2 and provides the total site TER and DER/BER emissions using the emerging carbon emissions factors and as required by the GLA Energy Assessment Guidance (October 2018).

The maximum allowable carbon dioxide emissions from the site (TER) are assessed as **13,123 kg CO_2 per year**, with the actual carbon dioxide emissions (DER/BER) assessed as **11,574 kg CO_2 per year.**

The reduction in emissions using from energy efficiency for the 'Be Lean' scenario and using the SAP 10 carbon factors is **1,549 kg CO_2 per year**, which equates to;

- **11.80%**

5.3 Low-Carbon and Renewable Technologies (Be Clean and Be Green)

The carbon dioxide emissions established above have been used to test the viability of various renewable and low carbon technologies as follows.

The Government's Renewable Obligation defines renewable energy in the UK. The identified technologies are;

- Small hydro-electric
- Landfill and sewage gas
- Onshore and offshore wind
- Biomass
- Tidal and wave power
- Geothermal power
- Solar

The use of landfill or sewage gas, offshore wind or any form of hydroelectric power is not suitable for the site due to its location. The remaining technologies are considered below;

Wind

Wind turbines are available in various sizes from large rotors able to supply whole communities to small roof or wall-mounted units for individual dwellings.

The Government wind speed database predicts local wind speeds at High Street to be 4.8 m/s at 10m above ground level and 5.6 m/s at 25m above ground level. This is below the level generally required for commercial investment in large wind turbines. In addition the land take, potential for noise and signal interference make a large wind turbine unsuitable for this development.

Roof mounted turbines could be used at the development to generate small but valuable amounts of renewable electricity but the small output and contribution to total emissions means any investment would be small and purely tokenism. In addition the use of wind turbines will have a detrimental aesthetic impact on the appearance of the development.

Combined Heat and Power and Community Heating

Combined heat and power (CHP) also called co-generation is a de-centralised method of producing electricity from a fuel and 'capturing' the heat generated for use in buildings. The plant is essentially a small-scale electrical power station. The production and transportation of electricity via the National Grid is very inefficient with over 65% of the energy produced at the power station being lost to the atmosphere and through transportation.

Consequently CHP can demonstrate significant CO_2 savings and although not necessary classed as renewable energy (depending on the fuel used) the technology is low carbon.

For a CHP plant to be economic it needs to operate for as much of the time as possible (usually deemed to be in excess of 14 hours per day) and therefore the size of the unit are usually based upon the hot water load of the building (s) with additional boilers meeting the peak space heating demand.

There is insufficient baseload to justify a CHP unit and therefore this technology is not proposed.

Ground Source Heat Pumps

Sub soil temperatures are reasonably constant and predictable in the UK, providing a store of the sun's energy throughout the year. Below London the groundwater in the lower London aquifer is at a fairly constant temperature of 12° C. Ground source heat pumps (GSHP) extract this low-grade heat and convert it to usable heat for space heating.

GSHP operates on a similar principle to refrigerators, transferring heat from a cool place to a warmer place. They operate most efficiently when providing space heating at a low temperature, typically via under floor heating or with low temperature radiators.

There is insufficient external area to install a shallow, horizontal collection system and in order to use ground source heat pumps the collection system would need to include a number of boreholes. There are limited opportunities to place these away from the building and the installation would be very complex.

The installation of ground source heat pumps into this site is not appropriate.

Solar

(i) Solar Water Heating

Solar hot water panels use the suns energy to directly heat water circulating through panels or pipes. The technology is simple and easily understood by purchasers.

Solar hot water heating panels are based generally around two types, which are available being 'flat plate collectors' and 'evacuated tubes'. Flat plate collectors can achieve an output of up to 1,124 kWh/annum (Schuco) and evacuated tubes can achieve outputs up to 1,365 kWh/annum (Riomay).

Panels are traditionally roof mounted and for highest efficiencies should be mounted plus or minus 30 degrees of due south. Evacuated tubes can be laid horizontally on flat roofs but flat plate collectors are recommended for installation at an incline of 30 degrees

In apartment buildings servicing apartments below the top-floor can be problematic for solar thermal panels. However, assuming all apartments could accommodate solar hot water demand the total demand of the eight apartments is 14,208 kWh per year (based on the gas system) and assuming panels would reduce demand by 50% the reduction in CO_2 emissions would be 1,534 kg CO_2 per year. When combined with the energy efficiency measures incorporated into the scheme this equates to a total reduction of 23.49%.

Solar hot water panels could be used to reduce emissions but additional technologies would be required to achieve the policy target and the use of solar hot water heating panels would require the use of a conventional gas boiler with hot water cylinders in selected units.

Solar hot water heating panels are not proposed.

(ii) Photovoltaics

Photovoltaic panels (PV) provide clean silent electricity. They generate electricity during most daylight conditions although they are most efficient when exposed to direct sunlight or are orientated to face plus or minus 30 degrees of due south.

PV panels can be integrated into many different aspects of a development including roofs, walls, shading devices or architectural panels.

The panels typically have an electrical warranty of 20-25 years and an expected system lifespan of 25-40 years.

The buildings contain pitched roofs with orientations predominantly towards the northeast (front) and southwest (rear). The roofs include a number of cut outs for amenity areas and rooflights, which limit the available roof area for photovoltaic panels.

Air Source Heat Pumps (ASHP)

Air sourced heat pumps operate using the same reverse refrigeration cycle as ground source heat pumps, however the initial heat energy is extracted from the external air rather than the ground.

Whilst ASHPs generally have a coefficient of performance (CoP) of around 3 because electricity costs around 4.5 times more than gas (per kWh) the annual heating bills for ASHPs can be more expensive than using a gas system.

However, due to the reduction in the carbon emissions factors proposed in the new SAP the use of electrical heating system can reduce emissions more than comparable gas installation.

5.4 Establishing Energy Demand and Carbon Dioxide Emissions (Be Clean)

Using the methodology set out in the Mayor of London's 'Energy Assessment Guidance' (Oct 2018), the carbon emissions have been calculated using the new carbon factors proposed as part of the new Part L of the Building Regulations, which is expected to be published in 2021 but using the existing SAP methodology (2012).

