# **1-5 Portpool Lane, London** Energy Statement

Issue 2 – 10<sup>th</sup> 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

Con	tents		2
1	Exe	cutive Summary	3
	1.1	Carbon Reduction Targets	3
	1.2	Carbon Reduction Strategy	3
	1.3	Environmental Assessment	4
2	Sum	mary of Proposal	5
3	Ene	rgy Strategy	6
	3.1	Be Lean - Passive Design and Energy Efficiency	6
	3.2	Energy Demand and CO2 Emissions ('Lean' Scheme)	6
	3.3	Be Clean – Community Energy and CHP	7
	3.4	Be Green – Renewable Energy	8
App			

Appendix A - SAP Calculations	9
Appendix B - CHP Whole Life Costing	_22
Appendix C - SBEM Calculations	_24



#### **Executive Summary** 1

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 331m<sup>2</sup> 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.

#### **Carbon Reduction Targets** 1.1

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.

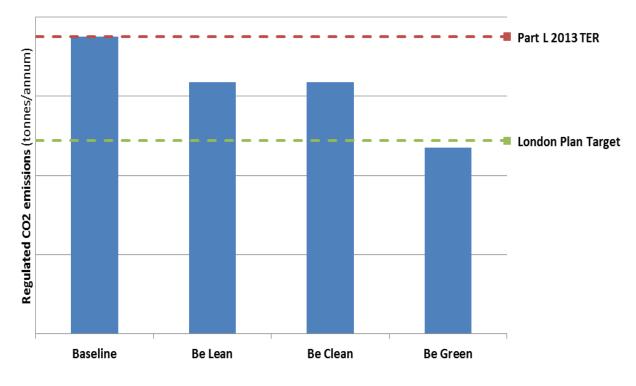
#### **Carbon Reduction Strategy** 1.2

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 <sub>2</sub> 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 carb	on dioxide savings
	(Tonnes CO <sub>2</sub> 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 331m<sup>2</sup> 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;-

- 46m<sup>2</sup> of photovoltaic panels (residential and office)
- 4m<sup>2</sup> 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.



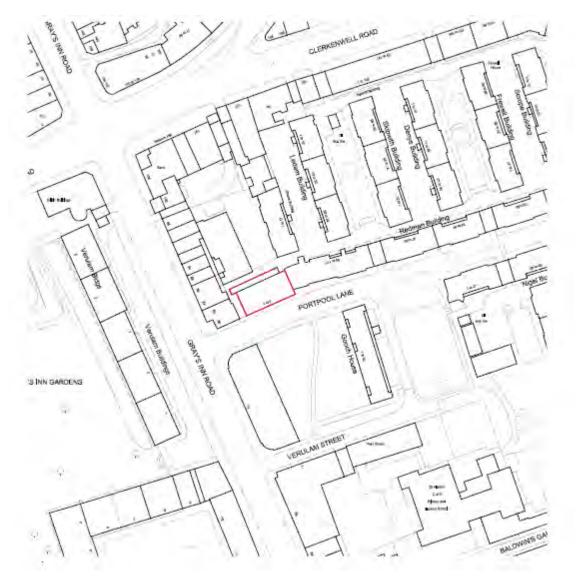
### 2 Summary of Proposal

The proposal is for a new 5-storey development on Portpool Lane which comprises six private residential apartments and 331m<sup>2</sup> 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.





1-5 Portpool Lane, London Energy Statement

### 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 <sup>2</sup> K
Floor	0.18 W/m <sup>2</sup> K
Roof	0.18 W/m <sup>2</sup> K
Glazing	1.4 W/m <sup>2</sup> K
Glazing (Fire rated)	2.4 W/m <sup>2</sup> K

### **Air Permeability**

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

### **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/(I/s) as compared to the Part L minimum requirement of 1.6 W/(I/s).

### Low Energy Lighting

Low energy lighting will be used throughout the development.

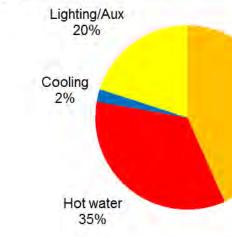
### 3.2 Energy Demand and CO2 Emissions ('Lean' Scheme)

### **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	Energy for space heating	Energy for domestic hot water	Energy for space cooling	Energy for lighting/auxillary	Unregulated energy
	(m²)	(kWh/year)	(kWh/year)	(kWh/year)	(kWh/year)	(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

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



### **Carbon Emissions**

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

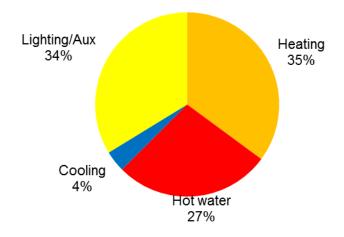


Heating 43%

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Space Use	CO <sub>2</sub> emissions for space heating	CO <sub>2</sub> emissions for domestic hot water	CO <sub>2</sub> emissions for space cooling	CO <sub>2</sub> emissions for lighting/auxillary	CO <sub>2</sub> emissions for unregulated energy uses
	(kg CO <sub>2</sub> /year)	(kg CO <sub>2</sub> /year)	(kg CO <sub>2</sub> /year)	(kg CO <sub>2</sub> /year)	(kg CO <sub>2</sub> /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

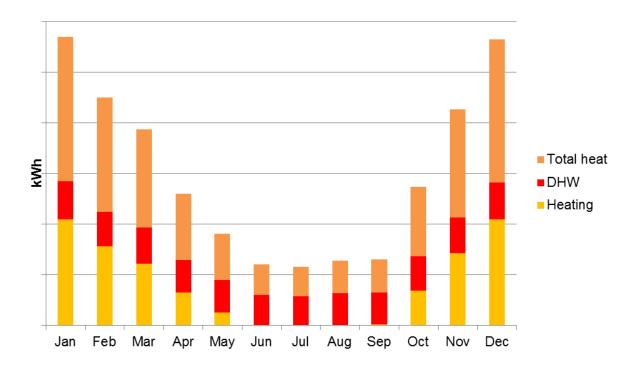
### **Combined Heat and Power (CHP)**

The proposed scheme is very small with only six apartments and 331m<sup>2</sup> 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	Annual thermal output	Annual electrical output	Annual CO <sub>2</sub> savings	Annual CO <sub>2</sub> reduction from energy efficient scheme
	(hours/year)	(kWh/year)	(kWh/year)	(Tonnes CO2 per year)	(%)
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;-

- DX system to provide comfort cooling to the offices. 2 kWp of PVs.
- to provide heating and cooling to the office area. 7 kWp of PVs and 4m<sup>2</sup> of solar thermal.

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

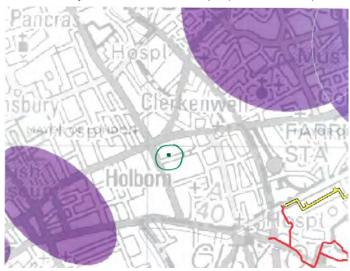
- CHP scheme £230,419
- Non CHP scheme £195,051

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.





• Central heating and domestic hot water plant (with CHP) serving the residential and office areas.

• Individual combi boilers in each apartment to provide heating and domestic hot water. VRV system

### 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.
<b>Solar water heating</b> 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.
<b>Ground Source Heat Pump</b> 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.
<b>Biomass Heating</b> 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.

