1-5 Portpool Lane, London

Energy Statement

Issue 2 – 10th October 2014

Prepared For:

Spot Property LTD

1-5 PORTPOOL LANE, LONDON

ENERGY STATEMENT

Quality Assurance Page

Issue	Date	Prepared By	Checked By	Approved By	Remarks
1	07/10/14	R.Wilkes	M.Smith	M.Taylor	1773-rw-141007-Energy Statement
2	10/10/14	R.Wilkes	M.Smith	M.Taylor	1773-rw-141010-Energy Statement

Contents

1 Executive Summary

This report describes the energy strategy adopted for the proposed residential and office accommodation at 1-5 Portpool Lane in the London Borough of Camden (LBC).

The development comprises six private residential apartments and 331m² of office accommodation (at basement and ground floors).

Energy is an integral part of the development's design, and this report demonstrates how the scheme responds to national, regional and local planning guidance in relation to climate change mitigation.

1.1 Carbon Reduction Targets

London Borough of Camden Sustainability Planning Guidance (CPG 3) dated September 2013 and the London Plan 2011, require that all new developments achieve a minimum 40% improvement in regulated carbon dioxide emissions over the 2010 Building Regulations requirements.

The GLA's Sustainable Design and Construction Supplementary Planning Guidance dated April 2014 confirms that a flat 35% carbon dioxide improvement target (against the 2013 Building Regulations) should be used for both residential and non-residential development to avoid complexity.

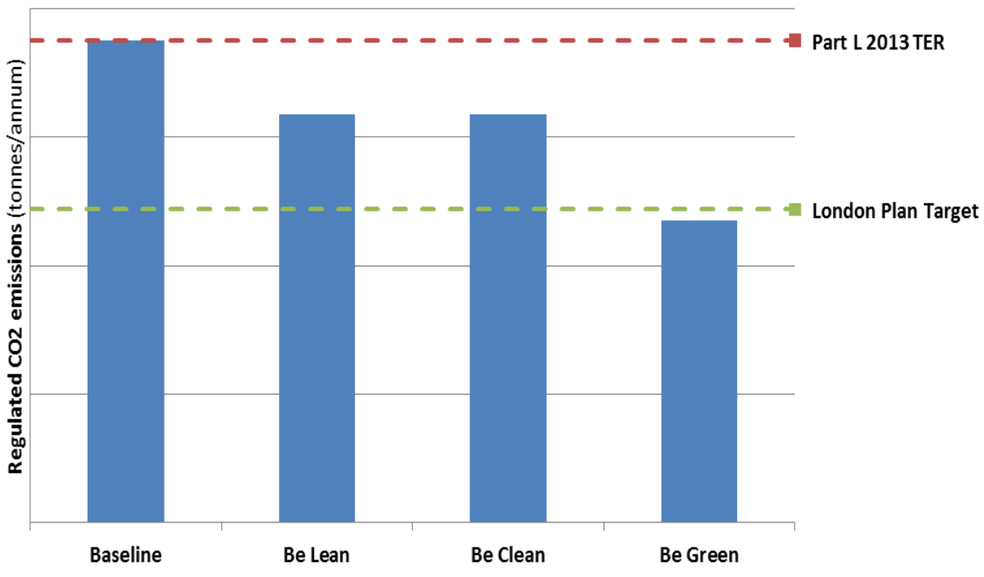
1.2 Carbon Reduction Strategy

The feasibility of achieving these targets has been assessed using the latest version of the Standard Assessment Procedure (SAP) for the residential apartments and the Simplified Building Energy Model (SBEM) for the office accommodation.

The targets will be achieved by following the energy hierarchy, as detailed below;-

- Be Lean – Use less energy
- Be Clean – Supply energy efficiently
- Be Green – Use renewable energy

The graph below details the proposed energy hierarchy for 1-5 Portpool Lane;-



The following table details the carbon dioxide emissions expected at each stage of the energy hierarchy;-

	Carbon dioxide emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	16.89	21.28
After energy demand reduction	14.31	21.28
After CHP	14.31	21.28
After renewable energy	10.58	21.28

The following table details the regulated carbon dioxide savings expected to be achieved at each stage of the energy hierarchy;-

	Regulated carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Savings from energy demand reduction	2.58	15.3
Savings from CHP	0.00	0.0
Savings from renewable energy	3.73	26.1
Total Cumulative Savings	6.31	37.4
Total Target Savings	5.9	35
Annual Surplus	0.40	

The development is expected to achieve a total saving of 37% in regulated carbon emissions over 2013 Building Regulations.

Passive Design and Energy Efficiency (Be Lean)

The development will demonstrate best practice performance for fabric and engineering services, providing a 15% reduction in regulated carbon dioxide emissions over the Part L 2013 compliance target.

For the residential apartments, the Fabric Efficiency is expected to be 8% better than the Approved Document L1A target rate.

Community Energy and CHP (Be Clean)

The potential for connecting into an existing or planned decentralised energy scheme has been investigated and it is considered that a connection is currently not feasible. There are no existing or planned schemes in the vicinity, and the proposed development is not within an opportunity area.

The proposed scheme is very small with only six apartments and 331m² of office space, and any potential CHP would be very small. A whole life cost appraisal has been carried out and the inclusion of CHP is considered to be unviable for the development.

Renewable Energy Systems (Be Green)

The opportunities for renewable energy systems have been reviewed, and it proposed that photovoltaic and solar thermal panels are installed on the roof of the building. It is planned to provide the following;-

- 46m² of photovoltaic panels (residential and office)
- 4m² of solar thermal panels (office)

As detailed above these provisions are expected to result in a further 22% improvement over Part L, following the passive design and energy efficiency measures.

1.3 Environmental Assessment

A Code for Sustainable Homes rating of 4 is targeted for all of the apartments at 1-5 Portpool Lane. The target rating required to achieve Code Level 4 is 68%.

A Code for Sustainable Homes pre-assessment has been carried out under the November 2010 version and May 2014 Addendum.

The pre-assessment indicates that a score of 70% is achievable, with all mandatory elements required for Code 4 met. Please refer to separate document.