Residential Accommodation

The apartments modelled above under the 'Be Lean' scenario have been remodelled using a Vaillant aroTHERM air source heat pump in lieu of a gas system. The heat pump would provide space heating and hot water to the apartments.

The Regulations Compliance Reports are attached as Appendix 3 but the energy demand for the modelled apartments can be summarised as follows;

1-Bedroom apartment – 50.1 m² Mid-floor	Energy Demand TER	Energy Demand DER
	kWh/yr	kWh/yr
Space heating	1,109	565
Water heating	2,145	946
Electricity for pumps, fans & lighting	307	232
Total	**3,561**	**1,743**

1-Bedroom apartment – 50.0 m² Top-floor	Energy Demand TER	Energy Demand DER
	kWh/yr	kWh/yr
Space heating	2,126	1,037
Water heating	2,111	946
Electricity for pumps, fans & lighting	307	232
Total	**4,544**	**2,215**

2-Bedroom apartment – 61.0 m² Top	Energy Demand TER	Energy Demand DER
	kWh/yr	kWh/yr
Space heating	2,330	975
Water heating	2,254	1,011
Electricity for pumps, fans & lighting	351	276
Total	**4,935**	**2,262**

2-Bedroom Duplex apartment – 85.7 m² Mid & Top	Energy Demand TER	Energy Demand DER
	kWh/yr	kWh/yr
Space heating	2,918	1,054
Water heating	2,493	1,123
Electricity for pumps, fans & lighting	453	378
Total	**5,864**	**2,555**

Commercial Accommodation

The BRUKL calculations have been remodelled using an air source heat pump to provide space heating to the commercial units. The energy demand can be summarised as follows:

Units 01, 03 & 04	Notional Energy Demand	Actual Energy Demand
	kWh/m²	kWh/m²
Heating	9.24	4.73
Cooling	0.00	0.00
Auxiliary and Lighting	22.47	24.72
Hot Water	3.34	2.89
Totals	**35.05**	**32.34**

Unit 02	Notional Energy Demand	Actual Energy Demand
	kWh/m²	kWh/m²
Heating	8.57	4.99
Cooling	0.00	0.00
Auxiliary and Lighting	20.24	22.80
Hot Water	3.34	2.89
Totals	**32.14**	**30.68**

The energy demand figures calculated above have been inputted into the SAP 10 spreadsheet, which is attached as Appendix 4 and provides the total site TER and DER/BER emissions using the emerging carbon emissions factors and as required by the GLA Energy Assessment Guidance (October 2018).

The maximum allowable carbon dioxide emissions from the site (TER) are assessed as **12,424 kg CO_2 per year**, with the actual carbon dioxide emissions (DER/BER) assessed as **7,434 kg CO_2 per year.**

The reduction in emissions from energy efficiency and the installation of air source heat pumps into the apartments and commercial accommodation and using the SAP 10 carbon factors is **4,990 kg CO_2 per year**, which equates to;

- **40.17%**

5.5 Summary of Calculations and Proposals for Low-carbon and Renewable Technologies

Be Lean

A baseline calculation has been prepared using 2013 Building Regulations and the SAP 10 carbon factors.

Using the current Regulations and based upon a gas heating system for the apartments and commercial units the total site CO_2 emissions are calculated as **13,123 kg CO_2 per year** (TER) and **11,574 kg CO_2 per year** (DER/BER).

This equates to a reduction of **1,549 kg CO_2 per year** or **11.80%** of the total TER emissions and is therefore compliant with the GLA energy planning guidance.

The Regulation Compliance Reports are attached as Appendix 1 and the SAP 10 'Be Lean' spreadsheet is attached as Appendix 2.

Be Clean

A further set of calculations has been prepared for the proposed energy strategy.

This proposes the installation of Vaillant aroTHERM air source heat pumps into the apartments and commercial units to provide space heating and hot water. These calculations have been converted to SAP 10 emissions and the 'Be Clean' spreadsheet is attached as Appendix 4. The Regulation Compliance Reports for the proposed energy strategy (based on Part L – 2013) are attached as Appendix 3.

The maximum allowable carbon dioxide emissions from the site (TER) are assessed as **12,424 kg CO_2 per year**, with the actual carbon dioxide emissions (DER/BER) assessed as **7,434 kg CO_2 per year.**

The reduction in emissions using from energy efficiency and the installation of air source heat pumps and using the SAP 10 carbon factors is therefore **4,990 kg CO_2 per year**, which equates to **40.17%.**

Summary

The total reduction in emissions from energy efficiency, low-carbon and renewable technologies are calculated as; 4,990 kg CO_2 per year, which equates to a reduction of 40.17% (% of TER).

The residual emissions are **7.434 tonnes**, which requires a carbon offset payment of **£13,381** (based on the carbon offset payment of £1,800 per tonne).

6.0 Climate change adaption and Water resources

Sustainable Drainage Systems (SUDS)

The site lies within Flood Zone 1 and Flood Zone 2 and a site-specific Flood Risk Assessment has been prepared which considers the issues and sets out what measures may be incorporated.

The existing site is mostly covered with buildings and hard surfacing and the proposal does not change the impermeable area on site. However, the surface water from the development will be managed by attenuation prior to discharge to the sewer in High Street. The attenuation measures will include permeable paving, a modular storage tank and a green roof.

Full details are provided in the Flood Risk Assessment and Indicative Surface Water Strategy by RSK, which accompanies the application.

Surface Water Management

Consideration has been given to the use of grey water recycling. However, customer's resistance to the appearance of the recycled water and the cost of the systems does not currently make them a viable option. They have therefore not been included in the proposals.

Water efficiency measures

In excess of 20% of the UK's water is used domestically with over 50% of this used for flushing WCs and washing (source: Environment Agency). The majority of this comes from drinking quality standard or potable water.

The water efficiency measures included will ensure that the water use target of 110 litres per person per day is achieved for the apartments.

Water efficient devices will be fully evaluated, and installed, wherever possible. The specification of such devices will be considered at detailed design stage and each will be subject to an evaluation based on technical performance, cost and market appeal, together with compliance with the water use regulations.