1-5 Portpool Lane, London Energy Statement

Appendix A – SAP Calculations





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 Informatio	n:			
Assessed By:	Paul Bainbridge (	(STRO006208)	Building Type:	Flat
Dwelling Details:				
NEW DWELLING	DESIGN STAGE		Total Floor Area: 65	5.51m²
Site Reference :	New Project		Plot Reference:	Flat 001 - Rev F - No PV
Address :	Flat 001			
Client Details:				
Name:				
Address :				
This report covers	s items included v	within the SAP calculations.		
		tions compliance.		
1a TER and DER				
Fuel for main heati	ng system: Mains g	jas		
Fuel factor: 1.00 (n				
-	xide Emission Rate		21.28 kg/m <sup>2</sup>	
-	ioxide Emission Ra	ate (DER)	19.98 kg/m²	ОК
1b TFEE and DFI		E)	50.40 MMb/m2	
-	gy Efficiency (TFE		59.10 kWh/m <sup>2</sup> 52.60 kWh/m <sup>2</sup>	
Dweiling Fabric En	ergy Efficiency (DF	EC)	52.00 KW0///11*	ок
2 Fabric U-values	8			
Element		Average	Highest	
External w	vall	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)	ОК
2a Thermal bridg				
3 Air permeabilit		from linear thermal transmittan	ces for each junction	
	ility at 50 pascals		3.00 (design valu	(a)
Maximum	nity at 50 pascals		10.0	ок
4 Heating efficie	ncv			
Main Heatin		Boiler systems with radiator	rs or underfloor heating - ma	ins das
and an ended	5 - 10 - 01 - 01	Data from manufacturer	e et anderneer nedang - ma	
		Combi boiler		
		Efficiency 89.0 % SEDBUK	2009	
		Minimum 88.0 %		ОК
Secondary h	neating system:	None		
5 Cylinder insula	tion			
Hot water St		No cylinder		
Hot water of	longo.	No cynnoor		

## N/A

## Regulations Compliance Report

	Space heating controls Hot water controls:	TTZC by plumbing and el No cylinder	ectrical services	ок
	Boiler interlock:	Yes		ок
	v energy lights			
	Percentage of fixed lights wit	h low-energy fittings	100.0%	
	Minimum		75.0%	ок
	chanical ventilation			
	Continuous supply and extra	ct system		
	Specific fan power:		0.47	
	Maximum		1.5	OK
I	MVHR efficiency:		93%	
	Minimum		70%	ок
9 Sun	nmertime temperature			
	Overheating risk (Thames va	lley):		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	
1	Blinds/curtains:		Dark-coloured venetian blind	l
			Closed 0% of daylight hours	
10 Ke	y features			
	Air permeablility		3.0 m³/m²h	
	Doors U-value		1.1 W/m²K	
	External Walls U-value		0.13 W/m <sup>2</sup> K	
	Fixed cooling system		0.10 1.111	



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

saesaed By: F	aul Bainbridge (STF	200062085	Building Type:	Flat	
	aarbanninge (om	(0000200)	building type.	) iei	
Dwelling Details:			Table Class Assar		
NEW DWELLING DE			Total Floor Area: 6		
	lew Project		Plot Reference:	Flat 001 - Rev F	
Address : F	lat 001				
Cileni Delaka					
Name: Address :					
This report covers if t is not a complete i		in the SAP calculations. is compliance.			
1a TER and DER	States of the local division in which the local division in the lo	a car a fair and			
uel for main heating	system: Mains gas				
uel factor: 1.00 (mai					
arget Carbon Dioxid			21.28 kg/m²		
Welling Carbon Diox		DER)	12.32 kg/m <sup>-</sup>		OK
In TFEE and DFEE					
arget Fabric Energy			59.10 kWh/mP		
weiling Fabric Energ	gy Emclency (DFEE)		51.90 KWh/m <sup>#</sup>		ок
2 Fabric U-vaines					Un
Element		Average	Highest		
External wal		0.15 (max. 0.30)	0.15 (max. 0.70)		OK
Party wall		0.00 (max, 0.20)	-		OK
FIDOF		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 bridgin	g -		A COMPANY OF THE		
	iging calculated from	linear thermal transmittances for	reach junction		_
3 All permeability		The second second second second second		-	
Air permeabilit Maximum	y at 50 pascals		3.00 (design val 10.0	ue)	ок
4 Reading efficiency	(				
Main Heating s	, C	Boller systems with radiators or u Data from manufacturer Combi boller Efficiency 89.0 % SEDBUK2009 Alnimum 88.0 %	nderfloor heating - m	ains gas	ок
Secondary hea	ating system:	lone			
5 Cylindar Insuletto					
	age: t	lo cylinder			

## **Regulations Compliance Report**

6 Cuntrola			
Space heating controls Hot water controls:	TTZC by plumbing and el No cylinder	lectrical services	OK
Boller Interlock:	Yes		OK
Low energy lights			-
Percentage of fixed lights with	th low-energy fittings	100.0%	
Minimum		75.0%	OK
i Mechanical ventilation	the second s		
Continuous supply and extra	ict system		
Specific fan power:	Color Color	0.47	
Maximum		1.5	OK
MVHR efficiency:		93%	
Minimum		70%	OK
Summartime tamperature			
Overheating risk (Thames va	alley):		.OP
ased on:			
Overshading:		Average or unknown	
Windows facing: North		8.1m <sup>2</sup> .	
Windows facing: East		1.06m²,	
Windows facing: South		5.28m²,	
Windows facing: West		2.68m²,	
Ventilation rate:		3.00	
Blinds/curtains:		Dark-coloured venetian blind Closed 0% of daylight hours	
10 Key features		100000	
Air permeability		3.0 m³/m²h	
Doors U-value		1.1 W/m <sup>=</sup> K	
External Walls U-value Photovoltaic array		0.13 W/m=K	

Stroma FSAP 2012 Vension, 1.0.0.30 (SAP 9.91) - http://www.stroma.com

Fixed cooling system

## MEIN-ARDT

Page 2 d 2

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:			
IEW 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:			
lame:			
ddress :			
his report covers items included			
is not a complete report of regula	ations compliance.		
1a TER and DER			
uel for main heating system: Mains uel factor: 1.00 (mains gas)	gas		
Farget Carbon Dioxide Emission Rate	e (TER)	18.79 kg/m <sup>2</sup>	
Welling Carbon Dioxide Emission R		17.53 kg/m <sup>2</sup>	ОК
1b TFEE and DFEE		in loo kighti	-
arget Fabric Energy Efficiency (TFE	E)	57.10 kWh/m <sup>2</sup>	
welling Fabric Energy Efficiency (DI	FEE)	50.50 kWh/m <sup>2</sup>	
			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 Roof	0.18 (max. 0.25) 0.18 (max. 0.20)	0.18 (max. 0.70) 0.18 (max. 0.35)	OK OK
Openings	1.78 (max. 2.00)	2.40 (max. 3.30)	OK
2a Thermal bridging	1.10 (max. 2.00)	2.10 (max. 0.00)	UK
	from linear thermal transmittan	ces 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 radiator	rs or underfloor heating - mair	is gas
	Data from manufacturer	-	
	Combi boiler		
	Efficiency 89.0 % SEDBUK	2009	
	Minimum 88.0 %		OK
Secondary heating system:	None		
5 Cylinder insulation			
Hot water Storage:	No cylinder		
	,		N/A

## **Regulations Compliance Report**

Controls			
Space heating controls	TTZC by plumbing and el	lectrical services	ок
Hot water controls:	No cylinder		
Boiler interlock:	Yes		OK
Low energy lights			
Percentage of fixed lights wi	th low-energy fittings	100.0%	
Minimum		75.0%	OK
Mechanical ventilation			
Continuous supply and extra	act system		
Specific fan power:	-	0.47	
Maximum		1.5	OK
MVHR efficiency:		93%	
Minimum		70%	OK
Summertime temperature			
Overheating risk (Thames va	alley):		ок
ased 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	
0 Key features			
Air permeablility		3.0 m <sup>3</sup> /m <sup>2</sup> h	
Dears II weber		4 4 14//212	

Doors U-value External Walls U-value Fixed cooling system

Stroma FSAP 2012 Version: 1.0.0.30 (SAP 9.91) - http://www.stroma.com

## **MEINH/RD**

1.1 W/m<sup>2</sup>K 0.13 W/m<sup>2</sup>K

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: 96.4m <sup>2</sup>	
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		
t is not a complete report of regula			
1a TER and DER			
Fuel for main heating system: Mains	nas		
Fuel factor: 1.00 (mains gas)	2		
Target Carbon Dioxide Emission Rate	e (TER)	18.79 kg/m²	
Owelling Carbon Dioxide Emission R	ate (DER)	12.32 kg/m <sup>2</sup>	OK
1b TFEE and DFEE			
Target Fabric Energy Efficiency (TFE	E)	57.07 kWh/m <sup>2</sup>	
Owelling Fabric Energy Efficiency (DI	EE)	50.46 kWh/m <sup>2</sup>	
			ок
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)	ок
2a Thermal bridging			
	from linear thermal transmittan	ces for each junction	
3 Air permeability			
Air permeability at 50 pascals		3.00 (design value)	
Maximum		10.0	ок
4 Heating efficiency			
Main Heating system:	Boiler systems with radiator	rs or underfloor heating - mains gas	
	Data from manufacturer		
	Combi boiler		
	Efficiency 89.0 % SEDBUK	2009	
	Minimum 88.0 %		ок
Secondary heating system:	None		
5 Cylinder insulation			
Hot water Storage:	No cylinder		
			N/A
			10/4