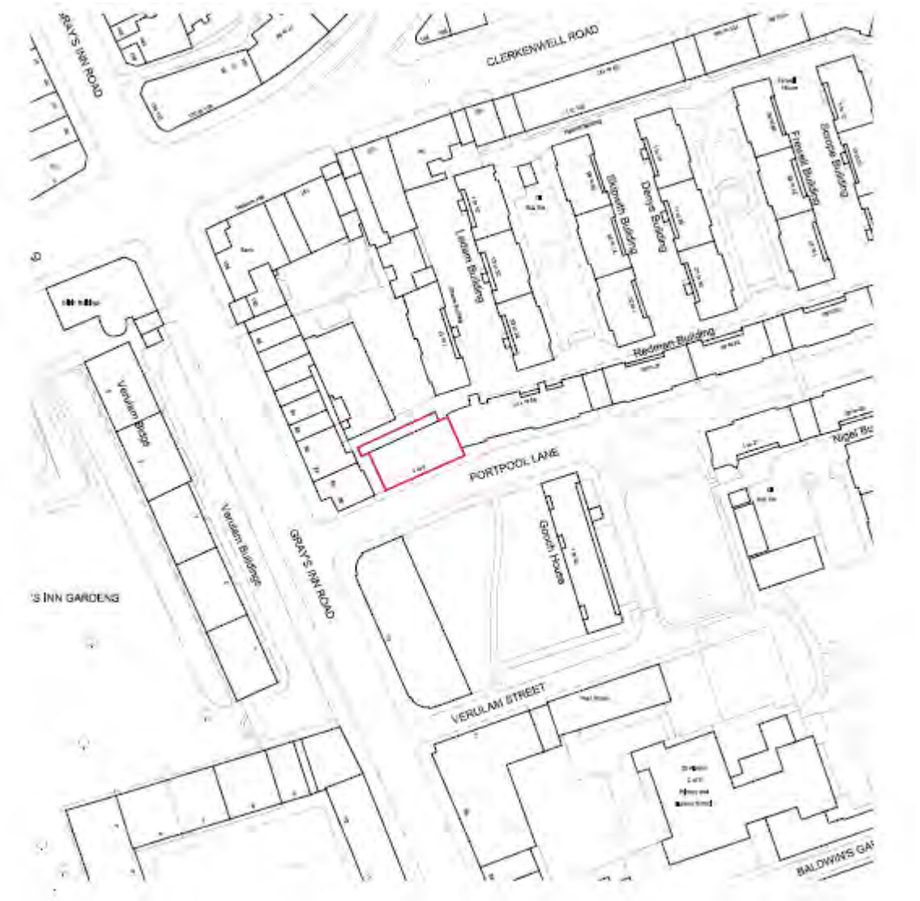
2 Summary of Proposal

The proposal is for a new 5-storey development on Portpool Lane which comprises six private residential apartments and 331m² GIA of office accommodation (at basement and ground floors).

The proposed building matches the footprint of the existing, which is to be demolished.

The 1-5 Portpool Lane site lies within the London Borough of Camden, and is located close to the junction with Gray's Inn Road, as shown on the location plan below.

The site is situated within a well-established mixed use area with mainly commercial properties along Gray's Inn Road and predominantly residential accommodation to Portpool Lane.



3 Energy Strategy

The energy strategy follows the principles of the energy hierarchy;-

- Be Lean – Use less energy
- Be Clean – Supply energy efficiently
- Be Green – Use renewable energy

Part L1A SAP modelling has been undertaken for all six residential apartments using Stroma FSAP 2012 software. Part L2A SBEM modelling has been undertaken for the office area using IES Virtual Environment software.

The results of the modelling have been used to inform the energy demand assessment for the development, as detailed below.

3.1 Be Lean - Passive Design and Energy Efficiency

The development will demonstrate best practice performance for fabric and engineering services, providing a 15% reduction in regulated carbon dioxide emissions over the Part L 2013 compliance target.

This reduction will be achieved by a combination of the measures, including the following;

Fabric 'U' Values

The thermal performance of the building fabric will be significantly improved over Part L minimum requirements;-

External Walls	0.15 W/m^2 K
Floor	0.18 W/m^2 K
Roof	0.18 W/m^2 K
Glazing	1.4 W/m^2 K
Glazing (Fire rated)	2.4 W/m^2 K

Air Permeability

The target air permeability for the building will be 3 m^3/(h m^2) at 50 Pa as compared to the Part L minimum requirement of 10 m^3/(h m^2).

Glazing Optimisation

The size, location and g-value of the glazing has been assessed to provide a balance between minimising heat gain and maximising natural daylight (to reduce lighting energy).

The design includes a total glazing area of around 20% of the external wall area, with a g-value of 0.63.

High Efficiency Heating and Cooling Systems

Gas fired condensing combi boilers are proposed to provide space heating and domestic hot water for the residential apartments, which provide an efficiency of 89% (SEDBUK 2009). Domestic hot water system losses are minimised as a storage cylinder is not required.

Air cooled chillers are proposed to provide comfort cooling for the residential apartments which provide an efficiency of 3.01, as compared to the Part L minimum requirement of 2.4.

VRV heat pumps are proposed to provide space heating and cooling for the office areas which provide an efficiency of 4.12 in heating mode and 3.86 in cooling mode, as compared to the Part L minimum requirements of 2.5 (heating) and 2.6 (cooling).

Mechanical Ventilation Systems

Ventilation to the residential apartments will be provided by Mechanical Ventilation with Heat Recovery (MVHR) units.

Mechanical ventilation to the office areas will be provided with heat recovery and will have a Specific Fan Power (SFP) of 0.8 W/(l/s) as compared to the Part L minimum requirement of 1.6 W/(l/s).

Low Energy Lighting

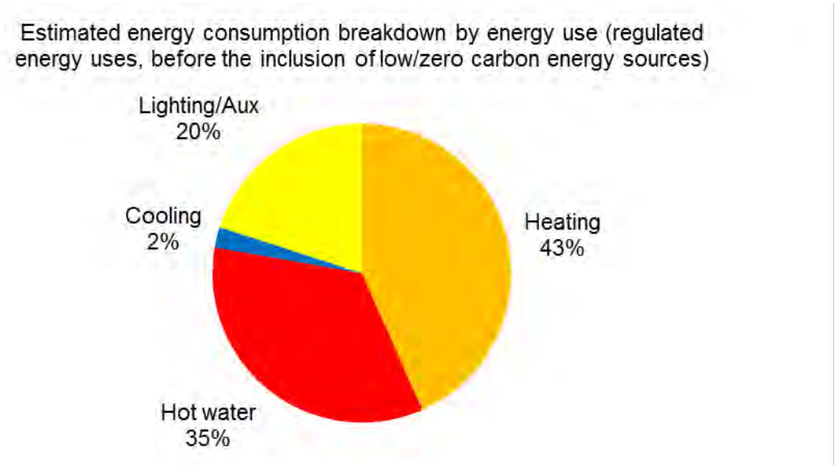
Low energy lighting will be used throughout the development.