The following devices will be incorporated within the apartments:

- water efficient taps
- water efficient toilets
- low output showers
- flow restrictors to manage water pressures to achieve optimum levels and
- water meters

Water consumption calculations have been carried out using the Water Efficiency Calculator provided by the BRE. Although not perfect this calculator gives a good indication of the probable water use in a dwelling, although this is largely dependent on the way on which occupants use their homes.

Below is a typical specification, which would achieve the 110 Litres per person per year target.

Schedule of Appliance Water Consumption		
Appliance	Flow rate or capacity	Total Litres
WC	6/4.0 litres dual flush	8.84
Basin	4.5 litres/min.	8.69
Shower	9.0 litres/min	39.33
Bath	156 litres	17.16
Sink	4.5 litres/min	12.34
Washing Machine	TBA	14.70
Dishwasher	TBA	3.30
Total Calculated Use		104.36
Normalisation Factor		0.91
Total Water Consumption		94.97
External Water Use		5.00
Total Water Consumption		99.97

7.0 Materials and Waste

The BRE Green Guide to Specification is a simple guide for design professionals. The guide provides environmental impact, cost and replacement interval information for a wide range of commonly used building specifications over a notional 60-year building life. The construction specification will prioritise materials within ratings A+, A or B.

Preference will be given to the use of local materials & suppliers where viable to reduce the transport distances and to support the local economy. A full evaluation of these suppliers will be undertaken at the next stage of design.

In addition, timber would be sourced, where practical, certified by PEFC or an equivalent approved certification body and all site timber used within the construction process would be recycled.

All insulation materials to will have a zero ozone depleting potential

Construction waste

Targets will be set to promote resource efficiency in accordance with guidance from WRAP, Envirowise, BRE and DEFRA.

The overarching principle of waste management is that waste should be treated or disposed of within the region where it is produced.

Construction operations generate waste materials as a result of general handling losses and surpluses. These wastes can be reduced through appropriate selection of the construction method, good site management practices and spotting opportunities to avoid creating unnecessary waste.

The Construction Strategy will explore these issues, some of which are set out below:

- Proper handling and storage of all materials to avoid damage.
- Efficient purchasing arrangements to minimise over ordering.
- Segregation of construction waste to maximise potential for reuse/recycling.
- Suppliers who collect and reuse/recycle packaging materials.

Appendix 1 – Regulations Compliance Reports for Modelled Units using Baseline Gas

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 26 January 2021 at 10:59:37

Project Information:

Assessed By: Bluesky Unlimited **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 50.1m²

Site Reference : 29-31 High Street, Hampton Wick **Plot Reference:** 1BF MID 50

Address :

Client Details:

Name: Mr & Mrs Frost

Address :

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

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	16.92 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.89 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	34.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	29.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.37 (max. 2.00)	1.37 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Database: (rev 464, product index 018118):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Vaillant
Model: ecoTEC sustain 24
Model qualifier: VUW 246/7-2 (H-GB)
(Combi)
Efficiency 89.2 % SEDBUK2009
Minimum 88.0 % **OK**

Secondary heating system: None

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	Time and temperature zone control by device in database	**OK**
Hot water controls:	No cylinder thermostat No cylinder	
Boiler interlock:	Yes	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South East	3.84m²
Windows facing: South West	3.84m²
Windows facing: South East	5.76m²
Ventilation rate:	3.00
Blinds/curtains:	Light-coloured venetian blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 26 January 2021 at 10:59:34

Project Information:

Assessed By: Bluesky Unlimited **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 50m²
Site Reference : 29-31 High Street, Hampton Wick **Plot Reference:** 1BF TOP 50
Address :

Client Details:

Name: Mr & Mrs Frost
Address :

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

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	21.4 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	19.90 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	51.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	**OK**
Openings	1.37 (max. 2.00)	1.37 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Database: (rev 464, product index 018118):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Vaillant
Model: ecoTEC sustain 24
Model qualifier: VUW 246/7-2 (H-GB)
(Combi)
Efficiency 89.2 % SEDBUK2009
Minimum 88.0 % **OK**

Secondary heating system: None

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	Time and temperature zone control by device in database	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	
Boiler interlock:	Yes	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South West	2.56m²
Windows facing: South West	0.78m²
Windows facing: North East	5.04m²
Windows facing: North West	3.6m²
Windows facing: North East	2.56m²
Ventilation rate:	3.00
Blinds/curtains:	Light-coloured venetian blind
	Closed 100% of daylight hours

10 Key features

Roofs U-value	0.1 W/m²K
Party Walls U-value	0 W/m²K

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 26 January 2021 at 10:59:31

Project Information:

Assessed By: Bluesky Unlimited **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 61m²

Site Reference : 29-31 High Street, Hampton Wick **Plot Reference:** 2BF TOP 61

Address :

Client Details:

Name: Mr & Mrs Frost

Address :

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

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	19.29 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.51 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	44.9 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	**OK**
Openings	1.37 (max. 2.00)	1.37 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Database: (rev 464, product index 018118):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Vaillant
Model: ecoTEC sustain 24
Model qualifier: VUW 246/7-2 (H-GB)
(Combi)
Efficiency 89.2 % SEDBUK2009
Minimum 88.0 % **OK**

Secondary heating system: None

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	Time and temperature zone control by device in database	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	
Boiler interlock:	Yes	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North East	1.92m²
Windows facing: South East	1m²
Windows facing: South West	7.2m²
Windows facing: North East	6m²
Ventilation rate:	3.00
Blinds/curtains:	Light-coloured venetian blind
	Closed 100% of daylight hours

10 Key features

Roofs U-value	0.1 W/m²K

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 26 January 2021 at 10:59:29

Project Information:

Assessed By: Bluesky Unlimited **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 85.7m²

Site Reference : 29-31 High Street, Hampton Wick **Plot Reference:** 2BF DUP 86

Address :

Client Details:

Name: Mr & Mrs Frost

Address :