## Regulations Compliance Report

TTZC by plumbing and el	ectrical services	OK
No cylinder		
Yes		OK
h low-energy fittings	100.0%	
	75.0%	OK
ct system		
2	0.47	
	1.5	OK
	93%	
	70%	OK
lley):	Medium	OK
	Average or unknown	
	7.97m²,	
	3.55m²,	
	9.36m²,	
	3.00	
	Dark-coloured venetian blir	nd
	Closed 0% of daylight hour	s
	3.0 m <sup>3</sup> /m <sup>2</sup> h	
	0.15 Will K	
	No cylinder	Yes h low-energy fittings 100.0% 75.0% 0.47 1.5 93% 70% Illey): Medium Average or unknown 7.97m <sup>2</sup> , 3.55m <sup>2</sup> , 9.36m <sup>2</sup> ,

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## **MEIN-ARDT**

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Flat 4m² lat 003 - Rev D - No PV
lat 003 - Rev D - No PV
OK
OK
ок
OK
U.
ок
OK
OK
gas
ок

## **Regulations Compliance Report**

Space heating controls	TTZC by plumbing and e	lectrical services	OK
Hot water controls:	No cylinder		
Boiler interlock:	Yes		OK
7 Low energy lights			
Percentage of fixed lights wit	th low-energy fittings	100.0%	
Minimum		75.0%	OK
8 Mechanical ventilation			
Continuous supply and extra	ct system		
Specific fan power:		0.47	
Maximum		1.5	OK
MVHR efficiency:		93%	
Minimum		70%	OK
9 Summertime temperature			
Overheating risk (Thames va	alley):		OK
ased 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	t i
		Closed 0% of daylight hours	
10 Key features			
Air permeablility		3.0 m³/m²h	
Doors U-value		1.1 W/m <sup>2</sup> K	

External Walls U-value

Fixed cooling system

## MEIN-ARDT

0.13 W/m<sup>2</sup>K

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Project Information:			
Assessed By: Paul Bainbridge	(STRO006208)	Building Type: Flat	
Dwelling Details:			
NEW DWELLING DESIGN STAGE		Total Floor Area: 72.24m <sup>2</sup>	
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 regula			
1a TER and DER	· ·		
Fuel for main heating system: Mains	198		
Fuel factor: 1.00 (mains gas)	300		
Target Carbon Dioxide Emission Rate	e (TER)	18.29 kg/m²	
Dwelling Carbon Dioxide Emission Ra	ate (DER)	10.94 kg/m <sup>2</sup>	OK
1b TFEE and DFEE			
Target Fabric Energy Efficiency (TFE	E)	46.52 kWh/m <sup>2</sup>	
Owelling Fabric Energy Efficiency (DR	EE)	45.34 kWh/m <sup>2</sup>	
			ок
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)	ок
2a Thermal bridging			
	from linear thermal transmittance	s for each junction	
3 Air permeability			
Air permeability at 50 pascals		3.00 (design value)	
Maximum		10.0	ок
4 Heating efficiency			
Main Heating system:	Boiler systems with radiators of	or underfloor heating - mains gas	
	Data from manufacturer		
	Combi boiler		
	Efficiency 89.0 % SEDBUK20	09	
	Minimum 88.0 %		ок
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 e	lectrical services	OK
Hot water controls:	No cylinder		
Boiler interlock:	Yes		OK
7 Low energy lights			
Percentage of fixed lights wi	th low-energy fittings	100.0%	
Minimum		75.0%	OK
8 Mechanical ventilation			
Continuous supply and extra	ict system		
Specific fan power:		0.47	
Maximum		1.5	OK
MVHR efficiency:		93%	
Minimum		70%	OK
9 Summertime temperature			
Overheating risk (Thames va	alley):	Medium	OK
ased on:			
Overshading:		Average or unknown	
Windows facing: North		7.97m*,	
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	l .
		Closed 0% of daylight hours	
10 Key features			
Air permeablility		3.0 m³/m²h	
Doors U-value		1.1 W/m <sup>2</sup> K	
Enternal Maile Handler		0.40.10//3//	

External Walls U-value Photovoltaic array Fixed cooling system

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## **MEIN-ARDT**

0.13 W/m<sup>2</sup>K

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D - No PV
ОК
OK
ок
OK
ок
OK
ок
ok
ок
OK

## **Regulations Compliance Report**

Space heating controls	TTZC by plumbing and e	lectrical services	OK
Hot water controls:	No cylinder		0.
Boiler interlock:	Yes		OK
ow energy lights			
Percentage of fixed lights wi	th low-energy fittings	100.0%	
Minimum		75.0%	OK
echanical ventilation			
Continuous supply and extra	ct system		
Specific fan power:		0.47	
Maximum		1.5	OF
MVHR efficiency:		93%	
Minimum		70%	OF
ummertime temperature			
Overheating risk (Thames va	alley):		O
ed on:			
Overshading:		Average or unknown	
Windows facing: North		8.26m*,	
Windows facing: South		5.28m*,	
Windows facing: East		3.7m²,	
Ventilation rate:		0.10	
Blinds/curtains:		Dark-coloured venetian blind	
		Closed 0% of daylight hours	
Key features			
Air permeablility		3.0 m³/m²h	
Doors U-value		1.1 W/m <sup>2</sup> K	
External Walls U-value		0.13 W/m <sup>2</sup> K	
Fixed cooling system			

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## MEIN-MRDT

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Project Information:			
ssessed By: Paul Bainbridge	(STRO006208)	Building Type: Flat	
Dwelling Details:			
EW DWELLING DESIGN STAGE		Total Floor Area: 76.35m <sup>2</sup>	
ite Reference : New Project		Plot Reference: Flat 004 - I	Rev D
ddress : Flat 004			
Client Details:			
lame:			
ddress :			
his report covers items included	within the SAP calculations.		
is not a complete report of regul			
1a TER and DER			
uel for main heating system: Mains	0.98		
uel factor: 1.00 (mains gas)	300		
arget Carbon Dioxide Emission Rat	e (TER)	18.46 kg/m <sup>2</sup>	
welling Carbon Dioxide Emission R		11.04 kg/m <sup>2</sup>	ок
1b TFEE and DFEE			
arget Fabric Energy Efficiency (TFE	E)	48.79 kWh/m <sup>2</sup>	
welling Fabric Energy Efficiency (D		45.56 kWh/m <sup>2</sup>	
			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)	ок
2a Thermal bridging			
	from linear thermal transmittan	ces for each junction	
3 Air permeability			
Air permeability at 50 pascals		3.00 (design value)	
Maximum		10.0	ок
4 Heating efficiency			
Main Heating system:	Boiler systems with radiator	rs or underfloor heating - mains gas	
2.1	Data from manufacturer	2 2	
	Combi boiler		
	Efficiency 89.0 % SEDBUK	2009	
	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	ок
Hot water controls:	No cylinder		
Boiler interlock:	Yes		OK
7 Low energy lights			
Percentage of fixed lights with	h low-energy fittings	100.0%	
Minimum		75.0%	OK
8 Mechanical ventilation			
Continuous supply and extra	ct system		
Specific fan power:		0.47	
Maximum		1.5	OK
MVHR efficiency:		93%	
Minimum		70%	OK
9 Summertime temperature			
Overheating risk (Thames va	illey):	Medium	OK
Based on:			
Overshading:		Average or unknown	
Windows facing: North		8.26m²,	
Windows facing: South		5.28m²,	
Windows facing: East		3.7m*,	
Ventilation rate:		3.00	
Blinds/curtains:		Dark-coloured venetian blind	
		Closed 0% of daylight hours	
10 Key features		2.0	
Air permeablility		3.0 m³/m²h	
Doors U-value		1.1 W/m²K	
External Walls U-value		0.13 W/m <sup>2</sup> K	
Photovoltaic array			
Fixed cooling system			