3.2 Energy Demand and CO2 Emissions ('Lean' Scheme)

Energy Demand

The energy demand for the development has been assessed using SAP and SBEM modelling, and the results are as below (before the inclusion of low/zero carbon energy sources);-

Space Use	Area (m²)	Energy for space heating (kWh/year)	Energy for domestic hot water (kWh/year)	Energy for space cooling (kWh/year)	Energy for lighting/auxillary (kWh/year)	Unregulated energy (kWh/year)
Residential	514	17,956	14,442	292	4,082	26,597
Office	343	2,188	1,541	738	5,217	18,517
Total	857	20,144	15,983	1,029	9,299	45,113

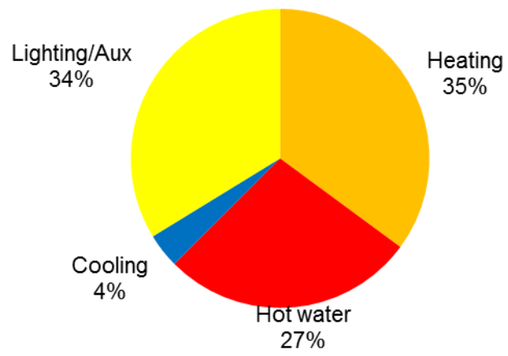


Carbon Emissions

The carbon emissions for the development have been assessed as below (before the inclusion of low/zero carbon energy sources);-

Space Use	CO_2 emissions for space heating ($kg\ CO_2$/year)	CO_2 emissions for domestic hot water ($kg\ CO_2$/year)	CO_2 emissions for space cooling ($kg\ CO_2$/year)	CO_2 emissions for lighting/auxillary ($kg\ CO_2$/year)	CO_2 emissions for unregulated energy uses ($kg\ CO_2$/year)
Residential	3,878	3,119	151	2,119	11,702
Office	1,131	797	381	2,697	9,573
Total	5,010	3,916	533	4,816	21,275

Estimated CO2 emissions by energy use (regulated energy uses, before the inclusion of low/zero carbon energy sources)



3.3 Be Clean – Community Energy and CHP

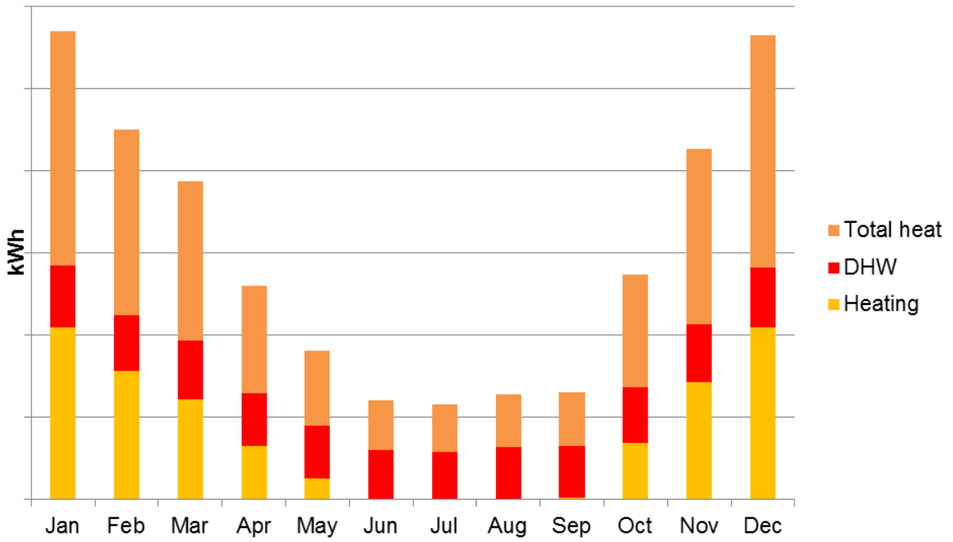
Combined Heat and Power (CHP)

The proposed scheme is very small with only six apartments and 331m² of office space, and the feasibility of the inclusion of CHP in the scheme has been assessed.

The energy required for space heating and domestic hot water has been calculated, and a load profile developed for the scheme, as shown below. From this load profile it has been determined that the optimum size of CHP would be 8kW (thermal) running between 5 and 23 hours per day to meet 100% of the heating and domestic hot water load (with appropriate thermal storage).

The estimated outputs from this CHP would be as below;-

CHP Unit	Annual running hours (hours/year)	Annual thermal output (kWh/year)	Annual electrical output (kWh/year)	Annual CO_2 savings (Tonnes CO2 per year)	Annual CO_2 reduction from energy efficient scheme (%)
8kWt, 4 kWe	4516	36126	18063	2.73	19.1



Thirty year whole life cost appraisals have been carried out to compare the following schemes;-

- Central heating and domestic hot water plant (with CHP) serving the residential and office areas. DX system to provide comfort cooling to the offices. 2 kWp of PVs.
- Individual combi boilers in each apartment to provide heating and domestic hot water. VRV system to provide heating and cooling to the office area. 7 kWp of PVs and $4m^2$ of solar thermal.

A 4% discount rate has been used in the assessments. The whole life costs are as detailed below;-

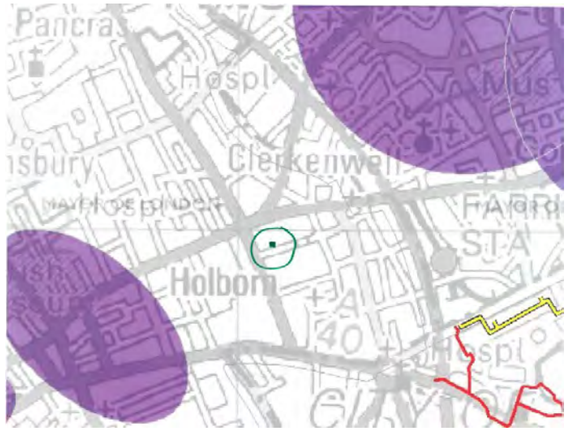
- CHP scheme £230,419
- Non CHP scheme £195,051

As a result of these appraisals a CHP is considered unviable for the development.