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

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	16.67 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.91 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	44.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	**OK**
Openings	1.37 (max. 2.00)	1.37 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:
Database: (rev 464, product index 018118):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Vaillant
Model: ecoTEC sustain 24
Model qualifier: VUW 246/7-2 (H-GB)
(Combi)
Efficiency 89.2 % SEDBUK2009
Minimum 88.0 % **OK**

Secondary heating system: None

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	Time and temperature zone control by device in database	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	
Boiler interlock:	Yes	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North West	1.92m²
Windows facing: South East	1.92m²
Windows facing: South East	5.76m²
Windows facing: North West	4.32m²
Ventilation rate:	3.00
Blinds/curtains:	Light-coloured venetian blind
	Closed 100% of daylight hours

10 Key features

Roofs U-value	0.1 W/m²K
Party Walls U-value	0 W/m²K

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name **Shell and Core**

Unit 01, 03 & 04 High Street - GAS

As designed

Date: Tue Jan 12 15:23:10 2021

Administrative information

Building Details

Address: 29-31 High Street, Hampton Wick

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: SBEM Online

Interface to calculation engine version: v4.02

BRUKL compliance check version: v5.6.b.0

Certifier details

Name:

Telephone number:

Address: , Information not provided by the user,

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, kgCO_2/m^2.annum	18
Target CO_2 emission rate (TER), kgCO_2/m^2.annum	18
Building CO_2 emission rate (BER), kgCO_2/m^2.annum	16.6
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	"Wall3102325"
Floor	0.25	0.12	0.12	"Wall3102329"
Roof	0.25	0.15	0.15	"Wall3102918"
Windows***, roof windows, and rooflights	2.2	1.3	1.3	"Window307355"
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m^{2}K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m^{2}K)]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m^{2}K)]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m^3/(h.m^2) at 50 Pa	10	5

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	>0.95

1- HVAC91855

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.95	-	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

1- HWSGenerator57623

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.95	-
Standard value	0.9*	N/A
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.		

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
ZoneOffice 1	NO

General lighting and display lighting

	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
ZoneOffice 1	80	-	-	709

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
ZoneOffice 1	NO (-67.7%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	93.4	93.4
External area [m^2]	217.4	217.4
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	5	5
Average conductance [W/K]	45.1	83.35
Average U-value [W/m^2K]	0.21	0.38
Alpha value* [%]	18.62	17.68

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	15.76	27.41
Cooling	0	0
Auxiliary	1.68	1.01
Lighting	23.04	21.46
Hot water	3.04	3.34
Equipment*	42.19	42.19
TOTAL**	**43.52**	**53.22**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	165.17	189.28
Primary energy* [kWh/m^2]	96.93	104.77
Total emissions [kg/m^2]	16.6	18

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	50.6	114.6	15.8	0	1.7	0.89	0	0.95	0
	Notional	80.8	108.5	27.4	0	1	0.82	0	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.18	"Wall3102325"
Floor	0.2	0.12	"Wall3102329"
Roof	0.15	0.15	"Wall3102918"
Windows, roof windows, and rooflights	1.5	1.3	"Window307355"
Personnel doors	1.5	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name **Shell and Core**

Unit 02 High Street - GAS

As designed

Date: Tue Jan 12 15:10:12 2021

Administrative information

Building Details

Address: 29-31 High Street, Hampton Wick

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: SBEM Online

Interface to calculation engine version: v4.02

BRUKL compliance check version: v5.6.b.0

Certifier details

Name:

Telephone number:

Address: , Information not provided by the user,

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	16.5
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	16.5
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	16.4
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	"Wall3102533"
Floor	0.25	0.11	0.11	"Wall3102537"
Roof	0.25	0.15	0.15	"Wall3102538"
Windows***, roof windows, and rooflights	2.2	1.3	1.3	"Window307418"
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	5

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	>0.95

1- HVAC91873

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.95	-	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

1- HWSGenerator57635

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.95	-
Standard value	0.9*	N/A
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.		

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
ZoneOffice 1	NO

General lighting and display lighting

	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
ZoneOffice 1	80	-	-	1817

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
ZoneOffice 1	YES (+36.6%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	245.9	245.9
External area [m^2]	499.2	499.2
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	5	5
Average conductance [W/K]	164.95	195.55
Average U-value [W/m^2K]	0.33	0.39
Alpha value* [%]	11.89	18.53

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	16.47	25.42
Cooling	0	0
Auxiliary	1.68	1.01
Lighting	22.44	19.23
Hot water	3.04	3.34
Equipment*	42.18	42.18
TOTAL**	**43.63**	**48.99**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	326.38	179.93
Primary energy* [kWh/m^2]	96	95.65
Total emissions [kg/m^2]	16.4	16.5

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	52.9	273.5	16.5	0	1.7	0.89	0	0.95	0
	Notional	74.9	105	25.4	0	1	0.82	0	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.18	"Wall3102533"
Floor	0.2	0.11	"Wall3102537"
Roof	0.15	0.15	"Wall3102538"
Windows, roof windows, and rooflights	1.5	1.3	"Window307418"
Personnel doors	1.5	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

Appendix 2: 'Be Lean' GLA SAP 10 Spreadsheet

Be Lean - SAP 2012 Methodology SAP 10 Carbon Factors

Project	29-31 High Street, Hampton Wick
Client	Mr & Mrs Frost
File ref and engineer	
Sheet	1
Date	Jan-21
Rev	A

SAP 2012	Carbon Factor	SAP 10	Carbon Factor
Gas	0.216	Gas	0.210
Grid Elec	0.519	Grid Elec	0.233

	Price	
Gas	£0.0392	per kW/hr
Electricity	£0.1696	per kW/hr

Residential Accommodation

TER

Plot	Bedrooms	Floor Area	Location	Space Htg	Water Htg	Pumps/ Lighting	Emissions
1	3	110.2	MID	3972	3135	583	1628.2
2	2	61.0	TOP	2494	2110	351	1048.6
3	1	49.6	MID	1232	1923	304	733.2
4	2	85.7	MID & TOP	3089	2438	453	1266.2
5	1	50.1	MID	1244	1942	307	740.6
6	1	53.8	TOP	2477	2058	330	1029.4
7	1	50.0	MID	1242	1938	306	739.1
8	1	50.0	TOP	2302	1913	307	956.7
							8,142