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## **MEINHARDT**

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Assessed By: Paul Bainbridge	e (STRO006208)	Building Type: Maison	ette
Dwelling Details:			
IEW DWELLING DESIGN STAGE		Total Floor Area: 96.98m <sup>2</sup>	
ite Reference : New Project		Plot Reference: Flat 005	- Rev D - No PV
Address: Flat 005			
Client Details:			
lame:			
Address :			
his report covers items included	within the SAP calculations		
t is not a complete report of regul			
1a TER and DER			
uel for main heating system: Mains	aas		
uel factor: 1.00 (mains gas)	-		
arget Carbon Dioxide Emission Ra	te (TER)	18.99 kg/m <sup>2</sup>	
welling Carbon Dioxide Emission F	(ate (DER)	18.20 kg/m <sup>2</sup>	ок
1b TFEE and DFEE			
arget Fabric Energy Efficiency (TF		58.40 kWh/m <sup>2</sup>	
welling Fabric Energy Efficiency (D	FEE)	54.20 kWh/m <sup>2</sup>	
			ок
2 Fabric U-values	•		
Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall Floor	0.00 (max. 0.20)	-	OK
Roof	(no floor) 0.12 (max. 0.20)	0.18 (max. 0.35)	ок
Openings	1.63 (max. 2.00)	2.40 (max. 3.30)	OK
2a Thermal bridging	1.00 (max. 2.00)	2.40 (max. 5.50)	ON
	d from linear thermal transmittanc	es for each junction	
3 Air permeability			
Air permeability at 50 pascals		3.00 (design value)	
Maximum		10.0	ок
4 Heating efficiency			
	Boiler systems with radiators	s or underfloor heating - mains gas	
Main Heating system:	Boiler systems with radiators Data from manufacturer	s or underfloor heating - mains gas	
		s or underfloor heating - mains gas	
	Data from manufacturer		
	Data from manufacturer Combi boiler		ок
Main Heating system:	Data from manufacturer Combi boiler Efficiency 89.0 % SEDBUK2 Minimum 88.0 %		ок
	Data from manufacturer Combi boiler Efficiency 89.0 % SEDBUK2		ок
Main Heating system:	Data from manufacturer Combi boiler Efficiency 89.0 % SEDBUK2 Minimum 88.0 %		ок
Main Heating system: Secondary heating system:	Data from manufacturer Combi boiler Efficiency 89.0 % SEDBUK2 Minimum 88.0 %		ок

## Regulations Compliance Report

ontrols			
Space heating controls	TTZC by plumbing and e	ectrical services	0
Hot water controls:	No cylinder		
Boiler interlock:	Yes		C
ow energy lights			
Percentage of fixed lights wi	th low-energy fittings	100.0%	
Minimum		75.0%	C
lechanical ventilation			
Continuous supply and extra	ict system		
Specific fan power:		0.47	
Maximum		1.5	C
MVHR efficiency:		93%	
Minimum		70%	C
ummertime temperature			
Overheating risk (Thames va	alley):		C
ed 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	
Key features			
Air permeablility		3.0 m³/m²h	
Doors U-value		1.1 W/m <sup>2</sup> K	
Roofs U-value		0.1 W/m <sup>2</sup> K	
External Walls U-value		0.13 W/m <sup>2</sup> K	
Fixed cooling system			