Community Energy

The potential for connecting into an existing or planned decentralised energy scheme has been investigated and it is considered that a connection is currently not feasible.

As can be seen from the extract of the London Heat Map below, there are no existing or planned schemes in the vicinity of the site, and the proposed development is not within an opportunity area.



3.4 Be Green – Renewable Energy

This section provides an appraisal of the renewable technologies that can be considered for the proposed development.

An appraisal of potential renewable technologies has been undertaken, the results of which are summarised in the table below.

Technologies such as anaerobic digestion or biomass CHP have been discounted owing to the inappropriate scale of these systems.

Description	Feasible	Output	Notes
Photovoltaic electricity generation Photovoltaic modules use the photovoltaic effect to generate electricity directly from sunlight.	✓	46m2 9kWh peak 7090kWh/year 3.73 Tonnes CO2 per year saving 26% reduction	This is the preferred option for the development, as it provides the greatest carbon savings. Roof space has been identified.
Solar water heating Solar water heating systems use energy from the sun to pre-heat domestic hot water. Solar water heating systems are generally composed of solar thermal collectors and a fluid system to move the heat from the collector to a storage tank in order to store the heat for subsequent use.	✓	4m2 70kWh/year 0.7% reduction	Solar thermal is feasible for the office hot water as CHP is not included, but limited space is available at roof level with PV's, so a small area is proposed.
Ground Source Heat Pump Ground source heat pumps can be used to extract heat from the ground by circulating a fluid through a system of pipes to a heat exchanger which transfers the energy to the distribution network. They have the advantage that they can act as a source of both heating and cooling for buildings. Ground source heat pumps are either open-loop (extracting and rejecting water to the aquifer below the site) or closed-loop.	✗	N/A	Due to the lack of external space for the boreholes an open loop system could not be incorporated, Capacity from closed loop limited by small site area. System not proposed.
Biomass Heating Biomass heating systems combust biomass material in a biomass boiler in order to heat water in the same way that gas boilers combust gas. Biomass heating approaches a carbon neutral process. Biomass boilers require storage adjacent to the boiler to be provided. The fuel is then delivered on a regular basis.	✗	N/A	Biomass would have significant maintenance, logistics (fuel delivery), and air quality implications in this central London location. System not proposed.
Wind power Wind turbines use the wind's forces to turn a rotor which generates electricity. Wind power is used in large scale wind farms for national electrical grids as well as in small	✗	N/A	This system would not be expected to lead to significant CO2 savings due to wind patterns in urban areas System not proposed.

Appendix A – SAP Calculations

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.0.30
Printed on 07 October 2014 at 10:25:16

Project Information:

Assessed By: Paul Bainbridge (STRO006208) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 65.51m²
Site Reference : New Project **Plot Reference:** Flat 001 - Rev F - No PV
Address : Flat 001

Client Details:

Name:
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)	21.28 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	19.98 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	59.10 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	52.60 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.18 (max. 0.25)	0.18 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.64 (max. 2.00)	2.40 (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	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage: No cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	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

Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley): OK

Based on:

Overshading:	Average or unknown
Windows facing: North	8.1m²,
Windows facing: East	1.08m²,
Windows facing: South	5.28m²,
Windows facing: West	2.68m²,
Ventilation rate:	0.10
Blinds/curtains:	Dark-coloured venetian blind Closed 0% of daylight hours

10 Key features

Air permeablility	3.0 m³/m²h
Doors U-value	1.1 W/m²K
External Walls U-value	0.13 W/m²K
Fixed cooling system	

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.0.30
Printed on 07 October 2014 at 10:15:18

Project Information:

Assessed By: Paul Bainbridge (STRO006208) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 65.51m²
Site Reference : New Project **Plot Reference:** Flat 001 - Rev F
Address : Flat 001

Client Details:

Name:
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)	21.26 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.32 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	59.10 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	51.90 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.18 (max. 0.25)	0.18 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.64 (max. 2.00)	2.40 (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	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder Insulation:

Hot water Storage:	No cylinder	
		N/A

Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	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

Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley): OK

Based on:

Overshading:	Average or unknown
Windows facing: North	8.1m²,
Windows facing: East	1.08m²,
Windows facing: South	5.28m²,
Windows facing: West	2.88m²,
Ventilation rate:	3.00
Blinds/curtains:	Dark-coloured venetian blind Closed 0% of daylight hours

10 Key features

Air permeability	3.0 m³/m²h
Doors U-value	1.1 W/m²K
External Walls U-value	0.13 W/m²K
Photovoltaic array	
Fixed cooling system	

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.0.30
Printed on 25 September 2014 at 16:10:32

Project Information:

Assessed By: Paul Bainbridge (STRO006208) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 96.4m²
Site Reference : New Project **Plot Reference:** Flat 002 - Rev D - No PV
Address : Flat 002

Client Details:

Name:
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)	18.79 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.53 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.10 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	50.50 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.18 (max. 0.25)	0.18 (max. 0.70)	OK
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.78 (max. 2.00)	2.40 (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	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder	
		N/A

Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	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

Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley): OK

Based on:

Overshading:	Average or unknown
Windows facing: North	7.97m²,
Windows facing: East	3.55m²,
Windows facing: South	9.36m²,
Ventilation rate:	0.10
Blinds/curtains:	Dark-coloured venetian blind Closed 0% of daylight hours

10 Key features

Air permeablility	3.0 m³/m²h
Doors U-value	1.1 W/m²K
External Walls U-value	0.13 W/m²K
Fixed cooling system	

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.1.8
Printed on 26 September 2014 at 11:46:05

Project Information:

Assessed By: Paul Bainbridge (STRO006208) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 96.4m²
Site Reference : New Project **Plot Reference:** Flat 002 - Rev D
Address : Flat 002

Client Details:

Name:
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)	18.79 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.32 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.07 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	50.46 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.18 (max. 0.25)	0.18 (max. 0.70)	OK
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.78 (max. 2.00)	2.40 (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	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder	
		N/A

Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	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

Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley):	Medium	OK

Based on:

Overshading:	Average or unknown
Windows facing: North	7.97m²,
Windows facing: East	3.55m²,
Windows facing: South	9.36m²,
Ventilation rate:	3.00
Blinds/curtains:	Dark-coloured venetian blind Closed 0% of daylight hours