DER - Based on Gas Heating with SAP 10 Carbon Factors

Plot	Space Htg	Water Htg	Pumps/ Lighting	Emissions
1	3756	2450	583	1438.9
2	2396	1706	351	943.2
3	1077	1611	304	635.3
4	2921	1905	453	1119.0
5	1088	1627	307	641.7
6	2461	1703	330	951.4
7	1086	1624	306	640.4
8	2287	1583	307	884.2
				7,254

Total Site Target Emissions	**8,142**	$kgCO_2$ per year
Total Site Design Emissions (Be Clean)	**7,254**	$kgCO_2$ per year
Total Reduction	**888**	$kgCO_2$ per year
% Reduction	**10.90%**	

Non-Residential Accommodation

TER

Plot	Floor Area	Use	Heating	Cooling	Aux/ Lighting	Hot Water	Emissions
01 & 03	211.3	Retail/ Store	5792	0	4746	706	2470.3
02	233.4	Office	5933	0	4724	779	2510.3
04	89.6	Workshop	2456	0	2013	299	1047.5
							4,981

BER - Based on Gas Heating with SAP 10 Carbon Factors

Heating	Cooling	Aux/ Lighting	Hot Water	Emissions
3330	0	5224	642	2051.4
3844	0	5630	710	2268.0
1412	0	2215	272	869.9
				4,319

Total Site Target Emissions	**4,981**	$kgCO_2$ per year
Total Site Design Emissions (Be Clean)	**4,319**	$kgCO_2$ per year
Total Reduction	**661**	$kgCO_2$ per year
% Reduction	**13.28%**	

Combined Reduction

Total Site Target Emissions	**13,123**	$kgCO_2$ per year
Total Site Design Emissions (Be Clean)	**11,574**	$kgCO_2$ per year
Total Reduction	**1,549**	$kgCO_2$ per year
% Reduction	**11.80%**	

Appendix 3 – Regulations Compliance Reports for Modelled Units using ASHPs

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 26 January 2021 at 14:50:17

Project Information:

Assessed By: Bluesky Unlimited **Building Type:** Flat - ASHP

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 50.1m²

Site Reference : 29-31 High Street, Hampton Wick **Plot Reference:** 1BF MID 50 ASHP

Address :

Client Details:

Name: Mr & Mrs Frost

Address :

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

1a TER and DER

Fuel for main heating system: Electricity
Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER)	24.93 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.07 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	34.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	29.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.37 (max. 2.00)	1.37 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:
Heat pumps with radiators or underfloor heating - electric
Vaillant aroTHERM

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 1.50 kWh/day
Permitted by DBSCG: 2.24 kWh/day **OK**

Regulations Compliance Report

Primary pipework insulated:	Yes	**OK**

6 Controls

Space heating controls	Time and temperature zone control by device in database	**OK**
Hot water controls:	Cylinderstat	**OK**
	Independent timer for DHW	**OK**
Boiler interlock:	Yes	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South East	3.84m²
Windows facing: South West	3.84m²
Windows facing: South East	5.76m²
Ventilation rate:	3.00
Blinds/curtains:	Light-coloured venetian blind
	Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 26 January 2021 at 14:50:14

Project Information:

Assessed By: Bluesky Unlimited **Building Type:** Flat - ASHP

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 50m²

Site Reference : 29-31 High Street, Hampton Wick **Plot Reference:** 1BF TOP 50 ASHP

Address :

Client Details:

Name: Mr & Mrs Frost

Address :

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

1a TER and DER

Fuel for main heating system: Electricity
Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER)	31.56 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	22.99 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	51.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	**OK**
Openings	1.37 (max. 2.00)	1.37 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric
Vaillant aroTHERM

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 1.50 kWh/day
Permitted by DBSCG: 2.24 kWh/day **OK**

Regulations Compliance Report

Primary pipework insulated:	Yes	**OK**

6 Controls

Space heating controls	Time and temperature zone control by device in database	**OK**
Hot water controls:	Cylinderstat	**OK**
	Independent timer for DHW	**OK**
Boiler interlock:	Yes	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South West	2.56m²
Windows facing: South West	0.78m²
Windows facing: North East	5.04m²
Windows facing: North West	3.6m²
Windows facing: North East	2.56m²
Ventilation rate:	3.00
Blinds/curtains:	Light-coloured venetian blind
	Closed 100% of daylight hours

10 Key features

Roofs U-value	0.1 W/m²K
Party Walls U-value	0 W/m²K

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 26 January 2021 at 14:50:11

Project Information:

Assessed By: Bluesky Unlimited **Building Type:** Flat - ASHP

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 61m²

Site Reference : 29-31 High Street, Hampton Wick **Plot Reference:** 2BF TOP 61 ASHP

Address :

Client Details:

Name: Mr & Mrs Frost

Address :

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

1a TER and DER

Fuel for main heating system: Electricity
Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER)	28.15 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	19.25 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	44.9 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	**OK**
Openings	1.37 (max. 2.00)	1.37 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:
Heat pumps with radiators or underfloor heating - electric
Vaillant aroTHERM

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.50 kWh/day	
	Permitted by DBSCG: 2.24 kWh/day	**OK**
Primary pipework insulated:	Yes	**OK**

Regulations Compliance Report

6 Controls

Space heating controls	Time and temperature zone control by device in database	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Medium	OK

Based on:

Overshading:	Average or unknown
Windows facing: North East	1.92m²
Windows facing: South East	1m²
Windows facing: South West	7.2m²
Windows facing: North East	6m²
Ventilation rate:	3.00
Blinds/curtains:	Light-coloured venetian blind
	Closed 100% of daylight hours

10 Key features

Roofs U-value	0.1 W/m²K

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 26 January 2021 at 14:50:09

Project Information:

Assessed By: Bluesky Unlimited **Building Type:** Flat - ASHP

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 85.7m²

Site Reference : 29-31 High Street, Hampton Wick **Plot Reference:** 2BF DUP 86 ASHP