## **MEIN-ARDT**

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Dwelling Details:       Total Floor Area: 96.98m <sup>2</sup> EW DWELLING DESIGN STAGE       Total Floor Area: 96.98m <sup>2</sup> Piot Reference:       Flat 005         Details:       Piot Reference:         ame:       ddress :         ddress :       is not a complete report of regulations compliance.         fa TER and DER       Uel for main heating system: Mains gas         uel for main heating system: Mains gas       arget factor. 10.0 (mains gas)         arget Carbon Dioxide Emission Rate (DER)       18.99 kg/m <sup>2</sup> welling Carbon Dioxide Emission Rate (DER)       18.99 kg/m <sup>2</sup> welling Fabric Energy Efficiency (IFEE)       58.42 kWh/m <sup>2</sup> welling Fabric Energy Efficiency (IFEE)       58.42 kWh/m <sup>2</sup> veltage       Highest         Element       Average         Element       Average         Party wall       0.15 (max. 0.30)       0.15 (max. 0.70)         Via Cristic       0.12 (max. 0.20)       -         Party wall       0.00 (max. 0.20)       -         Chernal bridging       3.00 (design value)         Marine Ibridging calculated from linear thermal transmittances for each junction       5         Air permeability       10.0       OK         Heating efficiency       Boiler systems with rad	Project Information:			
EW DWELLING DESIGN STAGE       Total Floor Area: 96.98m <sup>3</sup> Ite Reference:       New Project       Plot Reference:       Flat 005 - Rev D         Other Details:       Ite and the set of the set o	Assessed By: Paul Bainbridge	(STRO006208)	Building Type:	Maisonette
ite Reference : New Project Plot Reference : Flat 005 - Rev D ddress : Flat 005 Send Details ame: ddress : Flat 005 Send Details ame: ddress : his report covers items included within the SAP calculations. is not a complete report of regulations compliance. la TER and DER Lef for main heating system: Mains gas arget Carbon Dioxide Emission Rate (DER) 18.99 kg/m <sup>2</sup> welling Carbon Dioxide Emission Rate (DER) 13.02 kg/m <sup>2</sup> Welling Carbon Dioxide Emission Rate (DER) 0.15 (max. 0.70) 0 K Party wall 0.00 (max. 0.20) - 0 K Party wall 0.00 (max. 0.20) - 0 K Party wall 0.00 (max. 0.20) 0.18 (max. 0.35) 0 K 20 Thermal bridging calculated from linear thermal transmittances for each junction 3 Air permeability Air permeability at 50 pascals 3.00 (design value) 0.0 K Air permeability at 50 pascals 3.00 (design value) 0.0 K Heating efficiency 80.0 % SEDBUK2000 Minimum 88.0 % 0K Secondary heating system: None Efficiency 80.0 % SEDBUK2000 Minimum 88.0 % 0K	Dwelling Details:			
ddress : Flat D05 Cleant Details: ame: ddress : his report covers items included within the SAP calculations. is not a complete report of regulations compliance. Is TER and DER uel for main heating system: Mains gas uel for main heating system: Mains gas uel for main heating system: Mains gas uel for anin heating system: Mains gas uel factor: 1.00 (mains gas) arget Carbon Dioxide Emission Rate (TER) 18.99 kg/m <sup>3</sup> welling Carbon Dioxide Emission Rate (DER) 13.02 kg/m <sup>3</sup> welling Carbon Dioxide Emission Rate (DER) 13.02 kg/m <sup>3</sup> welling Carbon Dioxide Emission Rate (DER) 13.02 kg/m <sup>3</sup> welling Carbon Dioxide Emission Rate (DER) 58.42 kWh/m <sup>3</sup> welling Carbon Dioxide Emission Rate (DER) 58.42 kWh/m <sup>4</sup> welling Carbon Dioxide Emission Rate (DER) 58.42 kWh/m <sup>4</sup> welling Carbon Dioxide Emission Rate (DER) 58.42 kWh/m <sup>4</sup> welling Carbon Dioxide Emission Rate (DER) 78.42 kWh/m <sup>4</sup> welling Carbon (DFEE) 54.16 kWh/m <sup>4</sup> Welling Fabric Energy Efficiency (DFEE) 68.42 kWh/m <sup>4</sup> Welling Fabric Energy Efficiency (DFEE) 78.42 kWh/m <sup>4</sup> Welling Fabric Energy Efficiency (DFEE) 78.42 kWh/m <sup>4</sup> Welling Carbon (DFEE) 78.42 kWh/m <sup>4</sup> Welling Fabric U-Values 78.42 kWh/m <sup>4</sup> Kernerab Didging calculated from linear thermal transmittances for each junction 78.42 kWh/m <sup>4</sup> Main Heating system: None Secondary heating system: None	IEW DWELLING DESIGN STAGE		Total Floor Area: 96	6.98m²
Cart Details:         ame:         ddress:         his report covers items included within the SAP calculations.         is not a complete report of regulations compliance.         Ia TER and DER         uel for main heating system: Mains gas         uel for main heating system: Mains gas         uel for main heating system: Mains gas         uel forton: 1.00 (mains gas)         arget Carbon Dixide Emission Rate (TER)       18.99 kg/m²         welling Carbon Dixide Emission Rate (DER)       13.02 kg/m²         arget Fabric Energy Efficiency (TFEE)       58.42 kWh/m²         welling Fabric Energy Efficiency (DFEE)       54.16 kWh/m²         Verates       0K         Element       Average       Highest         External wall       0.15 (max. 0.30)       0.15 (max. 0.70)       OK         Party wall       0.00 (max. 0.20)       -       OK         Party wall       0.00 (max. 0.20)       -       OK         Party wall       0.10 (max. 0.20)       0.18 (max. 0.35)       OK         Openings       1.63 (max. 2.00)       2.40 (max. 3.30)       OK         Air permeability at 50 pascals       3.00 (design value)       Main Heating system:       Boiler systems with radiators or underfloor heating - mains gas <t< td=""><td>Site Reference : New Project</td><td></td><td>Plot Reference:</td><td>Flat 005 - Rev D</td></t<>	Site Reference : New Project		Plot Reference:	Flat 005 - Rev D
ame: ddress : his report covers items included within the SAP calculations. is not a complete report of regulations compliance. I <b>51 FR and DER</b> Uel for main heating system: Mains gas uel factor: 1.00 (mains gas) arget Carbon Dioxide Emission Rate (DER) 18.99 kg/m² welling Carbon Dioxide Emission Rate (DER) 13.02 kg/m² Welling Carbon Dioxide Emission Rate (DER) 13.02 kg/m² Welling Fabric Energy Efficiency (TFEE) 58.42 kWh/m² Welling Fabric Energy Efficiency (DFEE) 54.16 kWh/m² V <b>2 Fabric U-values</b> Element Average Highest External wall 0.15 (max. 0.30) 0.15 (max. 0.70) 0K Party wall 0.00 (max. 0.20) - OK Porings 1.63 (max. 2.00) 2.40 (max. 0.35) 0K Openings 1.63 (max. 2.00) 2.40 (max. 3.30) 0K 2 <b>a Thermal bridging calculated from</b> linear thermal transmittances for each junction <b>3 Air permeability</b> Air permeability Air permeability Air permeability at 50 pascals 0.30 % SEDBUK 2009 Main Heating system: Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 69.0 % SEDBUK 2009 Minimum 88.0 % 0K	Address : Flat 005			
ddress : his report covers items included within the SAP calculations. is not a complete report of regulations compliance. la TER and DER uel for main heating system: Mains gas uel factor: 1.00 (mains gas) arget Carbon Dioxide Emission Rate (TER) 18.99 kg/m <sup>3</sup> welling Carbon Dioxide Emission Rate (DER) 13.02 kg/m <sup>3</sup> welling Carbon Dioxide Emission Rate (DER) 58.42 kWh/m <sup>3</sup> welling Carbon Dioxide Emission Rate (DER) 58.42 kWh/m <sup>3</sup> welling Carbon Dioxide Emission Rate (DER) 58.42 kWh/m <sup>3</sup> welling Fabric Energy Efficiency (DFEE) 58.42 kWh/m <sup>3</sup> welling Fabric Energy Efficiency (DFEE) 58.42 kWh/m <sup>3</sup> welling Fabric Energy Efficiency (DFEE) 58.416 kWh/m <sup>3</sup> welling Fabric Energy Efficiency (DFEE) 76.416 kWh/m <sup>3</sup> welling Fabric Uncent 76.416 kWh/m <sup>3</sup> welling Fabric Unc	Client Details:			
his report covers items included within the SAP calculations. is not a complete report of regulations compliance. <b>In TER and DER</b> Uel for main heating system: Mains gas uel factor: 1.00 (mains gas) arget Carbon Dioxide Emission Rate (TER) 18.99 kg/m² welling Carbon Dioxide Emission Rate (DER) 13.02 kg/m² Welling Carbon Dioxide Emission Rate (DER) 58.42 kWh/m² Welling Fabric Energy Efficiency (TFEE) 58.42 kWh/m² Welling Fabric Energy Efficiency (DFEE) 54.16 kWh/m² Veltare the transmitter of t	lame:			
is not a complete report of regulations compliance. In TER and DER Uel for main heating system: Mains gas arget Carbon Dioxide Emission Rate (TER) 18.99 kg/m² welling Carbon Dioxide Emission Rate (DER) 13.02 kg/m² welling Carbon Dioxide Emission Rate (DER) 58.42 kWh/m² arget Fabric Energy Efficiency (TFEE) 58.42 kWh/m² welling Fabric Energy Efficiency (DFEE) 54.16 kWh/m² C Fabric U-values E lement Average Highest E termal wall 0.15 (max. 0.30) 0.15 (max. 0.70) 0K Party wall 0.00 (max. 0.20) - 0K Floor (no floor) Roof 0.12 (max. 0.20) 0.18 (max. 0.35) 0K Openings 1.63 (max. 2.00) 2.40 (max. 3.30) 0K 2 Thermal bridging calculated from linear thermal transmittances for each junction 3 Air permeability at 50 pascals 3.00 (design value) 10.0 0K 4 Heating efficiency Main Heating system: Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.0 % SEDBUK 2009 Minimum 88.0 % 0K 5 Cylinder insulation Hot water Storage: No cylinder	Address:			
In the start of the start o	his report covers items included	within the SAP calculations.		
lel for main heating system: Mains gas uel factor: 1.00 (mains gas) arget Carbon Dioxide Emission Rate (TER) 18.99 kg/m² welling Carbon Dioxide Emission Rate (DER) 13.02 kg/m² Velling Carbon Dioxide Emission Rate (DER) 13.02 kg/m² Welling Fabric Energy Efficiency (TFEE) 58.42 kWh/m² welling Fabric Energy Efficiency (DFEE) 54.16 kWh/m² Velling Carbon Dioxide Mains gas Velling Carbon Dioxide Mains gas Velling Carbon Dioxide Emission Rate (DER) 13.02 kg/m² Welling Carbon Dioxide Emission Rate (DER) 13.02 kg/m² Welling Carbon Dioxide Emission Rate (DER) 54.42 kWh/m² Velling Carbon Dioxide Emission Rate (DER) 54.42 kWh/m² Velling Carbon Dioxide Emission Rate (DER) 54.416 kWh/m² Velling Carbon Dioxide Emission Rate (DER) 754.416 kWh/m² Velling Carbon Dioxide Mains 2.00 0.15 (max. 0.70) 0K Party wall 0.15 (max. 0.30) 0.15 (max. 0.70) 0K Party wall 0.12 (max. 0.20) 0.18 (max. 0.35) 0K Openings 1.63 (max. 2.00) 2.40 (max. 3.30) 0K 24 Thermal Diridging Thermal Diridging calculated from linear thermal transmittances for each junction 3 Air permeability Air permeability at 50 pascals 3.00 (design value) 10.0 0K 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 % 0K Secondary heating system: None	is not a complete report of regula	ations compliance.		