10 Key features

Air permeablility	3.0 m³/m²h
Doors U-value	1.1 W/m²K
External Walls U-value	0.13 W/m²K
Photovoltaic array	
Fixed cooling system	

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.0.30
Printed on 25 September 2014 at 16:10:28

Project Information:

Assessed By: Paul Bainbridge (STRO006208) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 72.24m²
Site Reference : New Project **Plot Reference:** Flat 003 - Rev D - No PV
Address : Flat 003

Client Details:

Name:
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)	18.29 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.89 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	46.50 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	45.30 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.68 (max. 2.00)	2.40 (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	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder	
		N/A

Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	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

Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley): OK

Based on:

Overshading:	Average or unknown
Windows facing: North	7.97m²,
Windows facing: East	1.08m²,
Windows facing: South	6.72m²,
Windows facing: West	3.65m²,
Ventilation rate:	0.10
Blinds/curtains:	Dark-coloured venetian blind Closed 0% of daylight hours

10 Key features

Air permeablility	3.0 m³/m²h
Doors U-value	1.1 W/m²K
External Walls U-value	0.13 W/m²K
Fixed cooling system	

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.1.8
Printed on 26 September 2014 at 11:45:57

Project Information:

Assessed By: Paul Bainbridge (STRO006208) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 72.24m²
Site Reference : New Project **Plot Reference:** Flat 003 - Rev D
Address : Flat 003

Client Details:

Name:
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)	18.29 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	10.94 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	46.52 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	45.34 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.68 (max. 2.00)	2.40 (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	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder	
		N/A

Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	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

Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley):	Medium	OK

Based on:

Overshading:	Average or unknown
Windows facing: North	7.97m²,
Windows facing: East	1.08m²,
Windows facing: South	6.72m²,
Windows facing: West	3.65m²,
Ventilation rate:	3.00
Blinds/curtains:	Dark-coloured venetian blind Closed 0% of daylight hours

10 Key features

Air permeablility	3.0 m³/m²h
Doors U-value	1.1 W/m²K
External Walls U-value	0.13 W/m²K
Photovoltaic array	
Fixed cooling system	

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.0.30
Printed on 25 September 2014 at 16:10:24

Project Information:

Assessed By: Paul Bainbridge (STRO006208) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 76.35m²
Site Reference : New Project **Plot Reference:** Flat 004 - Rev D - No PV
Address : Flat 004

Client Details:

Name:
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)	18.46 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.62 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.80 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	45.60 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.64 (max. 2.00)	2.40 (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	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder	
		N/A

Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	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

Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley):		OK

Based on:

Overshading:	Average or unknown
Windows facing: North	8.26m²,
Windows facing: South	5.28m²,
Windows facing: East	3.7m²,
Ventilation rate:	0.10
Blinds/curtains:	Dark-coloured venetian blind Closed 0% of daylight hours

10 Key features

Air permeablility	3.0 m³/m²h
Doors U-value	1.1 W/m²K
External Walls U-value	0.13 W/m²K
Fixed cooling system	

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.1.8
Printed on 26 September 2014 at 11:45:51

Project Information:

Assessed By: Paul Bainbridge (STRO006208) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 76.35m²
Site Reference : New Project **Plot Reference:** Flat 004 - Rev D
Address : Flat 004

Client Details:

Name:
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)	18.46 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.04 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.79 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	45.56 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.64 (max. 2.00)	2.40 (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	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder	
		N/A

Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	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

Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley):	Medium	OK

Based on:

Overshading:	Average or unknown
Windows facing: North	8.26m²,
Windows facing: South	5.28m²,
Windows facing: East	3.7m²,
Ventilation rate:	3.00
Blinds/curtains:	Dark-coloured venetian blind Closed 0% of daylight hours

10 Key features

Air permeablility	3.0 m³/m²h
Doors U-value	1.1 W/m²K
External Walls U-value	0.13 W/m²K
Photovoltaic array	
Fixed cooling system	

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.0.30
Printed on 25 September 2014 at 16:10:20

Project Information:

Assessed By: Paul Bainbridge (STRO006208) **Building Type:** Maisonette

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 96.98m²
Site Reference : New Project **Plot Reference:** Flat 005 - Rev D - No PV
Address : Flat 005

Client Details:

Name:
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)	18.99 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.20 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	58.40 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	54.20 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.63 (max. 2.00)	2.40 (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	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder	
		N/A

Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	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

Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley): OK

Based on:

Overshading:	Average or unknown
Windows facing: North	15.13m²,
Windows facing: East	2.16m²,
Windows facing: South	8.64m²,
Windows facing: West	6.77m²,
Ventilation rate:	0.10
Blinds/curtains:	Dark-coloured venetian blind Closed 0% of daylight hours

10 Key features

Air permeablility	3.0 m³/m²h
Doors U-value	1.1 W/m²K
Roofs U-value	0.1 W/m²K
External Walls U-value	0.13 W/m²K
Fixed cooling system	

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.1.8
Printed on 26 September 2014 at 11:45:45

Project Information:

Assessed By: Paul Bainbridge (STRO006208) **Building Type:** Maisonette

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 96.98m²
Site Reference : New Project **Plot Reference:** Flat 005 - Rev D
Address : Flat 005

Client Details:

Name:
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)	18.99 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.02 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	58.42 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	54.16 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.63 (max. 2.00)	2.40 (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	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder	
		N/A

Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	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

Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley):	Medium	OK

Based on:

Overshading:	Average or unknown
Windows facing: North	15.13m²,
Windows facing: East	2.16m²,
Windows facing: South	8.64m²,
Windows facing: West	6.77m²,
Ventilation rate:	3.00
Blinds/curtains:	Dark-coloured venetian blind Closed 0% of daylight hours

10 Key features

Air permeablility	3.0 m³/m²h
Doors U-value	1.1 W/m²K
Roofs U-value	0.1 W/m²K
External Walls U-value	0.13 W/m²K
Photovoltaic array	
Fixed cooling system	

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.0.30
Printed on 25 September 2014 at 16:10:14

Project Information:

Assessed By: Paul Bainbridge (STRO006208) **Building Type:** Maisonette

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 106.46m²
Site Reference : New Project **Plot Reference:** Flat 006 - Rev D - No PV
Address : Flat 006

Client Details:

Name:
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)	18.23 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.53 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.20 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	53.50 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.72 (max. 2.00)	2.40 (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	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder	
		N/A

Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	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

Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley): OK

Based on:

Overshading:	Average or unknown
Windows facing: North	15.37m²,
Windows facing: East	6.6m²,
Windows facing: South	12.48m²,
Ventilation rate:	0.10
Blinds/curtains:	Dark-coloured venetian blind Closed 0% of daylight hours

10 Key features

Air permeablility	3.0 m³/m²h
Doors U-value	1.1 W/m²K
Roofs U-value	0.1 W/m²K
External Walls U-value	0.13 W/m²K
Fixed cooling system	

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.1.8
Printed on 26 September 2014 at 11:45:39

Project Information:

Assessed By: Paul Bainbridge (STRO006208) **Building Type:** Maisonette

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 106.46m²
Site Reference : New Project **Plot Reference:** Flat 006 - Rev D
Address : Flat 006

Client Details:

Name:
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)	18.23 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.82 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.25 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	53.54 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.72 (max. 2.00)	2.40 (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	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder	
		N/A

Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	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

Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley):	Medium	OK

Based on:

Overshading:	Average or unknown
Windows facing: North	15.37m²,
Windows facing: East	6.6m²,
Windows facing: South	12.48m²,
Ventilation rate:	3.00
Blinds/curtains:	Dark-coloured venetian blind Closed 0% of daylight hours

10 Key features

Air permeablility	3.0 m³/m²h
Doors U-value	1.1 W/m²K
Roofs U-value	0.1 W/m²K
External Walls U-value	0.13 W/m²K
Photovoltaic array	
Fixed cooling system	

Appendix B – CHP Whole Life Costing

Whole Life Costs - Central plant with CHP, 4% Discount Rate

	Description	Years																															Notes
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Central Plant/Residential	Capital cost - Heating system	£48,435	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£5,500 per apartment (not including fit-out) + £45/m² for office (including fit-out)
	Capital cost - PV panels	£6,000	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£3000/kWp (installed), 2kWp
	Replacement cost - Heating system	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£17,684	£0	£0	£0	£0	£5,884	£0	£0	£0	£0	£0	Boilers/CHP/pumps replaced at 20 years, primary heating pipew ork at 25 years, PV panels 25 years
	Residual value	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	-£11,323	Boilers/CHP/pumps 10 years, primary heating pipew ork 20 years, PV panels 20 years
	Operation/maintenance - Heating	£0	£3,296	£3,169	£3,047	£2,930	£2,818	£2,709	£2,605	£2,505	£2,408	£2,316	£2,227	£2,141	£2,059	£1,980	£1,903	£1,830	£1,760	£1,692	£1,627	£1,564	£1,504	£1,446	£1,391	£1,337	£1,286	£1,236	£1,189	£1,143	£1,099	£1,057	£4/m²
	Gas costs - central heating system	£0	£1,737	£1,670	£1,606	£1,544	£1,485	£1,470	£1,414	£1,359	£1,307	£1,257	£1,245	£1,197	£1,151	£1,107	£1,064	£1,054	£1,013	£974	£937	£901	£892	£858	£825	£793	£763	£755	£726	£698	£671	£646	Heat output 36126kWh/annum, CHP gas input 72253kWh @ 2.5p/kWh
	Displaced electricity (CHP)	£0	-£1,476	-£1,420	-£1,365	-£1,312	-£1,262	-£1,250	-£1,202	-£1,156	-£1,111	-£1,068	-£1,058	-£1,017	-£978	-£941	-£904	-£896	-£861	-£828	-£796	-£766	-£758	-£729	-£701	-£674	-£648	-£642	-£617	-£594	-£571	-£549	CHP electrical output 18063kWh/annum @ 8.5p/kWh
	Displaced electricity (PVs)	£0	-£166	-£159	-£153	-£147	-£141	-£140	-£135	-£130	-£125	-£120	-£119	-£114	-£110	-£105	-£101	-£100	-£97	-£93	-£89	-£86	-£85	-£82	-£79	-£76	-£73	-£72	-£69	-£67	-£64	-£62	2025kWh/annum @ 8.5p/kWh
	Meter reading and billing	£0	£462	£444	£427	£410	£395	£379	£365	£351	£337	£324	£312	£300	£288	£277	£267	£256	£246	£237	£228	£219	£211	£203	£195	£187	£180	£173	£166	£160	£154	£148	£80/apartment
Offices	Capital cost - Cooling to offices	£25,725	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£75/m² for office (including fit-out)
	Replacement cost - Office cooling	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£17,379	£0	£0	£0	£0	£0	£0	£0	£0	£0	£11,741	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	Cooling system replaced at 10 and 20 years
	Meter reading and billing	£0	£154	£148	£142	£137	£132	£126	£122	£117	£112	£108	£104	£100	£96	£92	£89	£85	£82	£79	£76	£73	£70	£68	£65	£62	£60	£58	£55	£53	£51	£49	£80/tenant
	Operation/maintenance - Cooling	£0	£1,979	£1,903	£1,830	£1,759	£1,692	£1,626	£1,564	£1,504	£1,446	£1,390	£1,337	£1,285	£1,236	£1,188	£1,143	£1,099	£1,057	£1,016	£977	£939	£903	£868	£835	£803	£772	£742	£714	£686	£660	£635	£6/m²
	Electricity cost - Comfort cooling	£0	£60	£58	£56	£54	£52	£51	£49	£47	£45	£44	£43	£42	£40	£38	£37	£37	£35	£34	£33	£31	£31	£30	£29	£28	£26	£26	£25	£24	£23	£22	738kWh/annum @ 8.5p/kWh
Total		£80,160	£6,046	£5,813	£5,590	£5,375	£5,168	£4,973	£4,782	£4,598	£4,421	£21,630	£4,091	£3,933	£3,782	£3,637	£3,497	£3,365	£3,236	£3,111	£2,991	£32,301	£2,768	£2,662	£2,559	£2,461	£8,251	£2,277	£2,190	£2,105	£2,024	-£9,376	
Cumulative		£80,160	£86,206	£92,019	£97,609	£102,983	£108,151	£113,124	£117,906	£122,504	£126,925	£148,554	£152,645	£156,579	£160,361	£163,997	£167,494	£170,859	£174,094	£177,206	£180,197	£212,498	£215,266	£217,928	£220,487	£222,948	£231,199	£233,476	£235,665	£237,771	£239,795	**£230,419**	