Address :

Client Details:

Name: Mr & Mrs Frost

Address :

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

1a TER and DER

Fuel for main heating system: Electricity
Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER)	23.88 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.47 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	44.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	**OK**
Openings	1.37 (max. 2.00)	1.37 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:
Heat pumps with radiators or underfloor heating - electric
Vaillant aroTHERM

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 1.50 kWh/day
Permitted by DBSCG: 2.24 kWh/day **OK**

Regulations Compliance Report

Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls	Time and temperature zone control by device in database	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Slight	OK

Based on:

Overshading:	Average or unknown
Windows facing: North West	1.92m²
Windows facing: South East	1.92m²
Windows facing: South East	5.76m²
Windows facing: North West	4.32m²
Ventilation rate:	3.00
Blinds/curtains:	Light-coloured venetian blind
	Closed 100% of daylight hours

10 Key features

Roofs U-value	0.1 W/m²K
Party Walls U-value	0 W/m²K

Appendix 4: 'Be Clean' GLA SAP 10 Spreadsheet

Be Clean - SAP 2012 Methodology SAP 10 Carbon Factors

Project	29-31 High Street, Hampton Wick
Client	Mr & Mrs Frost
File ref and engineer	
Sheet	1
Date	Jan-21
Rev	A

SAP 2012	Carbon Factor	SAP 10	Carbon Factor
Gas	0.216	Gas	0.210
Grid Elec	0.519	Grid Elec	0.233

	Price	
Gas	£0.0392	per kW/hr
Electricity	£0.1696	per kW/hr

Residential Accommodation

TER

Plot	Bedrooms	Floor Area	Location	Space Htg	Water Htg	Pumps/ Lighting	Emissions
1	3	110.2	MID	3752	3206	583	1756.9
2	2	61.0	TOP	2330	2254	351	1149.9
3	1	49.6	MID	1098	2124	304	821.4
4	2	85.7	MID & TOP	2918	2493	453	1366.3
5	1	50.1	MID	1109	2145	307	829.7
6	1	53.8	TOP	2288	2271	330	1139.2
7	1	50.0	MID	1107	2141	306	828.1
8	1	50.0	TOP	2126	2111	307	1058.8
							8,950

DER - Based on ASHP with SAP 10 Carbon Factors

Plot	Space Htg	Water Htg	Pumps/ Lighting	Emissions
1	1355	1444	486	765.5
2	975	1011	276	527.0
3	559	937	230	402.1
4	1054	1123	378	595.3
5	565	946	232	406.1
6	1116	1018	250	555.3
7	564	944	232	405.3
8	1037	946	232	516.1
				4,173

Total Site Target Emissions	**8,950**	$kgCO_2$ per year
Total Site Design Emissions (Be Clean)	**4,173**	$kgCO_2$ per year
Total Reduction	**4,777**	$kgCO_2$ per year
% Reduction	**53.38%**	

Non-Residential Accommodation

TER

Plot	Floor Area	Use	Heating	Cooling	Aux/ Lighting	Hot Water	Emissions
01 & 03	211.3	Retail/ Store	1952	0	4749	706	1725.8
02	233.4	Office	2000	0	4724	779	1748.2
04	89.6	Workshop	828	0	2014	299	731.8
							3,474

BER - Based on ASHP with SAP 10 Carbon Factors

Heating	Cooling	Aux/ Lighting	Hot Water	Emissions
1000	0	5224	611	1592.4
1165	0	5322	675	1668.6
424	0	2215	259	675.3
				3,261

Total Site Target Emissions	**3,474**	$kgCO_2$ per year
Total Site Design Emissions (Be Clean)	**3,261**	$kgCO_2$ per year
Total Reduction	**213**	$kgCO_2$ per year
% Reduction	**6.13%**	

Combined Reduction

Total Site Target Emissions	**12,424**	$kgCO_2$ per year
Total Site Design Emissions (Be Clean)	**7,434**	$kgCO_2$ per year
Total Reduction	**4,990**	$kgCO_2$ per year
% Reduction	**40.17%**	

Appendix 5 – London Borough of Richmond Sustainable Construction Checklist

LBRUT Sustainable Construction Checklist - June 2020

This document forms part of the Sustainable Construction Checklist SPD. This document **must** be filled out as part of the planning application for the following developments: all residential development providing **one or more new residential units (including conversions leading to one or more new units)**, and all other forms of development providing **100sqm or more of non-residential floor space**. Developments including new non-residential development of less than 100sqm floor space, extensions less than 100sqm, and other conversions are strongly encouraged to comply with this checklist. Where further information is requested, please either fill in the relevant section, or refer to the document where this information may be found in detail, e.g. Flood Risk Assessment or similar. **Further guidance** on completing the Checklist may be found in the Justification and Guidance section of this SPD.

Property Name (if relevant): 29-31 High Street, Hampton Wick

Application No. (if known):

Address (include. postcode): 29-31 High Street, Hampton Wick

Completed by: Ivan Ball

For Non-Residential
Size of development (m2): 534

For Residential
Number of dwellings: 8

1 MINIMUM COMPLIANCE (RESIDENTIAL AND NON-RESIDENTIAL)

Energy Assessment

Has an energy assessment been submitted that demonstrates the expected energy and carbon dioxide emissions saving from energy efficiency and renewable energy measures, including the feasibility of CHP/CCHP and community heating systems? If yes, please select TRUE. — TRUE

Carbon Dioxide emissions reduction

What is the on site carbon dioxide emissions reduction against a Building Regulations Part L (2013) baseline — 40.17 %

Policy LP 22 B. and Draft London Plan Policy 9.2.5 require a 35% onsite reduction in CO_2 emissions beyond Building Regulations 2013.

What is the percentage reduction from efficiency measures alone — 11.8 %

Policy LP 22 C. and Draft London Plan Policy 9.2.6 require a 10% onsite reduction in CO2 emissions beyond Building Regulations 2013 from efficiency measures for residential and 15% for non-residential.