leel factor: 1.00 (mains gas) arget Carbon Dioxide Emission Rate (TER) 18.99 kg/m² welling Carbon Dioxide Emission Rate (DER) 13.02 kg/m² oK <b>b TFEE and DFEE</b> arget Fabric Energy Efficiency (TFEE) 58.42 kWh/m² welling Fabric Energy Efficiency (DFEE) 54.16 kWh/m² <b>C Fabric U-values</b> 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 <b>2 a Thermal bridging</b> Thermal bridging calculated from linear thermal transmittances for each junction <b>3 Air permeability</b> Air permeability at 50 pascals 0.00 (design value) Maximum 0.00 % SEDBUK2009 Minimum 88.0 % OK Secondary heating system: None <b>5 Cylinder insulation</b> Hot water Storage: No cylinder	1a TER and DER			
arget Carbon Dioxide Emission Rate (TER) 18.99 kg/m² OK welling Carbon Dioxide Emission Rate (DER) 13.02 kg/m² OK Ib TFEE and DFEE arget Fabric Energy Efficiency (TFEE) 58.42 kWh/m² welling Fabric Energy Efficiency (DFEE) 54.16 kWh/m² Vertice Element Average Highest OK E termal 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 24 Thermal bridging calculated from linear thermal transmittances for each junction 3 Air permeability at 50 pascals 3.00 (design value) Maximum 0.00 (max 8.0 % SEDBUK2009 Minimum 88.0 % SEDBUK2009 Minimum 88.0 % SEDBUK2009 Minimum 88.0 % OK	uel for main heating system: Mains	gas		
welling Carbon Dioxide Emission Rate (DER) 13.02 kg/m² OK th TFEE and DFEE arget Fabric Energy Efficiency (TFEE) 58.42 kWh/m² welling Fabric Energy Efficiency (DFEE) 58.42 kWh/m² V 2 Fabric U-values V 2 Fabric U-values V 2 Fabric U-values 0.05 (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 2 A Thermal bridging Thermal bridging calculated from linear thermal transmittances for each junction 3 Air permeability at 50 pascals 3.00 (design value) Maximum 0.00 (Max 8.0 (design value) 0.0 (Max 8.0 (design value)) Maximum 0.00 (Max 8.0 (design value) 0.0 (Max 8.0 (design value)) Air permeability at 50 pascals 0.0 (design value) 0.0 (Max 8.0 (design value)) Maximum 0.0 (Max 8.0 (design value) 0.0 (Max 8.0 (design value)) 0.0 (Max 8.0 (design va	uel factor: 1.00 (mains gas)			
Ib TFEE and DFEE arget Fabric Energy Efficiency (TFEE) welling Fabric Energy Efficiency (DFEE) 58.42 kWh/m <sup>2</sup> 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) - 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 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			-	
arget Fabric Energy Efficiency (TFEE) 58.42 kWh/m <sup>3</sup> welling Fabric Energy Efficiency (DFEE) 54.16 kWh/m <sup>2</sup> CK 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 calculated from linear thermal transmittances for each junction 3 Air permeability at 50 pascals 3.00 (design value) Maximum 10.0 OK 4 Heating efficiency Main Heating system: Boller systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boller Efficiency 89.0 % SEDBUK2009 Minimum 88.0 % OK	-	ate (DER)	13.02 kg/m <sup>2</sup>	ОК
welling Fabric Energy Efficiency (DFEE) 54.16 kWh/m <sup>2</sup> Flement         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)         -         OK           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 calculated form linear thermal transmittances for each junction         OK           3 Air permeability at 50 pascals         3.00 (design value)         OK           Maximum         10.0         OK           4 Heating efficiency         Jata from manufacturer         Combi boiler           Combi boiler         Efficiency 89.0 % SEDBUK2009         OK           Minimum 88.0 %         OK         OK				
OK     OK       2 Fabric U-values     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)     OK     OK       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 calculated from linear thermal transmittances for each junction     3     Air permeability       Air permeability     3.00 (design value)     0K       Maximum     10.0     OK       4 Heating efficiency     Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler     OK       Efficiency 89.0 % SEDBUK2009     Minimum 88.0 %     OK       Secondary heating system:     None     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)       -       OK         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       Calculated from linear thermal transmittances for each junction       3         Air permeability       Air permeability at 50 pascals       3.00 (design value)       0K         Maximum       10.0       OK       0K         4 Heating efficiency       Boiler systems with radiators or underfloor heating - mains gas       0ata from manufacturer         Combi boiler       Efficiency 89.0 % SEDBUK2009       OK         Secondary heating system:       None       OK         5 Cylinder insulation       No cylinder       U	welling Fabric Energy Efficiency (Dr	·EE)	54.16 KWh/m*	OK
External wall       0.15 (max. 0.30)       0.15 (max. 0.70)       OK         Party wall       0.00 (max. 0.20)       -       OK         Floor       (no floor)       OK       OK         Roof       0.12 (max. 0.20)       0.18 (max. 0.35)       OK         Openings       1.63 (max. 2.00)       2.40 (max. 3.30)       OK <b>2a Thermal bridging</b> Thermal bridging calculated from linear thermal transmittances for each junction       OK <b>3 Air permeability</b> Air permeability at 50 pascals       3.00 (design value)       OK         Maximum       10.0       OK       OK <b>4 Heating efficiency</b> Boiler systems with radiators or underfloor heating - mains gas       Data from manufacturer         Combi boiler       Efficiency 89.0 % SEDBUK2009       OK         Secondary heating system:       None       OK <b>5 Cylinder insulation</b> No cylinder       Vinger	2 Fabric U-values			OK
Party wall0.00 (max. 0.20)-OKFloor(no floor)(no floor)(No floor)(No floor)Roof0.12 (max. 0.20)0.18 (max. 0.35)OKOpenings1.63 (max. 2.00)2.40 (max. 3.30)OKCarthermal bridgingThermal bridging calculated from linear thermal transmittances for each junction3 Air permeabilityAir permeability at 50 pascals3.00 (design value) 10.0Maximum10.0OKCombine systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %OKSecondary heating system:NoneSecondary heating system:None	Element	Average	Highest	
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       calculated from linear thermal transmittances for each junction       OK         3 Air permeability       Afr permeability at 50 pascals       3.00 (design value)       OK         Maximum       10.0       OK         4 Heating efficiency       Boiler systems with radiators or underfloor heating - mains gas       Data from manufacturer         Combi boiler       Efficiency 89.0 % SEDBUK2009       OK         Secondary heating system:       None       OK         5 Cylinder insulation       No cylinder       U	External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	ОК
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       calculated from linear thermal transmittances for each junction       OK         3 Air permeability       Air permeability at 50 pascals       3.00 (design value)       OK         Maximum       10.0       OK         4 Heating efficiency       Boiler systems with radiators or underfloor heating - mains gas       Data from manufacturer         Combi boiler       Efficiency 89.0 % SEDBUK2009       OK         Secondary heating system:       None       OK         5 Cylinder insulation       Hot water Storage:       No cylinder	Party wall	0.00 (max. 0.20)	-	OK
Openings1.63 (max. 2.00)2.40 (max. 3.30)OKCa Thermal bridgingCalculated from linear thermal transmittances for each junctionOpeningOpening3 Air permeability3.00 (design value) 10.0OK4 Heating efficiency3.00 (design value) 10.0OK4 Heating system:Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %OK5 Cylinder insulationNoneImage: Secondary heating system:None	Floor	· · · · · · · · · · · · · · · · · · ·		
2a Thermal bridging       Thermal bridging calculated from linear thermal transmittances for each junction         3 Air permeability       3.00 (design value)         Air permeability at 50 pascals       3.00 (design value)         Maximum       10.0       OK         4 Heating efficiency       Boiler systems with radiators or underfloor heating - mains gas       Oata from manufacturer         Combi boiler       Efficiency 89.0 % SEDBUK2009       OK         Secondary heating system:       None       OK         4 Hot water Storage:       No cylinder       OK				
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         Heating efficiency         Main Heating system:       Boiler systems with radiators or underfloor heating - mains gas       OK         Data from manufacturer       Combi boiler       Efficiency 89.0 % SEDBUK2009       OK         Secondary heating system:       None       OK         Hot water Storage:		1.63 (max. 2.00)	2.40 (max. 3.30)	ок
3 Air permeability       Air permeability at 50 pascals       3.00 (design value)       OK         Maximum       10.0       OK         4 Heating efficiency       Boiler systems with radiators or underfloor heating - mains gas       Oata from manufacturer         Main Heating system:       Boiler systems with radiators or underfloor heating - mains gas       Oata from manufacturer         Combi boiler       Efficiency 89.0 % SEDBUK2009       OK         Secondary heating system:       None       OK         6 Cylinder insulation       Hot water Storage:       No cylinder				
Air permeability at 50 pascals Maximum       3.00 (design value) 10.0       OK         I Heating efficiency       IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII		from linear thermal transmittan	ices for each junction	
Maximum     10.0     OK       Image: 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     OK       Image: Secondary heating system:     None     None			3.00 (design valu	e)
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         Secondary heating system:       None         Main Heating system:       None				
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         Secondary heating system:       None         Main Heating system:       None	4 Heating efficiency			
Combi boiler       Efficiency 89.0 % SEDBUK2009       OK         Secondary heating system:       None       OK         Secondary heating system:       None       None         Secondary heating system:       None       None         Secondary heating system:       None       None		-	rs or underfloor heating - mai	ins gas
Minimum 88.0 % OK Secondary heating system: None Cylinder insulation Hot water Storage: No cylinder				
Secondary heating system: None  5 Cylinder insulation Hot water Storage: No cylinder		Efficiency 89.0 % SEDBUK	2009	
5 Cylinder insulation Hot water Storage: No cylinder		Minimum 88.0 %		ок
Hot water Storage: No cylinder	Secondary heating system:	None		
	5 Cylinder insulation			
N/A	Hot water Storage:	No cylinder		
				N/A