Whole Life Costs - Individual plant, no CHP, 4% Discount Rate

	Description	Years																															Notes
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Central Plant	Capital cost - PV panels	£21,000	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£3000/kWp (installed), 7kWp
	Replacement cost	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£7,877	£0	£0	£0	£0	£0	PV panels replaced at 25 years
	Residual value	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£5,180	PV panels 20 years
	Displaced electricity (PVs)	£0	-£579	-£557	-£536	-£515	-£495	-£491	-£472	-£453	-£436	-£419	-£415	-£399	-£384	-£369	-£355	-£352	-£338	-£325	-£313	-£301	-£298	-£286	-£275	-£265	-£254	-£252	-£242	-£233	-£224	-£215	7089kWh/annum @ 8.5p/kWh
Residential	Capital cost - Individual combi boilers	£14,000	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£1500 per apartment + £5000 for gas distribution
	Replacement cost	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£6,080	£0	£0	£0	£0	£0	£0	£0	£0	£0	£4,107	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	Boiler replaced at 10 and 20 years
	Operation/maintenance	£0	£1,154	£1,109	£1,067	£1,026	£986	£948	£912	£877	£843	£811	£779	£750	£721	£693	£666	£641	£616	£592	£570	£548	£527	£506	£487	£468	£450	£433	£416	£400	£385	£370	£200/year per apartment
	Residual value	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	-£617	Gas pipew ork 20 years
	Gas cost - Individual combi boilers	£0	£1,218	£1,171	£1,126	£1,083	£1,041	£1,031	£992	£953	£917	£881	£873	£839	£807	£776	£746	£739	£711	£683	£657	£632	£626	£602	£578	£556	£535	£530	£509	£490	£471	£453	Heat output 32398kWh/annum, Boiler gas input 36402kWh @ 3.48p/kWh
Offices	Capital cost - VRV (heating/cooling)	£30,870	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£90/m² for office (including fit-out)
	Capital cost - Solar thermal	£5,000	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£5000 (installed)
	Replacement cost	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£17,141	£0	£0	£0	£0	£0	£0	£0	£0	£0	£1,876	£0	£0	£0	£0	£0	VRV at 15 years, solar thermal at 25 years
	Operation/maintenance - VRV	£0	£2,309	£2,220	£2,134	£2,052	£1,973	£1,898	£1,825	£1,754	£1,687	£1,622	£1,560	£1,500	£1,442	£1,387	£1,333	£1,282	£1,233	£1,185	£1,140	£1,096	£1,054	£1,013	£974	£937	£901	£866	£833	£801	£770	£740	£7/m²
	Residual value	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£1,233	Solar thermal 20 years
	Electricity cost - VRV (heating/cooling)	£0	£239	£230	£221	£213	£204	£202	£195	£187	£180	£173	£171	£165	£158	£152	£147	£145	£140	£134	£129	£124	£123	£118	£114	£109	£105	£104	£100	£96	£92	£89	2926kWh/annum @ 8.5p/kWh
	Electricity cost - DHW	£0	£126	£121	£116	£112	£108	£107	£103	£99	£95	£91	£90	£87	£83	£80	£77	£76	£73	£71	£68	£65	£65	£62	£60	£58	£55	£55	£53	£51	£49	£47	1541kWh/annum @ 8.5p/kWh
	Displaced electricity (Solar thermal)	£0	-£6	-£5	-£5	-£5	-£5	-£5	-£5	-£4	-£4	-£4	-£4	-£4	-£4	-£4	-£3	-£3	-£3	-£3	-£3	-£3	-£3	-£3	-£3	-£3	-£2	-£2	-£2	-£2	-£2	-£2	68kWh/annum @ 8.5p/kWh
Total		£70,870	£4,461	£4,289	£4,124	£3,966	£3,813	£3,691	£3,549	£3,413	£3,281	£9,235	£3,055	£2,937	£2,824	£2,715	£19,752	£2,528	£2,431	£2,338	£2,248	£6,269	£2,093	£2,012	£1,935	£1,861	£11,542	£1,733	£1,666	£1,602	£1,541	£7,278	
Cumulative		£70,870	£75,331	£79,620	£83,744	£87,710	£91,523	£95,214	£98,763	£102,175	£105,456	£114,692	£117,746	£120,683	£123,507	£126,223	£145,975	£148,503	£150,934	£153,272	£155,519	£161,788	£163,881	£165,894	£167,829	£169,689	£181,231	£182,964	£184,631	£186,233	£187,773	**£195,051**	

Appendix C – SBEM Calculations

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L 2010

Project name

1-5 Portpool Lane - Solar Thermal and PV As designed

Date: Tue Sep 30 16:55:16 2014

Administrative information

Building Details

Address: Portpool Lane, London, WC1

Certification tool

Calculation engine: SBEM

Calculation engine version: v4.1.e.5

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v6.4.0

BRUKL compliance check version: v4.1.e.5

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Bryan Wood

Telephone number: 01904 674890

Address: Clifford Chambers, 4 Clifford Street, York, YO1 9RD

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

1.1	CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	20.9
1.2	Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	20.9
1.3	Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	12.6
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

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

2.a Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	NT000002_W1_-1
Floor	0.25	0.18	0.18	ST000004_F_-1
Roof	0.25	-	-	"No heat loss roofs"
Windows***, roof windows, and rooflights	2.2	1.5	1.5	FF000007_W-1-W1
Personnel doors	2.2	2.09	2.09	NT000002_W1-W0
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/(m²K)]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

* 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	3

2.b Building services

The building services parameters listed below are expected to be checked by the BCO against guidance. No automatic checking is performed by the tool.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- 1-5 PORTPOOL Heating

Heating seasonal efficiency	**Cooling nominal efficiency**	**SFP [W/(l/s)]**	**HR seasonal efficiency**
5.75	3.86	-	-
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			NO

1- SYST0000-DHW

Heating seasonal efficiency	**Hot water storage loss factor [kWh/litre per day]**
1	0.013

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

General lighting and display lighting

Zone	**General lighting [W]**	**Display lamps efficacy [lm/W]**
Cupboards	40	-
Cupboards	20	-
Cupboards	30	-
Store and lift	60	-
Office BF	1530	-
Office GF	1060	-