Percentage of **total** site CO2 emissions saved through renewable energy installation? — 28.37 %

What is the total remaining carbon to be offset — 7.434 Tonne

Policy LP 22 B. and Draft London Plan Policy 9.2.4 require Major developments to achieve Zero Carbon after offsetting.

Are remaining emissions going to be offset through offset fund payment in accordance with current guidelines issued for the cost per tonne of CO2? — TRUE

What is the total predicted cost of offset? — 13381 £

The London Plan sets this as £95/tonne per year over 30 years, this should be updated based on As Build calculations.

1A MINIMUM POLICY COMPLIANCE (NON-RESIDENTIAL AND DOMESTIC REFURBISHMENT)

Please check the Guidance Section of this SPD for the policy requirements

Environmental Rating of development:

Non-Residential new-build (100sqm or more)
BREEAM Level: Please Select — Have you attached a pre-assessment to support this? FALSE
Excellent required under Policy LP22 A 3

Extensions and conversions for residential dwellings
BREEAM Domestic Refurbishment: Please Select — Have you attached a pre-assessment to support this? FALSE
Excellent required under Policy LP22 A 4

Extensions and conversions for non-residential buildings
BREEAM Level: Please Select — Have you attached a pre-assessment to support this? FALSE
Excellent required under Policy LP 22

Score awarded for Environmental Rating:
BREEAM: Good = *0*, Very Good = 4, Excellent = *8*, Outstanding = *16*

Subtotal 0

1B MINIMUM POLICY COMPLIANCE (RESIDENTIAL)

	Score	
Water Usage		
Internal water usage after gray/rainwater systems limited to 105 litres person per day. (Excluding an allowance 5 litres per person per day for external water consumption). Calculations using the water efficiency calculator for new dwellings have been submitted. *110l/p/d Required for new dwellings under Policy LP22 A 2 105l/p/d required under Draft London Plan Policy SI5*	*1*	TRUE
Subtotal	1	

2. ENERGY USE AND POLLUTION

	Score	
2.1 Need for Cooling		
a. How does the development incorporate cooling measures? Tick all that apply:		
Energy efficient design incorporating specific heat demand to less than or equal to 15 kWh/sqm	*6*	TRUE
Reduce heat entering a building through providing/improving insulation and living roofs and walls	*2*	TRUE
Reduce heat entering a building through shading	*3*	FALSE
Exposed thermal mass and high ceilings	*4*	TRUE
Passive ventilation	*3*	TRUE
Mechanical ventilation with heat recovery	*1*	FALSE
Active cooling systems, i.e. Air Conditioning Unit	*0*	FALSE
See Draft London Plan SI4		
2.2 Heat Generation		
b. How have the heating and cooling systems, with preference to the heating system hierarchy, been selected (defined in London Plan policy **SI3)** Tick all heating and cooling systems that will be used in the development:	**Score**	
Connection to existing heating or cooling networks powered by renewable energy	*6*	FALSE
Connection to existing heating or cooling networks powered by gas or electricity	*5*	FALSE
Site wide CHP network powered by renewable energy	*4*	FALSE
Site wide CHP network powered by gas	*3*	FALSE
Communal heating and cooling powered by renewable energy	*2*	FALSE
Communal heating and cooling powered by gas or electricity	*1*	FALSE
Individual heating and cooling	*0*	TRUE
See Draft London Plan SI3		
2.3 Pollution: Air, Noise and Light		
a. Does the development plan to implement reduction strategies for dust emissions from construction sites?	*2*	TRUE
b. Does the development plan to include a biomass boiler?		FALSE
If yes, please refer to the biomass guidelines for the Borough of Richmond, please see guidance for supplementary information. If the proposed boiler is of a qualifying size, you may need to complete the information request form found on the Richmond website.		
c. Has an air quality impact assessment been provided		FALSE
If yes, has 'Emissions Neutral' been achieved	*1*	TRUE
If yes, have occupants of new development been protected from existing pollution	*1*	FALSE
If no to any of the above are there any sensitive receptors as defined in Policy LP 10 present?	*-1*	FALSE
see Policy LP 10		
d. Please tick only one option below		
Has the development taken measures to reduce existing noise and enhance the existing soundscape of the site?	*3*	TRUE
Has the development taken care to not create any new noise generation/transmission issues in its intended operation?	*1*	TRUE
see Policy LP 10		
e. Has the development taken measures to reduce light pollution impacts on character, residential amenity and biodiversity?	*3*	TRUE

see Policy LP 10

f. Have you attached a Lighting Pollution Report? -

Subtotal 25

Please give any additional relevant comments to the Energy Use and Pollution Section below

The proposals include all electric systems on site. Therefore will be no on-site emissions.

3. TRANSPORT

3.1 Provision for the safe efficient and sustainable movement of people and goods

a. Does your development provide opportunities for occupants to use innovative travel technologies? — FALSE

Please explain:

		Score	
b.	Does your development provide for 100% active provision for electric vehicle charging point(s) and have you successfully demonstrated that it would be able to operate satisfactorily in the future expectation of all vehicles being electrically powered?	2	FALSE
c.	**For major developments ONLY**: Has a Transport Assessment been produced for your development based on TfL's Best Practice Guidance? If you have provided a Transport Assessment as part of your planning application, please tick here and move to Section 3 of this Checklist.	5	TRUE
	See policy LP44		
d.	**For smaller developments ONLY**: Have you provided a Transport Statement?	5	FALSE
e.	Does your development provide cycle storage? (Standard space requirements are set out in the Council's Parking Standards - Local Plan Appendix 3)	2	TRUE
	If so, for how many bicycles?	24	
	Is this shown on the site plans?		TRUE
	See Local Plan Appendix 3		
f.	Will the development create or improve links with local and wider transport networks? If yes, please provide details.	2	FALSE

Subtotal 7

Please give any additional relevant comments to the Transport Section below

There are three car parking spaces allocated to the residential element and two of these will be provided with electric vehicle charging points.