## **Regulations Compliance Report**

Controls			
Controls			
Space heating controls Hot water controls:	TTZC by plumbing and el No cylinder	ectrical services	ок
Boiler interlock:	Yes		ок
Low energy lights			
Percentage of fixed lights with	th low-energy fittings	100.0%	
Minimum		75.0%	ок
Mechanical ventilation			
Continuous supply and extra	ct system		
Specific fan power:	-	0.47	
Maximum		1.5	ок
MVHR efficiency:		93%	
Minimum		70%	OK
Summertime temperature			
Overheating risk (Thames va	alley):	Medium	OK
ased on:			
Overshading:		Average or unknown	
Windows facing: North		15.13m²,	
Windows facing: East		2.16m*,	
Windows facing: South		8.64m²,	
Windows facing: West		6.77m*,	
Ventilation rate:		3.00	
Blinds/curtains:		Dark-coloured venetian bli	nd
		Closed 0% of daylight hou	rs
0 Key features			
Air permeablility		3.0 m³/m²h	
Doors U-value		1.1 W/m <sup>2</sup> K	
Roofs U-value		0.1 W/m <sup>2</sup> K	
External Walls U-value		0.13 W/m <sup>2</sup> K	

Stroma FSAP 2012 Version: 1.0.1.8 (SAP 9.92) - http://www.stroma.com

Photovoltaic array Fixed cooling system

## MEIN-ARDT

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:			
ssessed By: Paul Bainbridge (	(STRO006208)	Building Type: Maison	ette
Dwelling Details:			
EW DWELLING DESIGN STAGE		Total Floor Area: 106.46m <sup>2</sup>	
ite Reference : New Project		Plot Reference: Flat 006	6 - Rev D - No PV
ddress: Flat 006			
Client Details:			
ame:			
ddress:			
his report covers items included v	within the SAP calculations.		
is not a complete report of regula			
1a TER and DER	- -		
uel for main heating system: Mains (	gas		
uel factor: 1.00 (mains gas)	-		
arget Carbon Dioxide Emission Rate	e (TER)	18.23 kg/m²	
welling Carbon Dioxide Emission Ra	ate (DER)	17.53 kg/m²	ок
1b TFEE and DFEE			
arget Fabric Energy Efficiency (TFE		57.20 kWh/m <sup>2</sup>	
welling Fabric Energy Efficiency (DF	EE)	53.50 kWh/m <sup>2</sup>	ок
2 Fabric U-values			UK
Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	ок
Party wall	0.00 (max. 0.20)	-	ок
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)	ок
2a Thermal bridging			
	from linear thermal transmittan	ces for each junction	
3 Air permeability			
Air permeability at 50 pascals Maximum		3.00 (design value)	ок
Maximum		10.0	UK
4 Heating efficiency			
Main Heating system:	-	s or underfloor heating - mains gas	
	Data from manufacturer		
	Combi boiler		
	Efficiency 89.0 % SEDBUK Minimum 88.0 %	2009	OK
	winimum oo.U %		ок
Secondary heating system:	None		
5 Cylinder insulation			
	No cylinder		

ontrols			
Space heating controls	TTZC by plumbing and el	lectrical services	ок
Hot water controls:	No cylinder		
Boiler interlock:	Yes		OK
w energy lights			
Percentage of fixed lights with	th low-energy fittings	100.0%	
Minimum		75.0%	OK
echanical ventilation			
Continuous supply and extra	act system		
Specific fan power:		0.47	
Maximum		1.5	OK
MVHR efficiency:		93%	
Minimum		70%	OK
Immertime temperature			
Overheating risk (Thames v	alley):		OK
d on:			
Overshading:		Average or unknown	
Windows facing: North		15.37m²,	
Windows facing: East		6.6m²,	
Windows facing: South		12.48m <sup>*</sup> ,	
Ventilation rate:		0.10	
Blinds/curtains:		Dark-coloured venetian blind Closed 0% of daylight hours	
		closed 0% of daylight hours	
(ey features			
Air permeablility		3.0 m³/m²h	
Doors U-value		1.1 W/m <sup>2</sup> K	
Roofs U-value		0.1 W/m <sup>2</sup> K	
External Walls U-value		0.13 W/m <sup>2</sup> K	
Fixed cooling system			

## **MEINHARDT**

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: Maiso	nette
Dwelling Details:			
NEW DWELLING DESIGN STAGE		Total Floor Area: 106.46m <sup>2</sup>	
Site Reference : New Project		Plot Reference: Flat 00	6 - Rev D
Address : Flat 006			
Client Details:			
Name:			
Address :			
This report covers items included	within the SAP calculations.		
t is not a complete report of regula	ations compliance.		
1a TER and DER			
uel for main heating system: Mains	gas		
uel factor: 1.00 (mains gas)			
Target Carbon Dioxide Emission Rate		18.23 kg/m <sup>2</sup>	
Welling Carbon Dioxide Emission Ra 1b TFEE and DFEE	ate (DER)	12.82 kg/m²	ок
arget Fabric Energy Efficiency (TFE	E)	57.25 kWh/m <sup>2</sup>	
welling Fabric Energy Efficiency (DF		53.54 kWh/m <sup>2</sup>	
	/		ок
2 Fabric U-values			
Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	ок
Party wall	0.00 (max. 0.20)	-	ок
Floor	(no floor)	0.40 (main 0.25)	014
Roof Openings	0.12 (max. 0.20) 1.72 (max. 2.00)	0.18 (max. 0.35) 2.40 (max. 3.30)	OK OK
2a Thermal bridging	1.72 (max. 2.00)	2.40 (max. 5.50)	OK
	from linear thermal transmittan	ces for each junction	
3 Air permeability		,	
Air permeability at 50 pascals		3.00 (design value)	
Maximum		10.0	ок
4 Heating efficiency			
Main Heating system:	Boiler systems with radiato	rs or underfloor heating - mains gas	
	Data from manufacturer		
	Combi boiler		
	Efficiency 89.0 % SEDBUK Minimum 88.0 %	2009	ок
	Willington 00.0 %		UK
Secondary heating system:	None		
5 Cylinder insulation			
Hot water Storage:	No cylinder		
not hater eterage.			N/A
			100

## Regulations Compliance Report

Space heating controls	TTZC by plumbing and el	ectrical services	ок
Hot water controls:	No cylinder		
Boiler interlock:	Yes		ок
Low energy lights			
Percentage of fixed lights wit	h low-energy fittings	100.0%	
Minimum		75.0%	ок
Mechanical ventilation			
Continuous supply and extra	ct system		
Specific fan power:		0.47	
Maximum		1.5	OK
MVHR efficiency:		93%	
Minimum		70%	OK
Summertime temperature			
Overheating risk (Thames va	lley):	Medium	OK
ed on:			
Overshading:		Average or unknown	
Windows facing: North		15.37m²,	
Windows facing: East		6.6m*,	
Windows facing: South		12.48m²,	
Ventilation rate:		3.00	
Blinds/curtains:		Dark-coloured venetian blind	
		Closed 0% of daylight hours	
Key features			
Air permeablility		3.0 m³/m²h	
Doors U-value		1.1 W/m <sup>2</sup> K	
Roofs U-value		0.1 W/m <sup>2</sup> K	
External Walls U-value		0.13 W/m <sup>2</sup> K	
Photovoltaic array			
Fixed cooling system			

## MEIN-KRDT

1-5 Portpool Lane, London Energy Statement

Appendix B – CHP Whole Life Costing





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

																Years																
Description	0	1	2	3	4	5	6	7	8	٩	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	3(	Notes
Capital cost - Heating system	£48,435	£0	£0	£0	£0	£C	) £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
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	£0	£75/m <sup>2</sup> for office (including fit-out)
Replacement cost - Office cooling	£0	£0	£0	£0	£0	£C	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
O 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	5 £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	3
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																Notoo
Description	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	Notes
E 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	£C	£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
Ö 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
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	£C	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
av 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
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	£C	£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	£C	£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	£C	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
E 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	2105,456	£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	

## MEIN-ARDT

1-5 Portpool Lane, London Energy Statement

Appendix C – SBEM Calculations





# 

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<sub>2</sub> emission rate for the building should not exceed the target

1.1	CO2 emission rate from the notional building, kgCO2/m2.annum	20.9
1.2	Target CO <sub>2</sub> emission rate (TER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	20.9
1.3	Building CO <sub>2</sub> emission rate (BER), kgCO <sub>2</sub> /m <sup>2</sup> .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