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?**
Office BF	N/A	N/A
Office GF	NO (-60.8%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the 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 [m²]	342.9	342.9
External area [m²]	571.2	571.2
Weather	GLA	GLA
Infiltration [m³/hm²@ 50Pa]	3	5
Average conductance [W/K]	159.65	364.7
Average U-value [W/m²K]	0.28	0.64
Alpha value* [%]	24.03	14.39

* 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 Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: 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/m²]

	Actual	Notional
Heating	6.38	20.83
Cooling	2.15	5.78
Auxiliary	0	0
Lighting	15.21	12.85
Hot water	4.49	3.32
Equipment*	39.84	39.84
TOTAL**	**28.24**	**42.78**

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	3.75	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0.2	0

Energy & CO_2 Emissions Summary

	Actual	Indicative Target
Heating + cooling demand [MJ/m²]	168.08	257.18
Primary energy* [kWh/m²]	82.46	115.87
Total emissions [kg/m²]	12.6	20.9

* 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] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	123.1	45	6.4	2.2	0	5.36	5.81	5.75	8.18
	Notional	182.2	75	20.8	5.8	0	2.43	3.6	----	----

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 BCO can give particular attention to items with specifications that 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	0.15	NT000002_W1_-1
Floor	0.2	0.18	ST000004_F_-1
Roof	0.15	-	"No heat loss roofs"
Windows, roof windows, and rooflights	1.5	1.5	FF000007_W-1-W1
Personnel doors	1.5	2.09	NT000002_W1-W0
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	3

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L 2010

Project name

1-5 Portpool Lane - Solar Thermal

As designed

Date: Tue Sep 30 16:57:15 2014

Administrative information

Building Details

Address: Portpool Lane, London, WC1

Certification tool

Calculation engine: SBEM

Calculation engine version: v4.1.e.5

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v6.4.0

BRUKL compliance check version: v4.1.e.5

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Bryan Wood

Telephone number: 01904 674890

Address: Clifford Chambers, 4 Clifford Street, York, YO1 9RD

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

1.1	CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	20.9
1.2	Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	20.9
1.3	Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	14.6
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

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

2.a Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	NT000002_W1_-1
Floor	0.25	0.18	0.18	ST000004_F_-1
Roof	0.25	-	-	"No heat loss roofs"
Windows***, roof windows, and rooflights	2.2	1.5	1.5	FF000007_W-1-W1
Personnel doors	2.2	2.09	2.09	NT000002_W1-W0
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	3

2.b Building services

The building services parameters listed below are expected to be checked by the BCO against guidance. No automatic checking is performed by the tool.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- 1-5 PORTPOOL Heating

Heating seasonal efficiency	**Cooling nominal efficiency**	**SFP [W/(l/s)]**	**HR seasonal efficiency**
5.75	3.86	-	-
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			NO

1- SYST0000-DHW

Heating seasonal efficiency	**Hot water storage loss factor [kWh/litre per day]**
1	0.013

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

General lighting and display lighting

Zone	**General lighting [W]**	**Display lamps efficacy [lm/W]**
Cupboards	40	-
Cupboards	20	-
Cupboards	30	-
Store and lift	60	-
Office BF	1530	-
Office GF	1060	-

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?**
Office BF	N/A	N/A
Office GF	NO (-60.8%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the 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 [m²]	342.9	342.9
External area [m²]	571.2	571.2
Weather	GLA	GLA
Infiltration [m³/hm²@ 50Pa]	3	5
Average conductance [W/K]	159.65	364.7
Average U-value [W/m²K]	0.28	0.64
Alpha value* [%]	24.03	14.39

* 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 Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: 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/m²]

	Actual	Notional
Heating	6.38	20.83
Cooling	2.15	5.78
Auxiliary	0	0
Lighting	15.21	12.85
Hot water	4.49	3.32
Equipment*	39.84	39.84
TOTAL**	**28.24**	**42.78**

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0.2	0

Energy & CO_2 Emissions Summary

	Actual	Indicative Target
Heating + cooling demand [MJ/m²]	168.08	257.18
Primary energy* [kWh/m²]	82.46	115.87
Total emissions [kg/m²]	14.6	20.9

* 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] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	123.1	45	6.4	2.2	0	5.36	5.81	5.75	8.18
	Notional	182.2	75	20.8	5.8	0	2.43	3.6	----	----

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 BCO can give particular attention to items with specifications that 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	0.15	NT000002_W1_-1
Floor	0.2	0.18	ST000004_F_-1
Roof	0.15	-	"No heat loss roofs"
Windows, roof windows, and rooflights	1.5	1.5	FF000007_W-1-W1
Personnel doors	1.5	2.09	NT000002_W1-W0
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	3

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L 2010

Project name

1-5 Portpool Lane - No Renewables

As designed

Date: Tue Sep 30 16:58:23 2014

Administrative information

Building Details

Address: Portpool Lane, London, WC1

Certification tool

Calculation engine: SBEM

Calculation engine version: v4.1.e.5

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v6.4.0

BRUKL compliance check version: v4.1.e.5

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Bryan Wood

Telephone number: 01904 674890

Address: Clifford Chambers, 4 Clifford Street, York, YO1 9RD

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

1.1	CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	20.9
1.2	Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	20.9
1.3	Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	14.7
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

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

2.a Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	NT000002_W1_-1
Floor	0.25	0.18	0.18	ST000004_F_-1
Roof	0.25	-	-	"No heat loss roofs"
Windows***, roof windows, and rooflights	2.2	1.5	1.5	FF000007_W-1-W1
Personnel doors	2.2	2.09	2.09	NT000002_W1-W0
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	3

2.b Building services

The building services parameters listed below are expected to be checked by the BCO against guidance. No automatic checking is performed by the tool.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- 1-5 PORTPOOL Heating

Heating seasonal efficiency	**Cooling nominal efficiency**	**SFP [W/(l/s)]**	**HR seasonal efficiency**
5.75	3.86	-	-
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			NO

1- SYST0000-DHW

Heating seasonal efficiency	**Hot water storage loss factor [kWh/litre per day]**
1	0.013

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

General lighting and display lighting

Zone	**General lighting [W]**	**Display lamps efficacy [lm/W]**
Cupboards	40	-
Cupboards	20	-
Cupboards	30	-
Store and lift	60	-
Office BF	1530	-
Office GF	1060	-

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?**
Office BF	N/A	N/A
Office GF	NO (-60.8%)	NO

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

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Energy & CO_2 Emissions Summary

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