4 BIODIVERSITY

4.1 Minimising the threat to biodiversity from new buildings, lighting, hard surfacing and people

a. Does your development involve the loss of an ecological feature or habitat, including a loss of garden or other green space? (Indicate if yes) -2 — FALSE
If so, please state how much in sqm? sqm

b. Does your development involve the removal of any tree(s)? (Indicate if yes) — FALSE
If so, has a tree report been provided in support of your application? (Indicate if yes) — FALSE

c. Does your development plan to add (and not remove) any tree(s) on site? (Indicate if yes) — FALSE

d. Please indicate which features and/or habitats that your development will incorporate to improve on site biodiversity:

Pond, reedbed or extensive native planting	6	Area provided:	sqm	FALSE
An extensive green roof	5	Area provided:	Circa 28 sqm	TRUE
An intensive green roof	4	Area provided:	sqm	FALSE
Garden space	4	Area provided:	sqm	FALSE
Additional native and/or wildlife friendly planting to peripheral areas	3	Area provided:	sqm	FALSE
Additional planting to peripheral areas	2	Area provided:	Circa 30 sqm	TRUE
A living wall	2	Area provided:	sqm	FALSE
Bat boxes	0.5			TRUE
Bird boxes	0.5			TRUE
Swift boxes	0.5			TRUE
Other	0.5			FALSE

e. Does your development use at least 70% of available roof plate as green/brown roof 1 — FALSE
Policy LP 17 requires 70%

Subtotal 8.5

Please give any additional relevant comments to the Biodiversity Section below

5 FLOODING AND DRAINAGE

5.1 Mitigating the risks of flooding and other impacts of climate change in the borough

a. Is your site located in a high flood risk zone (Zone 3)? (Indicate if yes) -2 — FALSE
Have you submitted a Flood Risk Assessment? (Indicate if yes) — TRUE

b. Which of the following measures of the drainage hierarchy are incorporated onto your site? (tick all that apply)

Store rainwater for later use	5	FALSE
Use of infiltration techniques such as porous surfacing materials to allow drainage on-site	3	TRUE
Attenuate rainwater in ponds or open water features	4	FALSE
Store rainwater in tanks for gradual release to a watercourse	3	FALSE
Discharge rainwater directly to watercourse	2	FALSE
Discharge rainwater to surface water drain	1	TRUE
Discharge rainwater to combined sewer	0	FALSE
Have you submitted a Drainage Statement (Indicate if yes)		TRUE

See Policy LP 21 and Draft London Plan SL 13

c. Please give the change in area of permeable surfacing which will result from your development proposal: 0 sqm
Please provide details of the permeable surfacing below — *please represent a loss in permeable area as a negative number*

Subtotal 4

Please give any additional relevant comments to the Flooding and Drainage Section below

6 IMPROVING RESOURCE EFFICIENCY

6.1 Reduce waste generated and amount disposed of by landfill though increasing level of re-use and recycling

a. Will demolition be required on your site prior to construction? *[Points will only be awarded if 10% or greater of demolition waste is reused/recycled]* 1 — TRUE

If so, what percentage of demolition waste will be reused in the new development? 10 %

What percentage of demolition waste will be recycled? 80 %

b. Does your site have any contaminated land? 1 — TRUE
Have you submitted an assessment of the site contamination? 2 — TRUE

Are plans in place to remediate the contamination?	2	FALSE
Have you submitted a remediation plan?	1	FALSE
Are plans in place to include composting on site?	1	FALSE

c. Will a waste management plan and facilities be in place in line with Policy LP24 — Yes

6.2 Reducing levels of water waste

a. Will the following measures of water conservation be incorporated into the development? (Please tick all that apply):

Fitting of water efficient taps, shower heads etc	1	TRUE
Use of water efficient A or B rated appliances	1	TRUE
Rainwater harvesting for internal use	4	FALSE
Greywater systems	4	FALSE
Fit a water meter	1	TRUE

Subtotal 6

Please give any additional relevant comments to the Improving Resource Efficiency Section below

A Phase 1 Desk Study for site contamination has been prepared and accompanies the application. This recommends further site investigation and if discovered a remediation plan will be agreed.

7 ACCESSIBILITY

7.1 Ensure flexible adaptable and long-term use of structures

a. **If the development is residential,** will it meet the requirements of the nationally described space standard for internal space and layout? 1 TRUE

If the standards are not met, in the space below, please provide details of the functionality of the internal space and layout

AND

b. **If the development is residential**, will it meet Building Regulation Requirement M4 (2) 'accessible and adaptable dwellings'? 2 TRUE

If this is not met, in the space below, please provide details of any accessibility measures included in the development.

For major residential developments, are 10% or more of the units in the development to Building Regulation Requirement M4 (3) 'wheelchair user dwellings'? 1 TRUE

OR

c. **If the development is non-residential,** does it comply with requirements included in Richmond's Local Plan LP1, LP28.B, LP30 & LP45 2 TRUE

Please provide details of the accessibility measures specified in the Local Plan that will be included in the development

Subtotal 6

Please give any additional relevant comments to the Design Standards and Accessibility Section below

LBRUT Sustainable Construction Checklist- Scoring Matrix for *New Construction* **(Non-Residential and domestic refurb)** ***TOTAL*** ***57.5***

Score	Rating	Significance
84 or more	*A+*	Project strives to achieve highest standard in energy efficient sustainable development
75-83	*A*	Makes a major contribution towards achieving sustainable development in Richmond
56-74	*B*	Helps to significantly improve the Borough's stock of sustainable developments
40-55	*C*	Minimal effort to increase sustainability beyond general compliance
39 or less	*FAIL*	Does not comply with SPD Policy

LBRUT Sustainable Construction Checklist- Scoring Matrix for New Construction **Residential new-build**

Score	Rating	Significance
85 or more	A++	Project strives to achieve highest standard in energy efficient sustainable development
68-84	*A+*	Project strives to achieve higher standard in energy efficient sustainable development
59-67	*A*	Makes a major contribution towards achieving sustainable development in Richmond
39-58	*B*	Helps to significantly improve the Borough's stock of sustainable developments
24-38	*C*	Minimal effort to increase sustainability beyond general compliance
23 or less	*FAIL*	Does not comply with SPD Policy

Authorisation:

I herewith declare that I have filled in this form to the best of my knowledge

Signature _____ **Date** _____