Ua-Limit	Ua-Calc	Ui-Calc	Surface where the maximum value occurs'
0.35	0.15	0.15	NT000002_W11
0.25	0.18	0.18	ST000004_F1
0.25	H 3	-	"No heat loss roofs"
2.2	1.5	1.5	FF000007 W-1-W1
2.2	2.09	2.09	NT000002_W1-W0
1.5	-	-	"No external vehicle access doors"
3.5	÷	1	"No external high usage entrance doors"
	0.35 0.25 0.25 2.2 2.2 1.5	0.35         0.15           0.25         0.18           0.25         -           2.2         1.5           2.2         2.09           1.5         -	0.35         0.15         0.15           0.25         0.18         0.18           0.25         -         -           2.2         1.5         1.5           2.2         2.09         2.09           1.5         -         -

Ua-calc = Calculated area-weighted average U-values [W/(m<sup>2</sup>K)]

Ui-calc = Calculated maximum individual element U-values [W/(m<sup>2</sup>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
m3/(h.m2) 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 & targe	eting with alarms for out-of-rai	nge values for this	s 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 [Im/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	% Are
Area [m <sup>2</sup> ]	342.9	342.9	
External area [m2]	571.2	571.2	-
Weather	GLA	GLA	100
Infiltration [m3/hm2@ 50Pa]	3	5	
Average conductance [W/K]	159.65	364.7	
Average U-value [W/m <sup>2</sup> K]	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

### 6 Area Building Type

A1/A2 Retail/Financial and Professional services	
A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways	
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/m<sup>2</sup>]

	Antonia	
	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/m<sup>2</sup>]

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

### Energy & CO<sub>2</sub> Emissions Summary

	Actual	Indicative Target
Heating + cooling demand [MJ/m <sup>2</sup> ]	168.08	257.18
Primary energy* [kWh/m <sup>2</sup> ]	82.46	115.87
Total emissions [kg/m <sup>2</sup> ]	12.6	20.9

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

I	HVAC Sys	stems Pe	rformanc	e			5. 3			
Sy	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Concernance of the second second second		The second second second second second second	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[5]	[] Split or m	ulti-split sy	stem, [HS]	Heat pump	(electric): a	air source,	[HFT] Elec	tricity, [CF]	] 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	UI-Typ	Ui-Min	Surface where the minimum value occurs*
Wall	0.23	0.15	NT000002_W11
Floor	0.2	0.18	ST000004_F1
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 <sub>FTyp</sub> = Typical individual element U-values [W/(m <sup>2</sup> k * There might be more than one surface where the		J-value oc	U <sub>HMin</sub> = Minimum individual element U-values [W/(m <sup>2</sup> K)]

Air Permeability	Typical value	This building	
m3/(h.m2) at 50 Pa	5	3	

# BRUKL Output Document IM 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<sub>2</sub> emission rate for the building should not exceed the target

1.1	CO2 emission rate from the notional building, kgCO2/m2.annum	20.9
1.2	Target CO <sub>2</sub> emission rate (TER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	20.9
1.3	Building CO <sub>2</sub> emission rate (BER), kgCO <sub>2</sub> /m <sup>2</sup> .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

0.15 0.18	0.15	NT000002_W11 ST000004_F1
0.18	0.18	ST000004 E 1
-		3100004_F1
-	÷	"No heat loss roofs"
1.5	1.5	FF000007_W-1-W1
2.09	2.09	NT000002_W1-W0
-	-	"No external vehicle access doors"
-	4	"No external high usage entrance doors"
	1.5	1.5 1.5

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

U<sub>I-Calc</sub> = Calculated maximum individual element U-values [W/(m<sup>2</sup>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	
m3/(h.m2) 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/(I/s)]	HR seasonal efficiency
5.75	3.86	-	-
Automatic monitoring & targ	eting with alarms for out-of-rai	nge values for this	s 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 [Im/W]		
Cupboards	40	-		
Cupboards	20			
Cupboards	30	-		
Store and lift	60	-		
Office BF				
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	% A
Area [m <sup>2</sup> ]	342.9	342.9	-
External area [m <sup>2</sup> ]	571.2	571.2	and other law
Weather	GLA	GLA	100
Infiltration [m³/hm²@ 50Pa]	3	5	-
Average conductance [W/K]	159.65	364.7	
Average U-value [W/m <sup>2</sup> K]	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 **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/m<sup>2</sup>]

	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/m<sup>2</sup>]

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

### Energy & CO<sub>2</sub> Emissions Summary

	Actual	Indicative Target
Heating + cooling demand [MJ/m <sup>2</sup> ]	168.08	257.18
Primary energy* [kWh/m <sup>2</sup> ]	82.46	115.87
Total emissions [kg/m <sup>2</sup> ]	14.6	20.9

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

System Type	Heat dem MJ/m2			Cool con kWh/m2	The state of the second s	Heat SSEEF	Cool SSEER	Heat gen	Cool ger SEER
[ST] Split or r	nulti-split sy	stem, [HS]	Heat pump	(electric): a	air source,			] Electricity	the second se
Astual	123.1	45	6.4	2.2	0	5.36	5.81	5.75	8.18
Actual	120.1	10							

### 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	UI-Typ	Ui-Min	Surface where the minimum value occurs*	
Wall	0.23	0.15	NT000002_W11	
Floor	0.2	0.18	ST000004 F -1	
Roof	0.15	-	"No heat loss roofs"	
Windows, roof windows, and roofligh	ts 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 <sub>FTyp</sub> = Typical individual element U-values [W * There might be more than one surface when		J-value oc	U <sub>i-Min</sub> = Minimum individual element U-values [W/(m <sup>2</sup> K)] curs.	
Air Permeability	Typical valu	le	This building	

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<sub>2</sub> emission rate for the building should not exceed the target

1.5	Are as built details the same as used in the BER calculations?	Separate submission
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.3	Building CO <sub>2</sub> emission rate (BER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	14.7
1.2	Target CO <sub>2</sub> emission rate (TER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	20.9
	CO2 emission rate from the notional building, kgCO2/m2.annum	20.9

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

### 2.a Building fabric

0.15	NT000002_W11 ST000004_F1 "No heat loss roofs"
-	"No heat loss roofs"
-	
1.5	FF000007_W-1-W1
2.09	NT000002_W1-W0
-0	"No external vehicle access doors"
-	"No external high usage entrance doors"
	-

Ua-cate = Calculated area-weighted average U-values [W/(m<sup>2</sup>K)]

U-cate = Calculated maximum individual element U-values [W/(m<sup>2</sup>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
m³/(h.m²) 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	

### 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				

#### 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	(A=C).	
Office GF	1060	<u>-</u>	

## 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
Area [m <sup>2</sup> ]	342.9	342.9	
External area [m <sup>2</sup> ]	571.2	571.2	and the second second
Weather	GLA	GLA	100
Infiltration [m3/hm2@ 50Pa]	3	5	
Average conductance [W/K]	159.65	364.7	
Average U-value [W/m <sup>2</sup> K]	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

### 6 Area Building Type

	-
A1/A2 Retail/Financial and Professional services	
A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways	
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/m<sup>2</sup>]

	Actual	Notional
Heating	6.38	20.83
Cooling	2.15	5.78
Auxiliary	0	0
Lighting	15.21	12.85
Hot water	4.69	3.32
Equipment*	39.84	39.84
TOTAL**	28.44	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/m<sup>2</sup>]

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

### Energy & CO<sub>2</sub> Emissions Summary

	Actual	Indicative Target
Heating + cooling demand [MJ/m <sup>2</sup> ]	168.08	257.18
Primary energy* [kWh/m <sup>2</sup> ]	83.04	115.87
Total emissions [kg/m <sup>2</sup> ]	14.7	20.9

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

4	HVAC Sys	stems Pe	rformanc	e						
Sy	stem Type	Heat dem MJ/m2	Cool dem MJ/m2		Cool con kWh/m2		Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool ger SEER
[S	T] Split or m	ulti-split sy	stem, [HS]	Heat pump	(electric): a	air source,	[HFT] Elec	tricity, [CF1	] 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

1	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
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	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**

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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 <sub>FTyp</sub> = Typical individual element U-values [W/(m <sup>2</sup> + * There might be more than one surface where the		J-value oc	U <sub>HMin</sub> = Minimum individual element U-values [W/(m <sup>2</sup> K)] curs.		

Air Permeability	Typical value	This building		
m3/(h.m2) at 50 Pa	5	3		



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